JP Court 3/17
Parking Lot Expansion

THIS COPY IS FOR INFORMATION ONLY. YOU MUST PURCHASE THE PROPOSAL TO SUBMIT A BID.

STATE PROJECT
#MC0213000002

PROJECT ADDRESS
23720 Shortly Rd.
Georgetown, DE 19947

OWNER
State of Delaware
Facilities Management Administration
Office of Management and Budget
540 S. DuPont Hwy., Suite 1
Dover, DE 19901

ARCHITECTS
DELAWARE ARCHITECTS, LLC
550 S. DuPont Blvd., Suite E
Milford, DE 19963
302-491-6047

VISTA DESIGN, Inc.
11634 Worcester highway
Showell, MD 21862

Volume I Of 2

TABLE OF CONTENTS

PROJECT MANUAL

A. Specifications for this project are arranged in accordance with the Construction Specification Institute numbering system and format. Section numbering is discontinuous and all numbers not appearing in the Table of Contents are not used for this Project.

B. DOCUMENTS BOUND HEREWITH

ADVERTISEMENT FOR BID

Sealed bids for **OMB/DFM Contract No. MC0213000002 – J.P. Court 3/17 – Parking Lot Expansion** will be received by the State of Delaware, Office of Management and Budget, Division of Facilities Management, in the reception area of the Facilities Management Office in the Thomas Collins Building, 540 S. DuPont Highway, Suite 1 (Third Floor), Dover, Delaware 19901 until 2:00 p.m. local time on Thursday, October 11, 2012, at which time they will be publicly opened and read aloud in the Conference Room. Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.

Project involves sitework and paving required for the expansion of the existing parking lot and installation of the required stormwater management devices at J.P. Court 3/17 located in Georgetown, Delaware.

A **MANDATORY** Pre-Bid Meeting will be held on Friday, September 21, 2012, at 10:00 a.m. at the J.P. Court 3/17 parking lot, 23730 Shortly Road, Georgetown, Delaware, for the purpose of establishing the list of subcontractors and to answer questions. Representatives of each party to any Joint Venture must attend this meeting. **ATTENDANCE OF THIS MEETING IS A PREREQUISITE FOR BIDDING ON THIS CONTRACT.**

Sealed bids shall be addressed to the Division of Facilities Management, 540 S. DuPont Highway, Suite 1, Dover, DE 19901, Attn: Kerry Wareham. The outer envelope should clearly indicate: **"OMB/DFM CONTRACT NO. MC0213000002 – J.P. COURT 3/17 – PARKING LOT EXPANSION - SEALED BID - DO NOT OPEN."**

Contract documents on CD may be obtained at the office of Delaware Architects, LLC, 550 S. DuPont Boulevard, Suite E, Milford, DE 19963, phone (302) 491-6047, upon receipt of $50.00 per CD/non refundable. Checks are to be made payable to "Delaware Architects, LLC".

Construction documents will be available for review at the following locations: Delaware Architects, LLC; Delaware Contractors Association; Associated Builders and Contractors.

Minority Business Enterprises (MBE), Disadvantaged Business Enterprises (DBE) and Women-Owned Business Enterprises (WBE) will be afforded full opportunity to submit bids on this contract and will not be subject to discrimination on the basis of race, color, national origin or sex in consideration of this award. 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. The Owner reserves the right to reject any or all bids and to waive any informality therein. The Owner 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 by certified delivery, facsimile machine or other electronic means to those bidders receiving plans.

END OF ADVERTISEMENT FOR BIDS

INSTRUCTIONS TO BIDDERS

TABLE OF ARTICLES

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 AGENCY: Contracting State Agency as noted on cover sheet.

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

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 BID: A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.14 BASE BID: The sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).

1.15 ALTERNATE BID (or ALTERNATE): An amount stated in the Bid, where applicable, to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted.

1.16 UNIT PRICE: An amount stated in the Bid, where applicable, as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

1.17 SURETY: The corporate body which is bound with and for the Contract, or which is liable, and which engages to be responsible for the Contractor's payments of all debts pertaining to and for his acceptable performance of the Work for which he has contracted.

1.18 BIDDER'S DEPOSIT: The security designated in the Bid to be furnished by the Bidder as a guaranty of good faith to enter into a contract with the Agency if the Work to be performed or the material or equipment to be furnished is awarded to him.

1.19 CONTRACT: The written agreement covering the furnishing and delivery of material or work to be performed.

1.20 CONTRACTOR: Any individual, firm or corporation with whom a contract is made by the Agency.

1.21 SUBCONTRACTOR: An individual, partnership or corporation which has a direct contract with a contractor to furnish labor and materials at the job site, or to perform construction labor and furnish material in connection with such labor at the job site.

1.22 CONTRACT BOND: The approved form of security furnished by the contractor and his surety as a guaranty of good faith on the part of the contractor to execute the work in accordance with the terms of the contract.

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 his 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 valid Delaware Business License Number with their Bid or shall state that the process of application for a Delaware Business License has been initiated.

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.

4.2 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, color, sex 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, color, sex 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, color, sex 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 $15,000, and $100,000 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 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 Prior to receiving an award, the successful Bidder shall furnish to the Agency proof of State of Delaware Business Licensure. If the Bidder does not currently have a Business License, they may obtain an application by writing to: Division of Revenue, Carvel State Office Building, 820 French Street, Wilmington, DE 19899. A copy of the letter written to the Division of Revenue, sent with your Bid will be adequate proof for your firm to be considered for award until such time as you receive your license.

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 provide 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.

END OF INSTRUCTIONS TO BIDDERS

BID FORM

For Bids Due:_____ **To:** State of Delaware – Department of State
Division of Facilities Management
540 S. DuPont Highway
Dover, DE 19901

Name of Bidder: _____

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

(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:

$_____
($)

ALTERNATES

There no alternates scheduled for this project at this time

UNIT PRICES

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

UNIT PRICE No. 1: Satisfactory fill in place per cubic yard. $_____

UNIT PRICE No. 2: Stone in place per cubic yard. Contract $_____

UNIT PRICE No. 3: Undercut and disposal (mass) per cubic yard. $_____

UNIT PRICE No. 4: Stone (trench) backfill per cubic yard. $_____

UNIT PRICE No. 5: Topsoil per cubic yard. $_____

BID FORM

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

This bid shall remain valid and cannot be withdrawn for 60 days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid (if required).

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

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

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.

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:** _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Bid Security

(Others as Required by Project Manuals)

BID FORM

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.

Subcontractor Category	Subcontractor	Address (City & State)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

BID FORM

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: _____

_____

_____

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.

STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

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)

Corporate Seal By: _____
Authorized Signature

Attest _____ _____
Title

_____
Name of Surety

Witness:_____ By: _____

_____
Title

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)

STATE OF DELAWARE
OFFICE OF MANAGEMENT AND BUDGET

PAYMENT 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 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: Name:
Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

_____ By: _____(SEAL)
Name: Name:
Title:

(Corporate Seal)

DRAFT

AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«DVMC - Bear»
« »
« »

The Architect:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.
(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

«»

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

«»

§ 3.2 The Contract Time shall be measured from the date of commencement.

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than « » (« ») days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)

« »

Portion of Work	Substantial Completion Date

, subject to adjustments of this Contract Time as provided in the Contract Documents.
(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)

« »

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

« »

§ 4.3 Unit prices, if any:
(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price Per Unit ($0.00)

§ 4.4 Allowances included in the Contract Sum, if any:
(Identify allowance and state exclusions, if any, from the allowance price.)

Item	Price

ARTICLE 5 PAYMENTS

§ 5.1 PROGRESS PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported

by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of « » percent (« » %). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of « » percent (« » %);

.3 Subtract the aggregate of previous payments made by the Owner; and

.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007.

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:
(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)

« »

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 FINAL PAYMENT

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2007

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

§ 8.3 The Owner's representative:
(Name, address and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 The Contractor's representative:
(Name, address and other information)

« »
« »
« »
« »
« »
« »

§ 8.5 Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.6 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 9.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

« »

Section	Title	Date	Pages

§ 9.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

« »

Number	Title	Date

§ 9.1.6 The Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are also enumerated in this Article 9.

§ 9.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:

«»

.2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor's bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

«»

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

Type of insurance or bond	Limit of liability or bond amount ($0.00)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

AIA® Document G702™ – 1992

Application and Certificate for Payment

TO OWNER:

PROJECT: DVMC - Bear

APPLICATION NO: 001

Distribution to:
OWNER:
ARCHITECT:
CONTRACTOR:
FIELD:
:

PERIOD TO:

CONTRACT FOR: General Construction

CONTRACT DATE:

PROJECT NOS: / /

FROM CONTRACTOR:

VIA ARCHITECT:

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	$0.00
2. NET CHANGE BY CHANGE ORDERS	$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)	$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	$0.00
5. RETAINAGE:	
a. 0 % of Completed Work (Column D + E on G703: $0.00)=	$0.00
b. 0 % of Stored Material (Column F on G703: $0.00)=	$0.00
Total Retainage (Lines 5a + 5b or Total in Column I of G703)	$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)	$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	$0.00
8. CURRENT PAYMENT DUE	$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$0.00

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

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 for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:
County of:
Subscribed and sworn to before me this day of
Notary Public:
My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $0.00

(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.

AIA® Document G703™ – 1992

Continuation Sheet

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT,
containing Contractor's signed certification is attached.
In tabulations below, amounts are in US dollars.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:	001
APPLICATION DATE:	
PERIOD TO:	
ARCHITECT'S PROJECT NO:	

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G ÷ C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00%**	**0.00**	**0.00**

STANDARD

GENERAL CONDITIONS

OF THE

CONSTRUCTION CONTRACT

The General Conditions of this Contract are as stated in the American Institute of Architects Document AIA A201 (1997 Edition) entitled General Conditions of the Contract for Construction and is part of this project manual as if herein written in full.

Copies of the Document are available through the Owner.

SUPPLEMENTARY GENERAL CONDITIONS A201-1997

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A201-1997. 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

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:

1.1.2 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.

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

Delete Paragraph 1.6.1 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."

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 cleaning 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 proceed 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 one year 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 one year 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.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.2 ARCHITECT'S 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.

4.3 CLAIMS AND DISPUTES

Delete Paragraph 4.3.10 in its entirety.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

Delete Paragraph 4.4.5 in it entirety and replace with the following:

4.4.5 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 4.4.6 in its entirety.

4.5 MEDIATION

4.5.2 At the end of the second sentence, delete "and with the American Arbitration Association."

4.6 ARBITRATION

Delete Paragraph 4.6 and its sub-sections in its entirety.

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, 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.

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK OF 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

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:

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

9.2.3 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 10% 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.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Paragraphs:

10.1.2 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.

10.1.3 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.

10.5 Delete Paragraphs 10.5 in its entirety.

ARTICLE 11: INSURANCE AND BONDS

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROJECT MANAGEMENT PROTECTIVE LIABILITY INSURANCE

Delete Paragraph 11.3 in its entirety.

11.4 PROPERTY INSURANCE

Delete Paragraph 11.4 in its entirety and replace with the following:

11.4 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.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

Add the following Paragraph:

12.2.2.1.1 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.

ARTICLE 13: MISCELLANEOUS PROVISIONS

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.

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.

END OF SUPPLEMENTARY GENERAL CONDITIONS

GENERAL REQUIREMENTS

TABLE OF ARTICLES

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 shall not begin until the Contractor is in receipt of a bonafide State of Delaware Purchase Order.

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, color, sex 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, color, sex 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, color, sex or national origin."

ARTICLE 2: OWNER
(NOT ADDENDED)

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 State Tax Department within ten (10) days after award of the Contract, a statement of the total values of each contract and Subcontract, together with the names and addresses of the contracting parties …. "

3.12 PREFERENCE FOR DELAWARE LABOR

3.12.1 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 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 twelve months 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 pursing 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 three (3) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of 3 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.

5.2 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 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 point five 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 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: 1) failure to supply the adequate labor supply ratio for the project; 2) inadequate financial resources; or, 3) 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: 1) failure to supply the adequate labor supply ratio for the project; 2) inadequate financial resources; or, 3) 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., 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 hold permanently, 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 will 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 "Article 6516, Chapter 65, Title 29 of the Delaware Code stipulates annualized interest 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.

9.4 FINAL PAYMENT

9.4.1 Final payment, including the five percent (5%) retainage, 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: provide two original, bound, full size sets of As-built drawings with changes marked clearly in red at time of project close-out.

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 work place, 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 this 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
	$1,000,000	aggregate
Property Damage	$ 500,000	for each occurrence
	$1,000,000	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
	$1,000,000	aggregate
Property Damage	$ 500,000	for each occurrence
	$500,000	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 one year 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 ARCHAEOLOGICAL 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 WARRANTY

13.5.1 For a period of one year 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 one year, 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 GENERAL REQUIREMENTS

Department of Veterans Affairs

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION - LOWER TIER COVERED TRANSACTIONS *(Contractor)*

AUTHORITY: This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 38 CFR Part 44.510, Participants' Responsibilities. The regulations were published as Part VII of the May 26, 1988, Federal Register (pages 191600 - 192110). Copies of the regulations may be obtained by contacting the person to whom this proposal is submitted.

CERTIFICATION: The authorized representative certifies, by submission of this form, that neither they nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

INSTRUCTIONS:

1. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

2. The certification in this clause is a material representation of act upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available, remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "participant," "person," "primary covered transaction," "principle," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion-Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

NAME AND ADDRESS OF COMPANY:	PROJECT FAI *(Federal Application Identifier)* NO.
NAME OF LOWER TIER PARTICIPANT	TITLE OF LOWER TIER PARTICIPANT
SIGNATURE OF LOWER TIER PARTICIPANT	DATE SIGNED *(mm/dd/yyyy)*

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR **HIGHWAY CONSTRUCTION** EFFECTIVE MARCH 15, 2012

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
BRICKLAYERS	45.63	45.63	14.51
CARPENTERS	49.06	49.06	39.22
CEMENT FINISHERS	30.40	26.13	23.29
ELECTRICAL LINE WORKERS	22.50	54.05	21.25
ELECTRICIANS	59.10	59.10	59.10
IRON WORKERS	42.20	22.98	25.35
LABORERS	30.23	26.66	29.03
MILLWRIGHTS	16.11	15.63	13.49
PAINTERS	56.07	56.07	56.07
PILEDRIVERS	59.23	23.75	26.95
POWER EQUIPMENT OPERATORS	41.41	27.54	26.43
SHEET METAL WORKERS	22.75	20.31	18.40
TRUCK DRIVERS	32.17	22.45	22.15

CERTIFIED: 5/25/12 BY: _____ for
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

PROJECT: MC0213000002 JP Court 3-17 Parking Lot Expansion, Sussex County

Employing Delawareans Reporting Requirements for Bidders

Consistent with Section 40 of Senate Bill 130, below are reporting requirements that must be filled out for projects funded through "Building Delaware's Future Now Fund". <u>This information shall be submitted along with your bid proposal.</u>

Contractor Name: _____

Project Name: _____

1. The number of people reasonably anticipated to be employed on the project (excluding subcontractors):_____
2. The number and percentage of such employees who are bona fide legal residents of the State: Number:_____ Percentage:_____
3. The total number of employees of the bidder: _____
4. The total percentage of employees of such bidder who are bona fide residents of the State: _____
5. To the extent subcontractors are to be employed, the bidder shall disclose its reasonable, good faith determination of the number and percentage of employees of such subcontractors who are bona fide legal residents of the State: Number:_____ Percentage:_____

No bid for any contract hereunder shall be responsive unless the prospective bidder discloses the information requested.

Bona Fide Delaware resident is defined in section 40 paragraph d: *(d) For purposes of this section, "bona fide legal resident of this State" shall mean any resident who has established residence of at least 90 days in the State.*

All contractors awarded contracts hereunder shall submit a report to the Director of the Office of Management and Budget setting forth the actual number and percentage of employees of such contractor who are bona fide legal residents of the State. To the extent subcontractors are employed in connection with any such contractor, the contractor shall further disclose the actual number and percentage of employees of such subcontractor who are bona fide legal residents of the State. Such report shall be due on the earlier of 30 days from the completion of the project or December 31 of each calendar year.

To be filled out by Awarding State Agency/Organization:

State Agency Name: _____

Point of Contact & Phone Number: _____

Bid ($) Amount: _____

Appropriation Number: _____

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work phases.
3. Work under other contracts.
4. Use of premises.
5. Owner's occupancy requirements.
6. Specification formats and conventions.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: JP court 3/17 Parking Lot Expansion

1. Project Location: Georgetown, DE

B. Owner: State of Delaware, OMB/DFM – 540 South DuPont Hwy, Dover, DE 19901

C. Owner's Representative: Mr. Mark DeVore

D. Architect: Delaware Architects, LLC, 550 S. DuPont Blvd., Suite E, Milford, Delaware 19963.

E. The Work consists of the following:

1. The Work includes Expansion of existing parking lot

F. Project will be constructed under a single prime contract.

1.3 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as directed by the Owner.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits: Confine constructions operations to those areas as indicated on the drawings.

2. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
3. Maintain access to existing walkways, drives, parking areas, and other adjacent site amenities as well as occupied or used buildings and facilities. Do not close or obstruct walkways, or other occupied buildings or used facilities without written permission from Owner.
4. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.4 OPERATIONS AND STORAGE AREAS

A. Coordination of Work with the Cemetery Administrator: Burial activities at the Delaware Veterans Memorial Cemetery – Bear, Delaware shall take precedence over construction activities. Construction noise during the interment services cannot disturb the burial service. To cause the least possible interference with cemetery activities, the Contractor will cease all work in areas where burials are taking place. Trucks and workmen are prohibited from passing through the service area during this period.

B. The Contractor shall confine all operations (including storage of materials) on Cemetery premises to areas authorized or approved by the Cemetery Administrator. The Contractor shall hold and save the Delaware Commission of Veterans Affairs and the State of Delaware, its officers and agents, free and harmless from liability of any nature resulting from the Contractor's performance and/or negligence. It is understood that the Delaware Commission of Veterans Affairs and the State of Delaware shall not be held responsible for any damage to the Contractor's equipment, materials, supplies or the like which may result from vandalism, theft etc. while on site.

C. The Contractor shall, under regulations prescribed by the Cemetery Administrator, use only established roadways.

D. When materials are transported in performance of work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

E. The Cemetery Administrator shall designate working space and space available for storing materials. Unless otherwise indicated on drawings as the Contractor’s “Staging Area”, all working and storage space must be approved by the Cemetery Administrator prior to its use.

F. Contract personnel are subject to the Cemetery rules of conduct. In addition to items listed elsewhere in this contract, the Contractor is responsible for ensuring that no contract work causes any committal service, ceremony, procession or visitation to be

delayed, altered, or otherwise impacted in such a way that the dignity, security, or safety of the event or visit is compromised.

G. Contractor shall execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times. Materials and Equipment shall not be stored in other than assigned areas.

1.5 WORK RESTRICTIONS

A. Required Stoppage of Work: All construction activities must cease during all funerals in progress including the gun salute. Owner will provide a weekly schedule of scheduled funerals.

B. Federal Holidays: No construction related work will be allowed on Federal Holidays.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "MasterFormat" numbering system.

1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. See Division 01 Section "Allowances" for procedures for using unit prices to adjust quantity allowances.

1.2 DEFINITIONS

A. Unit price is a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. See Bid Form

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. The are no alternates scheduled for this project.

END OF SECTION 012300

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. See Division 01 Section "Unit Prices" for administrative requirements for using unit prices.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.4 ALLOWANCES

A. Allowances are not considered as part of this contract.

1.5 CHANGE ORDER PROCEDURES

A. A Change Order that results in added cost to the project must be approved by VCGS prior to Owner/Architect approving Change Order.

B. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets Submittals Schedule and Contractor's Construction Schedule.
2. Submit the Schedule of Values to Architect at earliest possible date but no later than 15 days before the date scheduled for submittal of initial Applications for Payment.
3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Progress payments shall be submitted to Architect by the last day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

    1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
    2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 5 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

    1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Schedule of unit prices.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.
9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.

8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Project meetings.
3. Requests for Interpretation (RFIs).

B. See Division 01 Section "Multiple Contract Summary" for a description of the division of Work among separate contracts and responsibility for coordination activities not in this Section.

C. See Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit five opaque copies of each submittal. Architect will return one copy.
4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Architect will record significant discussions and agreements achieved. Architect will distribute the meeting minutes to everyone concerned, including Owner, Contractor and VCGS, within five days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. LEED requirements.
l. Preparation of Record Documents.
m. Use of the premises.
n. Work restrictions.
o. Owner's occupancy requirements.
p. Responsibility for temporary facilities and controls.
q. Construction waste management and recycling.
r. Parking availability.
s. Office, work, and storage areas.
t. Equipment deliveries and priorities.
u. First aid.
v. Security.

w. Progress cleaning.
x. Working hours.

3. Minutes: Architect will record and distribute meeting minutes to everyone concerned, including Owner, Contractor and VCGS.

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

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility problems.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written recommendations.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

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

D. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) RFIs.
        16) Status of proposal requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

3. Minutes: Architect will record and distribute meeting minutes to everyone concerned, including Owner, Contractor and VCGS.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.6 REPORTING REQUIREMETNS

A. The Contractor is required to check-in with the Cemetery Director (or designee) at the Cemetery on a weekly basis (or as otherwise agreed upon). The Contractor will provide the Cemetery Director with an anticipated work schedule, and the Cemetery Director will furnish the Contractor with a schedule of funerals and/or special events. This weekly check-in is mandatory and may not be accomplished by telephone or e-mail.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

C. Hard-Copy RFIs: CSI Form 13.2A.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

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

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Submittals Schedule.
3. Daily construction reports.
4. Monthly Progress reports.
5. Field condition reports.

B. See Division 01 Section "Payment Procedures" for submitting the Schedule of Values.

C. See Division 01 Section "Photographic Documentation" for submitting construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

E. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

F. Major Area: A story of construction, a separate building, or a similar significant construction element.

1.3 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

B. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

D. Daily Construction Reports: Submit two copies at weekly intervals.

E. Monthly Construction Progress Report: Submit three copies along with Request for Payment.

F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include the appropriate number of days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Bar Graph Schedule: Submit a comprehensive, fully developed, horizontal Bar Graph, Contractor's Construction Schedule within 10 days of date established for the Notice of Award. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Stoppages, delays, shortages, and losses.

7. Orders and requests of authorities having jurisdiction.
8. Services connected and disconnected.

B. Monthly Construction Progress Reports: Prepare a monthly construction report to be submitted along with requests for payment. Three copies of the Monthly Construction Progress Reports shall be submitted to the Architect. The Architect will distribute report to Owner and VCGS. Monthly Construction Progress Reports shall record the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Equipment at Project site.
3. Material deliveries.
4. High and low temperatures and general weather conditions.
5. Accidents.
6. Stoppages, delays, shortages, and losses.
7. Orders and requests of authorities having jurisdiction.
8. Services connected and disconnected.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices if applicable.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have

completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

B. See Division 01 Section "Closeout Procedures" for submitting digital media as Project Record Documents at Project closeout.

C. See Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.

1.2 SUBMITTALS

A. Key Plan: Submit key plan of Project Site with notation of vantage points marked for location and direction of each photograph. Indicate location (Section and Field) of construction. Include same label information as corresponding set of photographs.

B. Construction Photographs: Submit one file of each photographic view within seven days of taking photographs.

1. Format: Digital. Keep all photographic images on a CD disc on site for review.
2. Identification: In a corresponding log, provide the following information keyed to each photo file:

   a. Name of Project.
   b. Name of Architect.
   c. Name of Contractor.
   d. Date and time of day photograph was taken if not date stamped by camera.
   e. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   f. Unique sequential identifier.
3. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

1.3 COORDINATION

A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including

temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

1.4 USAGE RIGHTS

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

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.
2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.

C. Preconstruction Photographs: Before starting construction, take, digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag excavation areas and construction limits before taking construction photographs.
2. Take a minimum of eight photographs to show existing conditions adjacent to property before starting the Work.
3. Take a minimum of eight photographs of adjoining fields to accurately record physical conditions at start of construction.

D. Periodic Construction Photographs: Take 12, digital photographs bi-weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Photographs must accompany each monthly request for payment.

E. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
d. Substantial Completion of a major phase or component of the Work.
e. Extra record photographs at time of final acceptance.
f. Owner's request for special publicity photographs.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. See Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.

C. See Division 01 Section "Photographic Documentation" for submitting construction photographs.

D. See Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.

E. See Division 01 Section "Closeout Procedures" for submitting warranties.

F. See Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1. Transmittal Form: Use AIA Document G810 or CSI Form 12.1A.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

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

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating " Approved or Approved as noted " taken by Architect.

1.4 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. Contractor must provide Delaware Architects, LLC (DALLC) with an executed release of liability form as provide by DALLC.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications.
    c. Manufacturer's installation instructions.
    d. Manufacturer's catalog cuts.
    e. Wiring diagrams showing factory-installed wiring.
    f. Printed performance curves.
    g. Operational range diagrams.
    h. Compliance with specified referenced standards.
    i. Testing by recognized testing agency.

4. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Notation of coordination requirements.
    j. Notation of dimensions established by field measurement.
    k. Relationship to adjoining construction clearly indicated.
    l. Seal and signature of professional engineer if specified.
    m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.

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

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.

1. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

1. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

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

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

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

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating

a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Statement on condition of substrates and their acceptability for installation of product.
2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

U. Construction Photographs: Comply with requirements specified in Division 01 Section "Photographic Documentation."

V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return them for resubmittal.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

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

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. “Approved” or “Approved as noted” indicates “Fabrication/Installation may be undertaken. Approval does not authorize changes to the Contract Sum or Contract Time” Nor does it relieve the contractor from their responsibility for review and verification that submittal meets the requirements set forth in the construction documents.

2. “Revise and Resubmit” or ‘Rejected” indicates “Fabrication and/or installation MAY NOT be undertaken. In resubmitting, limit corrections to items marked.

3. Review/approval neither extends nor alters any contractual obligations of the Architect/Engineer or Contractor.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

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

3.3 REQUIRED SUBMISSIONS

A. Contractor to submit product literature/samples for approval of the following:
   1. Geo-grid System
   2. Crushed Stone Base Material
   3. Sod
   4. Temporary Grave Site Marker

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. See Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

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

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

C. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

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

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

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

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

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

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

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

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

1.5 QUALITY ASSURANCE

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

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

H. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 49.

1.6 QUALITY CONTROL

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

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

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

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

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

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

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

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

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists (The)
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	ACI International (American Concrete Institute)
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers

AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (The American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	AWCI International

	(Association of the Wall and Ceiling Industry International)
AWCMA	American Window Covering Manufacturers Association (Now WCSC)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet & Rug Institute (The)

CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association
FIBA	Federation Internationale de Basketball (The International Basketball Federation)
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals
FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association

GANA	Glass Association of North America
GRI	(Now GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA
ITU	International Telecommunication Union

KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association

NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute

PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings

STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute
UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association (Now WCSC)
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association

WWPA Western Wood Products Association

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

BOCA BOCA International, Inc.
(See ICC)

IAPMO International Association of Plumbing and Mechanical Officials

ICBO International Conference of Building Officials
(See ICC)

ICBO ES ICBO Evaluation Service, Inc.
(See ICC-ES)

ICC International Code Council

ICC-ES ICC Evaluation Service, Inc.

SBCCI Southern Building Code Congress International, Inc.
(See ICC)

UBC Uniform Building Code
(See ICC)

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CE Army Corps of Engineers

CPSC Consumer Product Safety Commission

DOC Department of Commerce

DOD Department of Defense

DOE Department of Energy

EPA Environmental Protection Agency

FAA Federal Aviation Administration

FCC Federal Communications Commission

FDA Food and Drug Administration

GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Building Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA)
CFR	Code of Federal Regulations
DOD	Department of Defense Military Specifications and Standards
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification

FTMS	Federal Test Method Standard (See FS)
MIL	(See MILSPEC)
MIL-STD	(See MILSPEC)
MILSPEC	Military Specification and Standards
UFAS	Uniform Federal Accessibility Standards

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation
CCR	California Code of Regulations
CPUC	California Public Utilities Commission
TFS	Texas Forest Service Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. See Division 01 Section "Execution" for progress cleaning requirements.

C. See Divisions 02 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

D. See Division 31 Section "Dewatering" for disposal of ground water at Project site.

1.2 USE CHARGES

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

B. Water Service: Water from Owner's existing water system is available for irrigation and construction use, not cleaning of marker headstones, without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.4 QUALITY ASSURANCE

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

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

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete bases for supporting posts.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Owner. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its own expense upon completion of the work.

C. Fence: Before work operations begin, Contractor shall provide a chain link fence, six feet in height and no more, around the staging area. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 15 inches. Bottom of fences shall extend to one inch above grade.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

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

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to private system indicated as directed by authorities having jurisdiction.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. It is the responsibility of the Contractor to provide water for the newly installed sod as part of this contract. The Contractor may utilize water provided by the Owner via the existing irrigation system, or tanks/water trucks filled offsite as necessary to transport water to areas where needed in order to complete the work required by this contract. Any water that the Contractor obtains from the cemetery will not need to be metered and will not be charged to Contractor.

1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.

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

F. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.

1. Provide additional telephone lines for the following:

    a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.

2. At each telephone, post a list of important telephone numbers including police and fire departments Contractor's home office Architect's office Owner's office Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

H. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail in field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Contractor shall utilize existing paved and gravel roads **only**. The construction of temporary roads, paths etc. shall **not** be permitted.

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

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

D. Parking: Use designated areas as shown on drawings for parking areas for construction personnel.

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

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

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

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

E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

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

1. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.

2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

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

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. See Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.

C. See Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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

1.3 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

B. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

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

C. Storage:

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

1.6 PRODUCT WARRANTIES

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

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 15 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. See Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

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

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work,

investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

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

3.2 PREPARATION

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

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

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

B. General: Engage a licensed Professional Land Surveyor, registered in the State of Delaware, to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

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

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

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

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations. A registered professional land surveyor or registered civil engineer whose services are retained and paid for by the Contractor shall be used to restore any grave section corner monuments that may be disturbed because of the Contractor’s work performance.

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

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.5 INSTALLATION

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

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

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

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

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

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

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

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

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

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

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

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 QUALITY ASSURANCE

A. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety

B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

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

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

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

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

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

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Proceed with patching after construction operations requiring cutting are complete.

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

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. See Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

C. See Division 01 Section "Photographic Documentation" for submitting Final Completion construction photographs and negatives.

D. See Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

E. See Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. If more than one (1) reinspection is required all associated cost of that inspection including architect/engineering fees shall be the responsibility of the Contractor.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize items applying to each major element, including categories.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average cleaning and maintenance program. Comply with manufacturer's written instructions.

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

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove labels that are not permanent.
h. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

i. Remove excess mortar droppings, and other foreign substances.
j. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings (As-built Drawings).
2. Record Specifications (As- built Specifications).
3. Record Product Data As-built Product Data).

B. See Divisions 02 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit one set of red marked as-built prints to the Architect. The Architect will approve via initials and date the prints and indicate whether general scope of changes, additional information recorded, and quality of mark-ups are acceptable as well as any other modifications are deemed necessary. If required by the Architect the Contractor shall, at no additional expense to the Owner or Architect, prepare a revised set of As-built Prints for submission and approval by the Architect. The Architect will return approved prints to the contractor to prepare additional required sets for final submittal.

b. Final Submittal: Submit one set of red marked As-built Prints to the Architect. As-built Prints must be identical to initial submission with required corrections.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

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

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 COMPLETE PROJECT RECORD DOCUMENTS

A. Preparation: Provide one complete set of Project Record Documents to the Owner.

2.4 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

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

END OF SECTION 017839

DIVISION 200 EARTHWORK

SECTION 201 - CLEARING AND GRUBBING

201.01 Description. This work consists of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction unless otherwise indicated, except such objects as are designated to remain or are to be removed in accordance with other Sections of these Specifications. This work also includes the preservation from injury or defacement of all vegetation, trees, and objects designated to remain.

CONSTRUCTION METHODS.

201.02 General. The Contractor shall remove only material herein specified. If the Contractor chooses to do such work with mechanical equipment, and removes and wastes suitable embankment and topsoil material required on the Project, any suitable embankment and topsoil material removed with the cleared and grubbed material shall be replaced by the Contractor.
The Department reserves the right to require the Contractor to use a root rake if large quantities of suitable embankment and topsoil material is being wasted during the grubbing operation.
All arboriculture practices for tree care operations shall be conducted in accordance with ANSI Z133.1 as prepared by the International Society of Arboriculture.

201.03 Trees Designated to Remain. The Engineer shall designate such trees, shrubbery, and plants which are not to be removed, and the Contractor shall protect them from any damage. If any such trees, shrubbery, or plants are damaged, they shall be replaced or repaired by a certified tree surgeon. Branches of trees overhanging the roadbed shall be properly trimmed to maintain a clearance height of 20' (6 m), unless otherwise directed. All pruning shall be performed in accordance with the International Society of Arboriculture's Current Tree Pruning Guidelines, Publication ISBN 1-881956-07-5, and as illustrated on the Standard Construction Details.

201.04 Disposal. All materials removed by the clearing and grubbing operation shall become the property of the Contractor and shall be removed from the Project or otherwise disposed of as specified in Subsection 106.09.

201.05 Preparation of Ground Surface. Grading operations shall not be started in any area until all operations of clearing and grubbing work within the area affected have been completed. In areas where excavation is to be made, the ground shall be cleared of all living or dead trees, stumps, brush, or other objectionable material. All embedded stumps, root mats, etc., shall be removed to a depth of not less than 2' (600 mm) below the subgrade or slope surfaces. All depressions made below the subgrade or slope surfaces by the removal of stumps or roots shall be backfilled with approved material and compacted as directed. In areas where embankment is to be made 5' (1.5 m) or more in depth, where depth is measured from the bottom of the fill to the subgrade, trees and stumps shall be cut off as close to the ground as is practicable, but not to exceed 6" (150 mm) above the ground surface. In the area from the toe of the embankment slope to 5' (1.5 m) inside the embankment, all trees, stumps, roots, brush, root mat, and debris shall be removed.

In areas where embankment is to be made less than 52 (1.5 m) in depth, all trees, stumps, roots, brush, root mat, and debris shall be removed, grubbed, or blasted from the ground, in their entirety. Root mat shall be removed to the following depths unless otherwise indicated in the Contract:

(a) Forested areas (within tree line shown on the Plans): 2' (600 mm)
(b) Scrub wooded areas: 1' (300 mm)
(c) Field areas: vegetation only

Clearing, grubbing, and excavation to permit installation of necessary ditches and sediment controls shall be done prior to clearing and grubbing the remainder of the Contract. Based on soil conditions encountered after completion and acceptance by the Engineer of the applicable clearing and grubbing, topsoil removal, and ditching, the Engineer may direct the Contractor to withhold all earthmoving activities for a maximum of 14 calendar days to allow for drying and solidification of the ground.

201.06 Clearing and Grubbing Limitations. The Engineer reserves the right to limit clearing and grubbing operations in order to ensure compliance with the applicable erosion and sediment control regulations.

The maximum exposed surface area of erodible soil, due to clearing and grubbing operation, shall be 20 ac (8 ha).

201.07 Clearing Outside the Limits of Construction. All trees that interfere with sight distance, either vertically or horizontally, shall be cleared from the right-of-way and easement areas. If noted in the Contract, right-of-way and easement areas shall be cleared, flush with the ground, of all trees, brush, shrubs, downed timber, rotten wood, rubbish, and other objectional debris and vegetation.

201.08 Removal of Other Obstructions. Fences and guardrail upon or within the limits of construction, shall be removed carefully by the Contractor, wholly or in part, as specified or directed, and disposed of as specified or directed, except as otherwise indicated in the Contract. Buildings and other structures shall be removed by the Department or other responsible authority unless otherwise provided. Footings, pipes, conduits, drainage inlets and grates, and similar items which are located beneath the ground surface are not to be removed under Section 201.

SECTION 202 - EXCAVATION AND EMBANKMENT

202.01 Description. This work consists of the removal and final disposal of all materials taken from within the limits of construction as necessary for the preparation and construction of the roadbed, embankments, subgrades, shoulders, slopes, side ditches, approaches, intersecting roads, and private

entrances. Flexible pavement shall be removed under this Section. The removal and final disposal of materials specified under other pay items is not included in this work.

This work also consists of grading and compacting of the embankment, roadway, and shoulders; construction, shaping, and sloping of side ditches, embankment, and cut slopes; construction and maintenance of temporary edge berms, interceptor berms, and embankment slopes associated with all erosion control methods indicated in Section 261; undercutting, which is the removal of unsuitable material below the grade of a proposed subgrade or embankment foundation; salvaging and stockpiling of topsoil for re-use; backfilling of areas from which unsuitable materials have been removed; and the removal and disposal of all material not otherwise provided for, so that the Project is completed in a neat workmanlike manner.

CONSTRUCTION METHODS.

202.02 Test Rolling. Test rolling shall be performed with self-propelled, pneumatic-tired equipment, which shall be of the size, type, and weight that will reveal any soft, yielding, or spongy areas. The equipment shall be run longitudinally with less than 18" (500 mm) of unrolled area between tire strips. If the test rolling shows the subgrade to be unstable, the Contractor shall scarify, disc, aerate, or add moisture, and recompact the subgrade to the extent necessary to achieve stability. Acceptance of the test roll by the Engineer will be a requirement prior to placement of subsequent lifts. The test roll shall be performed with a fully loaded, ten-wheel dump truck or other equipment approved by the Engineer. The test roll shall serve to verify the stability of the lift in question, and no compaction tests will be taken until the stability of the lift is determined to be satisfactory by the Engineer.

202.03 Excavation. Excavation shall be made in accordance with these Specifications, the Plans, or as established by the Engineer. No allowance will be made for materials excavated beyond or below the lines and grades shown. All suitable material removed as excavation shall be used in the formation of embankments, shoulders, and slopes, before securing or impoting any borrow, unless specifically approved by the Engineer. No unsuitable material will be allowed in the formation of embankment. Unsuitable materials shall be deposited on slopes as directed or shall be disposed of when directed. All existing ditches and waterways, and all new or existing pipes and culverts, unless noted on the Plans to be abandoned, shall be cleaned and cleared of obstructions and shall be left in a neat and trimmed condition.

(a) *Obstructions.* The Contractor shall remove and properly dispose of pipes, drainage inlets, pole bases, conduits, and any other articles located below existing ground level.

(b) *Disposal.* All waste materials removed by the excavation operation shall become the property of the Contractor and shall be removed from the Project or otherwise disposed of as specified in Subsection 106.09.

(c) *Topsoil.* Topsoil, if present, shall be removed in its entirety from all cut sections and from fill sections where embankment heights are less than 5’ (1.5 m) when measured from bottom of fill to subgrade.

Sufficient topsoil shall be stockpiled to meet the requirements of Section 733.

For projects where excavation generates excess fill material, remaining topsoil shall be removed from the site and taken to an approved disposal area or shall be retained by the State.

For projects in which embankments are constructed, remaining topsoil shall be incorporated in the outer portions of embankment as shown in the Contract. After all

embankment needs have been met, any remaining topsoil shall be removed from the site and taken to an approved disposal area or shall be retained by the State.

Excess topsoil may be claimed by the Engineer. In such cases, the Contractor shall load State vehicles for its removal. If the State wishes to claim excess topsoil, such direction will be given to the Contractor prior to the start of earth-moving operations.

(d) *Excess Material Stockpiled for Later Use.* If ordered by the Engineer, excess material that cannot be immediately placed in fill areas shall be stockpiled at a location within the Project limits designated by the Engineer, for later use, thus requiring double handling. At the time when stockpiled excess material is to be used in fill areas or for the formation of embankments, shoulders and slopes, it shall be loaded and hauled by the Contractor and placed and compacted as specified in Subsection 202.05. The requirements of this paragraph also apply to excess materials generated from hot-mix removal, incidental concrete removal, and all construction materials which can be used for fill material.

(e) *Excess Material Generated From Other Pay Items.* If ordered by the Engineer, excess materials generated from other pay items which are suitable for embankment purposes shall be placed in fill areas. If the material being excavated can immediately be moved to fill areas for placement, it shall be placed and compacted in accordance with Subsection 202.05. If the material cannot be immediately placed in fill areas, then it shall be stockpiled, and reused at a later time according to (d) above.

(f) *Excess Material Generated by Others.* Excess material generated by others, including other Contractors or utility companies and their Contractors performing work within the Contract limits shall be separately stockpiled for later use in accordance with Subsection 202.03 (d).

202.05 Embankment. All embankments shall be formed of material meeting the requirements of Section 209, except that rock, bituminous concrete, or portland cement concrete, obtained from the excavation, may be used if placed in uniform loose layers of 24" (600 mm) or less. Any exposed rebar shall be cut and disposed of. All material which cannot be readily incorporated into a 24" (600 mm) loose layer shall be reduced in size to meet this requirement. Individual pieces of rock, bituminous concrete, or portland cement concrete shall not exceed 36" (900 mm) in any dimension. No rock, bituminous concrete, or portland cement concrete shall be placed within 5’ (1.5 m) of the top of the embankment when measured from the top surface of rock, bituminous concrete, or portland cement concrete to the bottom of the pavement structure. Embankment materials placed in pile foundation areas where piles are to be placed shall contain no rock, aggregate, broken concrete, or other material which would be retained on a 2½" (63 mm) sieve. No spongy, wet, or frozen material will be permitted in the embankment. Excessive or insufficient mixture content shall not be criteria for classifying materials as unsuitable for embankment. The Contractor shall make the necessary effort to wet or dry the mixture in order to comply with Subsection 202.05 (f).

(a) *Preparation.* Unless shown otherwise on the Plans or in the Special Provisions, where the embankment height to be constructed is less than 5' (1.5 m), all sod, vegetation, and topsoil shall be removed from the surface upon which the embankment is to be placed, and the cleared surface shall be completely broken-up to a minimum depth of 6" (150 mm). This area shall then be recompacted. Sod not required to be removed shall be thoroughly disced before construction of embankment.

Existing treated or compacted road surfaces lying within 3' (900 mm) of the final grade, or within the pavement structure if the subgrade is more than 3' (900 mm) from the final grade, shall be scarified to a depth of at least 6" (150 mm), unless otherwise designated on the Plans. Scarified material shall be recompacted.

Existing paved road surfaces lying within 3' (900 mm) of the final grade, or within the pavement structure if the subgrade is more than 3' (900 mm) from the final grade, shall be removed, and the underlying base materials scarified to a depth of 6" (150 mm).

Existing roadway surfaces lying more than 3' (900 mm) below the final grade, or bottom of pavement structure, shall remain in place and be treated as follows:

(1) Bituminous concrete shall be broken up to a maximum surface area of 1 ft² (0.1 m2) and recompacted.

(2) Portland cement concrete shall be broken up to a maximum surface area of 1 yd² (0.8 m2) with a pavement breaker or other approved equipment.

(3) Bituminous surface treated roadways lying beneath an embankment shall be scarified to a depth of 6" (150 mm) and recompacted.

(b) *Widening Existing Embankments.* Where new embankments are to be placed against existing embankments or the existing embankment is to be widened, the existing embankment shall be benched in accordance with the details shown on the Plans or as directed.

(c) *Placement.* Material shall be placed in successive layers, and each layer shall be placed in a level, uniform cross-section, not to exceed 8" (200 mm) in depth, loose measurement, unless otherwise approved by the Engineer. It shall be deposited and spread parallel to the roadway centerline, and the layers shall extend the full width of the embankment. If so required, each layer shall be disced to ensure uniform distribution of moisture and component materials. Each layer shall be properly compacted, as hereinafter specified, before starting the next layer. No embankment shall be placed on any wet, unstable, or frozen materials.

However, depending on the soil conditions encountered at proposed embankment areas, the Contractor may be directed to place the first lift of embankment to a thickness greater than 83 (200 mm) in depth. All subsequent lifts shall be placed as specified herein.

Unless otherwise approved by the Engineer, the Contractor shall be required to test roll all lifts of soil, aggregate, or soil mixtures according to the requirements of Subsection 202.02. Any instability evidenced during the test roll shall be corrected to the satisfaction of the Engineer by discing, aerating, recompacting, removing, and replacing of material. After corrective measures have been taken, test rolls to verify the stability of the lift shall be required.

At the end of each day during which the Contractor places embankment, the Contractor shall construct edge berms, interceptor berms, and embankment slopes. Temporary slope drains shall be extended to connect to the edge and interceptor berms.

(d) *Compaction Equipment.* There shall be sufficient equipment of the proper type and weight provided to do the work of grading, leveling, and compacting promptly after depositing the material. When this equipment is inadequate for the rate of compacting, the rate of excavation or placing of embankment shall be reduced to a rate not to exceed the capacity of the grading and compacting equipment.

Compaction shall be attained by approved rollers or compactors. The use of other suitable compaction equipment may be approved for work under Section 202 provided such equipment is configured and operated so that the requirements of these Specifications are fully met.

(e) *Compaction Procedure.* Compaction or rolling shall start at the edges, progress toward the center of the embankment, and shall continue until each layer is thoroughly and uniformly compacted to the full width of the embankment and to 95% or more of the maximum density of the same soils as determined by AASHTO T 99 Method C, Modified.

The ordinary use of trucks, carryalls, scrapers, tractors, or other construction equipment may be considered as rolling, but the traffic of such hauling equipment shall be distributed over the fill in such a manner that makes use of the compaction provided by the construction equipment.

All areas of sharp depressions, trench backfills, and around culverts, bridges, and walls, inaccessible to the specified methods of compaction, shall be built in continuous horizontal layers not more than 8" (200 mm) in depth, loose measurement, and shall be thoroughly tamped and compacted to the specified density.

Properly broken rock, bituminous material, or portland cement concrete shall be compacted with a minimum of six passes of an approved roller or as otherwise directed.

(f) *Density and Moisture Control.* The determination of compliance with field compaction requirements, as specified herein, shall be in accordance with the following AASHTO test methods:

(1) AASHTO T 191, T 238, and T 239, Modified. Field density tests shall be expressed as a percentage of the maximum density made on the same soils.

(2) AASHTO T 99 Method C, Modified, for determination of maximum density and optimum moisture content.

(3) AASHTO T 224, Modified, by coarse particle correction method.

The moisture content of the soil at the time of compaction shall be within 2% of the optimum moisture content, as determined by AASHTO T 99 Method C, Modified. If the moisture content is not within 2% of optimum, the soil shall be either moistened or dried and thoroughly mixed to the proper moisture content before compaction.

No compaction or moisture tests shall be taken, unless specifically requested by the Engineer, until the stability of the lift to be tested has been approved by the Engineer.

202.06 Preparation of Subgrade. The subgrade shall be maintained in such condition that it drains. Prior to the formation of the final subgrade, or of the cutting of any section for the pavement structure in which the subbase or base is to be placed, all side ditches parallel to the centerline of the roadway shall be cut to their plan gradient and vegetatively stabilized to prevent scour and erosion. Temporary ditches permitting drainage from the cut for the pavement structure to the side ditches shall be provided at intervals as required. All facilities necessary for complete drainage of the construction area shall be provided and maintained by the Contractor. The Contractor shall provide for the control of sediment and erosion for all water drained or pumped from the subgrade in accordance with Section 110.

In no case shall vehicles be allowed to travel in a single track and form ruts in the subgrade. If any sharp irregularities are formed, the subgrade shall be scarified and recompacted.

(a) *Cut Section.* The subgrade shall be properly shaped and uniformly and thoroughly compacted, in conformity with the lines and grades shown on the Plans or as established in the field, before any subbase, base, or surfacing material is placed. The subgrade shall be free from boulders, large rocks, muck, vegetation, or other materials that would prove detrimental to the road2s stability. Depressions that develop during the rolling shall be filled with suitable material, and the subgrade shall be rolled until no depressions continue to develop.

Where excavation to the finished graded section results in a subgrade or slopes of unsuitable material, the Engineer may require the Contractor to remove the unsuitable material and backfill to the finished graded section with approved material in accordance with Section 212. The Contractor shall conduct its operations in a manner that allows the Engineer to take the necessary cross-sectional measurements before the backfill is placed.

(b) *Fill Section.* Prior to placement of any base material, the subgrade and adjacent shoulder or slope rounding earthwork shall be completed to their finished grade elevation in order to form a box to retain the base material. No base material shall be placed in a section where a box has not been created unless specifically approved by the Engineer.

202.07 Approval of Subgrades. No subbase or base materials shall be placed until the subgrade has been approved.

202.09 Dust Control. Adequate dust control must be maintained by the Contractor at all times during the earth-moving operations. Dust shall be controlled exclusively through the use of water unless otherwise indicated in the Contract documents or authorized by the Engineer.

SECTION 207 - EXCAVATION AND BACKFILLING FOR STRUCTURES

207.01 Description. This work consists of the excavation, removal, and replacement or disposal of all materials necessary for the construction of box and pipe culverts, pipe headwalls, bridge structures, bridge approach slabs, and other structures. This work also consists of placing and compacting backfill material; furnishing and placing of shoring, sheeting, bracing, and cofferdams; and dewatering of these areas, unless otherwise specified.

CONSTRUCTION METHODS.

207.02 Foundation Pits. Foundation pits shall be excavated to the depths shown on the Plans, or to such depth as required to ensure the stability of the structure to be erected, or as directed by the Engineer.

207.03 Excavation. Excavation shall be sufficient in volume to place the full widths, thicknesses, and lengths of footings. Undercutting of edges, ends, corners, and other surfaces will not be permitted. If a sump area is required to keep the excavation dry during construction, it shall be outside the footing line.

All suitable materials removed during excavation shall be used, as far as practicable, in the formation of roadway embankments, or as structure backfill if it meets the requirements of Subsection 207.05. No excavated material shall be wasted without permission. Boulders, logs, structure remnants, or other obstructions shall be considered unsuitable materials. All unsuitable and excess material shall be disposed of as specified in Subsection 106.09, or as directed.

When the excavation is completed, the Engineer will make an inspection of the footing area. No concrete shall be placed until the depth and character of the foundation material are approved.

207.05 Backfilling. All backfilling of structures shall conform to the requirements of Subsection 202.05 (c), (d), and (e). Unless otherwise specified, all backfilling around and over structures shall be performed with material conforming to the requirements of Subsection 209.04, Borrow Type C. Backfill material shall be compacted to 95% or more of the maximum density according to the requirements of Subsection 202.05 (f). When backfilling next to bridges, culverts, or other structures, no heavy mechanical compacting equipment will be permitted over the structure until a minimum of 18" (450 mm) of cover has been placed.

Backfill adjacent to rigid frames, arches, timber structures, and other similar structures shall be brought up simultaneously at each abutment, so that no unbalanced stresses are introduced.

SECTION 208 EXCAVATION AND BACKFILLING FOR PIPE TRENCHES

208.01 Description. This work consists of the excavation, removal, and replacement or disposal of all materials necessary for the placement of pipes.

This work also consists of placing and compacting backfill for pipe trenches.

CONSTRUCTION METHODS.

208.02 Test Holes and Test Pits. All test holes and test pits shall be excavated under this Section. They shall be dug with extreme care, using hand excavation methods where necessary.

208.03 Excavation. Unsuitable foundation material shall be removed from below the bottom of trench elevation shown on the Plans, or as directed.

When a pipe is to be placed either partially or completely in a fill, the embankment shall be compacted to an elevation of 12" (300 mm) plus the outside diameter of the pipe above the design invert of the pipe for a minimum of two pipe diameters on each side of the centerline of the pipe. The trench shall then be excavated, as specified in this Subsection.

When rock, hardpan, or other unyielding material is encountered, the trench shall be excavated as shown on the Plans and in accordance with Subsection 206.03.

208.04 Backfilling. All backfilling of pipe trenches shall conform to the requirements of Subsection 202.05 (c), except proof rolling will not be required.

For pipe trenches or utility trenches below the roadway or shoulders, trenches shall be backfilled with material conforming to the requirements of Subsection 209.04, Borrow Type C. If the existing material meets these requirements, it shall be used for pipe or utility backfill. For these areas, backfill material shall be compacted to 95% or more of maximum density according to the requirements of Subsection 202.05 (f). For pipe trenches or utility trenches at locations other than below the roadway and shoulders, trenches shall be backfilled with material conforming to the requirements of Subsection 209.04, Borrow Type C, to a height of 12" (300 mm) above the top of the pipe or utility. The remaining depth of these pipe or utility trenches shall be backfilled with existing material. For these areas, backfill material shall be compacted to 90% or more of the maximum density according to the requirements of Subsection 202.05 (f).

Material for backfilling utility trenches shall be furnished by the Contractor. Materials shall be stockpiled at location(s) mutually agreed upon by the Contractor, the utility, and the Engineer.

The operation of backfilling utility trenches shall be performed by the utility organizations involved and shall conform to the requirements of Section 202.05 (c).

Utility companies will be required to remove all excess excavation material from the Project, unless the Engineer directs it to be utilized by the Contractor in the Project.

SECTION 209 BORROW

209.01 Description. This work consists of furnishing and placing additional material from approved borrow areas or other approved sources when suitable material available within the right-of-way is not sufficient in quantity for construction purposes. This work also includes all clearing, grubbing, or stripping required to prepare the borrow area for cross-sectioning and excavating.

MATERIALS.

209.02 General Requirements. The uses, classifications, characteristics, and definitions of terms for borrow materials shall be in accordance with the requirements of AASHTO M 57, Modified; M 145, Modified; and M 146 and M 147, Modified.

Unless otherwise directed, all materials having the following properties shall be excluded from use:

(a) Material with a maximum dry weight less than 90lb/ft³ (1440 kg/m³).
(b) Material with a liquid limit greater than 50.
(c) Material containing frozen material, rubbish, boulders in excess of 6" (150 mm) in any direction, or organic matter such as leaves, roots, grass, or sewage.

209.03 Materials Testing. The method of testing materials shall be in accordance with the requirements of AASHTO T 88, Modified; T 89, Modified; T 90, Modified; and T 99 Method C, Modified.

209.04 Borrow Types. The following types of borrow are subject to the requirements of this Section.

(a) *Borrow Type A.* This material shall have between 95 and 100% inclusive, by dry weight, passing a 2½" (63 mm) sieve and a maximum of 35%, by dry weight, passing a No. 200 (75 μm) sieve.

(b) *Borrow Type B (Special Fill).* This material shall have 100%, by dry weight, passing a

3" (75 mm) sieve and a maximum of 10%, by dry weight, passing a No. 200 (75 µm) sieve.

(c) *Borrow Type C (Backfill).* This material shall have between 85 and 100% inclusive, by dry weight, passing a 1" (25.0 mm) sieve and a maximum of 25%, by dry weight, passing a No. 200 (75 µm) sieve.

(d) *Borrow Type D (Cement Stabilization).* This material shall have 100%, by dry weight, passing a 3" (75 mm) sieve and between 8 and 30% inclusive, by dry weight, passing a No. 200 (75 µm) sieve.

(e) *Borrow Type E (Asphalt Stabilization).* This material shall have 100%, by dry weight, passing a 3" (75 mm) sieve and between 6 and 20% inclusive, by dry weight, passing a No. 200 (75 µm) sieve. This material shall be non-plastic.

(f) *Borrow Type F (Common Borrow).* This material shall meet the general requirements as specified in Subsection 209.02.

(g) *Borrow Type G (Select Borrow).* This material shall meet any of the grading requirements listed in the following table:

Table 209-A
Type G* (Select Borrow)

Sieve Designation U.S. Customary	Sieve Designation Metric	Dry Weight Percent Passing Square Mesh Sieves					
		Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
2"	50 mm	100	100	95 – 100	95 – 100	95 – 100	95 – 100
1"	25.0 mm	- - -	75 – 95	85 – 100	85 – 100	85 – 100	85 – 100
3/8"	9.5 mm	30 - 65	40 – 75	50 – 85	60 – 100	- - -	- - -
No. 4	4.75 mm	25 – 55	30 – 60	35 – 65	50 – 85	55 – 100	70 – 100
No. 10	2.0 mm	15 – 40	20 – 45	25 – 50	40 – 70	40 – 100	55 – 100
No. 40	425 mm	8 – 20	15 – 30	15 – 30	25 – 45	20 – 50	30 – 70
No. 200	75 mm	2 – 8	5 – 20	5 – 15	5 - 20	6 – 20	8 - 25

* The fraction passing a No. 200 (75 µm) sieve shall not be greater than two-thirds of the fraction passing a No.40 (425 µm) sieve. The fraction passing a No. 40 (425 µm) sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6, when tested according to AASHTO T 89, Modified, and AASHTO T 90, Modified.

CONSTRUCTION METHODS.

209.05 Borrow Sources. The Contractor shall notify the Department's Materials and Research Section at least ten working days in advance of material being removed from any borrow source so that samples may be obtained and tested prior to use. The limits of approved material within the borrow source and the method of excavation shall be approved by the Department2s Materials and Research Section. The ground surface shall be cleared and grubbed in the manner described under Section 201 and shall be stripped of all unsuitable material, as determined by the Engineer, before the excavation of any borrow. No borrow for the Contract shall be excavated within 100' (30 m) of the right-of-way lines except with written permission from the Engineer.

The Contractor shall secure any borrow source that is tested, approved, and cross-sectioned for excavation by means of physical control. The method of control shall be based on conditions at the source, but may consist of complete or partial fencing, earth berms, guardrails, or other physical barriers. A gate, chain, cable, or other acceptable device shall be installed across the entrance to the source and secured by padlock. The key to the padlock will be retained by the Department, once the security method is approved.

The Contractor shall submit a physical control plan to the Engineer after the borrow source has been tested and approved, and the overburden removed. The physical control plan must be implemented and approved before the source is cross-sectioned. After excavation is completed, all borrow areas shall be trimmed and left in a neat condition to permit accurate measurement. Where practicable, water shall not collect or stand therein.

209.06 Source Testing. The Department will assist the Contractor in determining the quality and quantity of material from sources it may proposes to use. The Department will perform soil analysis tests on one test boring for each 500 yd^3 (400 m^3) of borrow.

209.07 Placing and Compacting. All borrow under this Section shall be placed and compacted in accordance with the requirements of Subsection 202.05. Placing of Type B hydraulic fill must be approved by the Engineer.

209.08 Utility Backfill. For utility trenches within the roadway, trenches shall be backfilled with material conforming to the requirements of Subsection 209.04, Borrow Type C. If the existing material meets these requirements, it shall be used for utility backfill. For these areas, backfill material shall be compacted to 95% or more of the maximum density according to the requirements of Subsection 202.05 (f). For utility trenches outside the roadway, trenches shall be backfilled with material conforming to the requirements of Subsection 209.04, Borrow Type C, to a height of 12" (300 mm) above the top of the utility, unless directed otherwise. The remaining depth of these utility trenches shall be backfilled with existing material, unless otherwise directed. For these areas, backfill material shall be compacted to 90% or more of the maximum density according to the requirements of Subsection 202.05 (f).

Material for backfilling utility trenches shall be furnished by the Contractor. Materials shall be stockpiled at location(s) mutually agreed upon by the Contractor, the utility, and the Engineer.

The operation of backfilling utility trenches shall be performed by the utility organizations involved and shall conform to the requirements of Subsection 202.05 (c) and (d), except proof rolling will not be required.

Utility companies will be required to remove all excess excavation material from the Project, unless the Engineer directs it to be utilized by the Contractor in the Project.

209.09 Method of Measurement. The quantity of borrow material will be measured in cubic yards (cubic meters) of approved and acceptable borrow material. The volume will be measured at the source, in its original position by cross-sections and computed by the method of average end areas, exclusive of the volume of overburden or stripping.

When requested by the Contractor and approved by the Department in writing, borrow material, which is specified to be measured in cubic yards (cubic meters), may alternatively be weighed and the weight converted to cubic yards (cubic meters). Factors for conversion from weight measurement to volumetric measurement will be determined by the Engineer and shall be agreed to by the Contractor, before the method is used.

SECTION 210 - FURNISHING BORROW FOR PIPE TRENCH, UTILITY TRENCH, AND STRUCTURE BACKFILLING

210.01 Description. This work consists of furnishing borrow for use as backfill in pipe and utility trenches, and structure excavations.

210.02 Materials. Material shall conform to the requirements of Subsection 209.04.

210.03 Method of Measurement. The quantity of borrow will be measured in cubic yards (cubic meters) in accordance with the requirements of Subsection 209.09.

SECTION 212 - UNDERCUT EXCAVATION

212.01 Description. This work consists of excavation to correct unstable subgrades and embankment foundations and the disposal of such excavated material.

212.02 Materials. All material removed in the work of undercut excavation will be classified unsuitable and shall be disposed of, unless otherwise directed.

CONSTRUCTION METHODS.

212.03 Equipment. Equipment utilized in undercutting and backfilling operations shall be capable of removing and replacing the material within the area established by the Engineer. Equipment that will displace the underlying or adjacent material will not be permitted.

212.04 Preparation. When unstable subgrade or foundation conditions are encountered, all normal construction preparation procedures shall be performed to correct the unstable situation before undercutting will be considered. After performing these normal preparation procedures, the Contractor shall allow sufficient time to elapse to accurately judge the success of the preparation effort. These normal construction preparation procedures shall include, but are not limited to, cutting channels and ditches in order to lower the water table, grading to prevent excessive surface water from entering the subgrade or foundation materials, performing all reasonable efforts to correct the moisture content to within specifications, and using properly sized equipment in such a way that does not overload the subgrade or foundations. Interpretation of "normal", "sufficient", and "reasonable", shall be made by the Engineer.

In lieu of following the above established preparation requirements, or following the required construction methods, or waiting over a reasonable time for the environmental conditions to improve, the Contractor may elect to replace the subgrade or foundation material as a means of correcting instability.

212.05 Undercutting. When the Engineer determines that undercutting is required, the Engineer will direct the Contractor to remove the material from within defined areas to defined depths. Prior to backfilling, additional depths of undercutting below the original defined depth may be required in some areas as directed by the Engineer.

Upon acceptance of the undercut excavation, the area shall be backfilled and compacted in accordance with Section 202, or as directed. The Contractor shall conduct undercut operations in a manner that will allow the Engineer to take necessary measurements, before any backfill is placed. No backfill material shall be placed in water unless approved.

Any area remaining unstable after backfilling shall be reworked in accordance with this Section. When such rework is required, the Contractor shall salvage and reuse as much of the previously placed backfill as possible. If the Engineer determines that an unstable subgrade or embankment foundation exists, the unstable condition within the affected limits shall be satisfactorily corrected.

212.06 Performance Requirements. The correction of an unstable condition shall result in a firm, unyielding foundation.

SECTION 250 SEDIMENT REMOVAL

250.01 Description. This work consists of the excavation, hauling, and disposal of accumulated sediment from temporary sediment control items, such as sediment traps, sediment basins, silt fences, stone check dams, dewatering basins, dikes, swales, and diversions.

250.02 Construction Methods. Sediment shall be removed using any method of hand tools or mechanized equipment deemed appropriate by the Contractor and acceptable to the Engineer at each location or as required by the Contract documents.

SECTION 251 SILT FENCE

251.01 Description. This work consists of furnishing, constructing, maintaining, and ultimately removing, and installing silt filter fences or reinforced silt fences as a temporary measure to control sedimentation within the limits of construction. Silt fences shall be constructed as shown on Standard Construction Detail, Silt Fence, at the locations shown on the Plans, and as directed by the Engineer.

MATERIALS.

251.02 General. All materials shall be approved prior to use by the Department's Materials and Research Section.

251.03 Posts. Posts shall be constructed of oak timber or steel. Posts shall be a minimum of 42" (1050 mm) long and at least 18" (450 mm) longer than the height of the silt fence.

(a) *Oak Timber Posts.* Oak timber posts shall be straight and have a minimum nominal cross-section of 2 by 2" (50 by 50 mm).
(b) *Steel Posts.* Steel posts shall be 2½" (65 mm) diameter Schedule 40 pipe or be standard steel "T" or "U" section of 1.30 lb/ft (1.98 kg/m) minimum.

251.04 Fasteners. Fasteners shall be either 5/8" (16 mm) long brass or copper staples, or 17 gage (1.37 mm) galvanized or aluminized steel tie wires long enough to securely attach the fabric to the posts.

251.05 Wire Mesh. Wire mesh shall be galvanized welded wire reinforcement 6 by 6-W 1.4 by W 1.4 (152 by 152 - MW9 by MW9).

251.06 Seed. Seed shall conform to the requirements of Section 734.

251.07 Mulch. Mulch shall conform to the requirements of Section 735.

251.08 Geotextile. Geotextile shall conform to the requirements of Section 827. It shall be a minimum of 36" (900 mm) wide.

251.09 Prefabricated Silt Fence. The Contractor shall have an option to use prefabricated silt fence provided it has been constructed with the materials specified in this Section and approved by the Engineer.

CONSTRUCTION METHODS.

251.10 Construction of Silt Fence. The Contractor shall excavate the trench along the upstream side of the post line as shown on Standard Construction Detail, Silt Fence. Posts shall be installed on the downstream edge of the trench, along the established fence line.

The geotextile shall be fastened to the upstream side of the posts. The geotextile roll ends shall be overlapped a minimum of 6" (150 mm) at post locations.

The geotextile shall be embedded in the excavated trench. The trench shall be backfilled and compacted over the geotextile to prevent water from flowing under the geotextile.

The silt fence shall not be constructed across a ditch, or swale, or area of concentrated flow. On slopes, the terminal ends of silt fence shall be turned upslope a sufficient distance to eliminate flow around the ends of the silt fence.

All geotextile damaged prior to installation, during installation, or during the life of the Contract shall be repaired or replaced to the satisfaction of the Engineer.

92

251.11 Construction of Reinforced Silt Fence. The Contractor shall construct the reinforced silt fence according to Subsection 251.10. The wire mesh shall be fastened to the posts so that the wire mesh is between the geotextile and the posts. The geotextile shall be fastened to the wire mesh at the required spacing.

251.12 Maintenance of Silt Fence. Throughout the Project construction period, the silt fence shall be maintained by removing trapped sediment. The Contractor shall clean the geotextile of trapped sediment by tapping the geotextile when dry. No trash shall be allowed to accumulate to the height of the fence. Any geotextile that does not function due to clogging or deterioration shall be replaced.

251.13 Sediment Removal. After every heavy rainfall, the Contractor shall check for excessive buildups of sediment which must be removed so that the silt fence can continue to function as intended. Accumulated sediment shall be removed by the Contractor when it reaches 50% of the height of the silt fence.

251.14 Removal of Silt Fence. The silt fence shall be removed when the Engineer determines that it is no longer required. The silt fence and all materials incidental to the silt fence construction shall be removed. All areas affected by the construction of the silt fence shall be restored to the original or plan contours and stabilized with seed and mulch.

SECTION 252 INLET SEDIMENT CONTROL

252.01 Description. This work consists of furnishing, constructing, maintaining, and ultimately removing sediment control around drainage inlets and curb inlets as a temporary measure to control sedimentation within the limits of construction. Inlet sediment control shall be constructed as shown on Standard Construction Details, Drainage Inlet Sediment Control and Curb Inlet Sediment Control, at the locations shown on the Plans, and as directed by the Engineer.

MATERIALS.

252.02 Lumber. Lumber shall be construction grade two-by-four measuring 1½ x 3½" (38 by 89 mm) and free from warps, checks, splits, and decay.

252.03 Wire Mesh. Wire mesh shall be steel or galvanized welded wire reinforcement with openings ½ x ½" (13 by 13 mm) and wire diameter of 19 gage (1.04 mm).

252.04 Seed. Seed shall conform to the requirements of Section 734.

252.05 Mulch. Mulch shall conform to the requirements of Section 735.

252.06 Stone. Stone shall be Delaware No. 3 conforming to the requirements of Section 813.

252.07 Geotextile. Geotextile shall conform to the requirements of Section 827.

252.08 Prefabricated Sediment Control. The Contractor shall have an option to use prefabricated sediment control devices provided each has been constructed with the materials specified in this Section and approved by the Engineer. Approval will be based on satisfactory performance at field test locations chosen by the Engineer.

CONSTRUCTION METHODS.

252.09 Construction of Drainage Inlet Sediment Control. The Contractor shall excavate completely around the walls of the inlet to the required depth. The corner posts shall be driven to the required depth below the excavated depth. The two-by-four frame shall be assembled and completed using overlapped joints. The lumber frame shall be set at a top elevation that ensures that water ponded by the inlet sediment control will not create a flooding or safety hazard.

Wire mesh shall be stretched tightly around the lumber frame and fastened securely. The geotextile shall be stretched tightly over the wire mesh and shall be fastened securely to the lumber frame at the required depth. The ends of the geotextile must meet at the posts, be overlapped and folded, and then fastened to the posts. After the geotextile is fastened to the posts, the Contractor shall backfill the previously excavated trench according to Subsection 207.05.

If the inlet is not in a low point, the Contractor shall construct a sediment control earth dike in the ditch line, downstream from the inlet, as shown on Standard Construction Detail, Drainage Inlet Sediment Control. The earth dike shall conform to the requirements of Section 260.

252.10 Construction of Curb Inlet Sediment Control. The Contractor shall assemble the two-by-four weir frame using overlapped joints. The weir frame shall be securely nailed to the vertical spacers as shown on Standard Construction Detail, Curb Inlet Sediment Control.

The Contractor shall place the assembly over the grate and against the inlet throat making sure that the end vertical spacers are at least 12" (300 mm) beyond each end of the throat opening and the grate. The two-by-four anchors shall be nailed to the top of the frame at the spacer locations. The anchors shall extend across the curb and be held in place by sandbags or alternate weights.

The Contractor shall lay a continuous piece of wire mesh over the grate, against the weir frame, and extending at least 12" (300 mm) from both ends of the weir frame. The wire mesh shall be formed to the concrete gutter and against the face of the curb at both ends of the inlet.

The Contractor shall place a piece of geotextile, of the same dimension as the wire mesh, over the wire mesh and securely attach it to the weir frame. The geotextile shall be formed to the wire mesh at both sides of the inlet. Clean stone shall be placed over the geotextile and the wire mesh to prevent water from entering the inlet from under or around the geotextile.

252.11 Maintenance of Inlet Sediment Control. Throughout the Project construction period, the inlet sediment controls shall be maintained and remain functional. Maintenance shall include cleaning the geotextile of trapped sediment by tapping the geotextile when it is dry. After every rainfall, the Contractor shall inspect the inlet sediment control. The geotextile and, if applicable, the stones shall be replaced when 50% of the voids are clogged. Any geotextile that does not function due to clogging or deterioration shall be replaced.

252.12 Sediment Removal. The Contractor shall remove all accumulated sediment from around the drainage inlet sediment control when the sediment has reached 6" (150 mm) from the top of the geotextile. When the sediment has reached 50% of the height of the curb, the Contractor shall remove all accumulated sediment from around the curb inlet sediment control.

252.15 Basis of Payment. The quantity of drainage inlet sediment controls will be paid for at the Contract unit price for each. The quantity of curb inlet sediment controls will be paid for at the Contract unit price for each. Price and payment will constitute full compensation for furnishing and installing all required materials, including lumber, wire mesh, geotextile, and stone; for excavating and backfilling; for maintaining the inlet sediment controls, including replacing the geotextile and stone; for removing the sediment controls and all incidental materials; for restoring the site; for seeding and mulching; and for all labor, tools, equipment, and incidentals required to complete the work.

The quantity of sediment removal will be paid for according to Section 250.

SECTION 254 STONE CHECK DAM

254.01 Description. This work consists of constructing, maintaining, and ultimately removing small stone check dams across a swale, channel, or any type of ditch as a temporary measure to reduce the velocity of concentrated flows, thereby reducing erosion of the swale, channel, or ditch. Stone check dams shall be constructed as shown on Standard Construction Detail, Stone Check Dam, at the locations shown on the Plans, and as directed by the Engineer.

MATERIALS.

254.02 Riprap. Riprap shall be R-4 conforming to the requirements of Section 712 with the exception that geotextile will not be required to be placed under the riprap.

254.03 Seed. Seed shall conform to the requirements of Section 734.

254.04 Mulch. Mulch shall conform to the requirements of Section 735.

CONSTRUCTION METHODS.

254.05 Construction of Stone Check Dam. The stone check dam shall be constructed in reasonably straight sections of the swale or channel. The Contractor shall place the riprap so that it completely covers the width of the channel. The top of the stone check dam shall be constructed so that the center is lower than the outer edges, forming a spillway across which the water can flow as shown on Standard Construction Detail, Stone Check Dam.

254.06 Maintenance of Stone Check Dam. After each rainfall, the Contractor shall inspect the stone check dam for sediment accumulation or washout. The Contractor shall replace the riprap whenever washout, construction traffic damage, or silt accumulation among the riprap occurs and whenever the stone check dam ceases to function as intended.

254.07 Sediment Removal. Sediment shall be removed from behind the check dams when it has accumulated to one-half of the original height of the stone check dam at the spillway.

254.08 Removal of Stone Check Dam. Temporary stone check dams shall be removed only when directed by the Engineer. If stone check dams are used in grass-lined swales or channels which are mowed, the Contractor shall ensure that all riprap is removed when the stone check dam is removed. In temporary swales and channels, check dams should be removed and the ditch filled in when it is no longer needed. In permanent swales or channels, check dams may be removed when a permanent non-erodible lining can be installed. In the case of grass-lined ditches, check dams may be removed when the grass has matured sufficiently to protect the swale or channel. The area beneath the check dams should be seeded and mulched immediately after the check dams are removed.

SECTION 257 - RIPRAP DITCH

257.01 Description. This work consists of constructing and maintaining trapezoidal riprap ditches with supporting toe walls to convey concentrated flow without damage from erosion and where grassed ditches would be inadequate due to a high flow velocity. Riprap ditches shall be constructed as shown on Standard Construction Detail, Riprap Ditch, at the locations shown on the Plans, and as directed by the Engineer.

MATERIALS.

257.02 Pins. Pins shall be steel, 18" (450 mm) long, 3/16" (4.7 mm) in diameter, and have a head or steel washer that is 1½" (38 mm) in diameter.

257.03 Riprap. Riprap shall be the type indicated on the Plans and shall conform to the requirements of Section 712.

257.04 Seed. Seed shall conform to the requirements of Section 734.

257.05 Mulch. Mulch shall conform to the requirements of Section 735.

257.06 Stone. Stone for bedding shall be Delaware No. 57 conforming to the requirements of Section 813.

257.07 Geotextile. Geotextile shall conform to the requirements of Section 827.

CONSTRUCTION METHODS.

257.08 Construction of Riprap Ditch. The Contractor shall excavate the riprap ditch according to the dimensions shown on the Plans. All debris shall be removed from the ditch. The ditch sides and bottom shall be smooth so that the geotextile rests flush with the ditch at all points of contact. The width of the geotextile shall be sufficient to cover the total width of the ditch and completely line the toe walls without any longitudinal joints. The geotextile shall be placed flat, loose, and without wrinkles against all surfaces. The geotextile shall be secured in place with pins as shown on the Standard Construction Details.

After placement of the geotextile and pins on the ditch banks, stone bedding, if required, and riprap in the ditch, the Contractor shall backfill, grade, compact, and restore the ditch banks and any other area affected by the construction of the riprap ditch to the original or plan contours. The restored areas shall be stabilized with seed and mulch.

The Contractor shall not perform any grading of the ditch after placement of the riprap.

257.09 Maintenance of Riprap Ditch. Throughout the Project construction period, the Contractor shall maintain the original dimensions and function of the riprap ditch.

SECTION 264 - DEWATERING BASIN

264.01 Description. This work consists of constructing, maintaining, and ultimately removing dewatering basins as shown on Standard Construction Detail, Dewatering Basin, at the locations shown on the Plans, and as directed by the Engineer.

MATERIALS.

264.02 Borrow. Borrow for fill material for the berm shall be clean mineral soil free of roots, woody vegetation, stones greater than 4" (100 mm) in diameter, or other objectionable materials. Sandy or gravely soils classified as GW, GP, SW, and SP under the Unified Soil Classification System shall not be used in the embankment.

264.03 Geotextile. Geotextile shall conform to the requirements of Section 827.

264.04 Riprap. Riprap shall be R-4 conforming to the requirements of Section 712.

264.05 Seed. Seed shall conform to the requirements of Section 734.

264.06 Mulch. Mulch shall conform to the requirements of Section 735.

ONSTRUCTION METHODS.

264.07 Construction of the Dewatering Basin. The area under the berm shall be cleared, grubbed, and stripped of topsoil. In order to facilitate clean out and restoration, the pool area will be cleared of all brush, trees, and other objectionable materials.

The fill material for the berm and the area on which the fill material for the berm is to be placed shall have sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. The fill material shall be placed in 12" (300 mm) thick lifts over the entire length of the fill. Compaction shall be obtained by tamping the berm with the flat side of the backhoe bucket used to excavate the dewatering basin.

264.08 Vegetative Treatment. The berm top and side slopes shall be stabilized immediately after construction with seed and mulch.

264.09 Maintenance of the Dewatering Basin. Throughout the Project construction period, the Contractor shall maintain the dewatering basin to its original dimensions and function.

264.10 Sediment Removal. The Contractor shall remove all accumulated sediment when the basin is filled to one-half of its original basin.

264.11 Removal of Dewatering Basin. The dewatering basin shall be removed at the end of the construction period or when directed by the Engineer. The dewatering basin and all materials incidental to its construction shall be removed. All areas affected by the construction, use, and removal of the dewatering basin shall be restored to the original or plan contours and stabilized with seed and mulch.

SECTION 271 - STORMWATER MANAGEMENT POND

271.01 Description. This work consists of constructing the foundation, dam, reservoir, and emergency spillway for a stormwater management pond at the location shown on the Plans and as directed by the Engineer.

271.02 Materials. Borrow for stormwater management pond construction shall conform to the requirements of Subsection 274.02. The types of soil required are as follows:

Foundation Cutoff.....Clay Borrow, Type 1
Dam.....Clay Borrow, Type 2

CONSTRUCTION METHODS.

271.03 Excavation. The Contractor shall excavate for the stormwater management pond in reasonably close conformity with the lines and grades shown on the Plans or as directed by the Engineer. All suitable material removed as excavation shall be used in constructing the dam foundation and embankment before securing or hauling any borrow, or unless directed by the Engineer. Materials determined by the Engineer to be unsuitable for use in the dam foundation and embankment shall be deposited on slopes as directed by the Engineer or removed from the Project site and disposed.

If rock excavation, as defined in Section 205, is necessary for construction of the stormwater management pond, it shall be paid for in accordance with Section 205. The classification "Rock Excavation" shall not apply to soft disintegrated rock. This material is classified as normal excavation and is included in Section 271.

SECTION 272 - POND OUTLET STRUCTURE, CONCRETE

272.01 Description. This work consists of furnishing, fabricating, and constructing a pond outlet structure at the locations shown on the Plans and as directed by the Engineer.

MATERIALS.

272.02 Borrow. Borrow for backfill material shall be Clay Borrow, Type 2 and shall conform to the requirements of Subsection 274.02.

272.03 Concrete. Concrete used in risers may be precast or cast-in-place. Concrete used in anti-seep collars shall be cast-in-place only. Concrete used in risers and anti-seep collars shall be Class A conforming to the requirements of Section 812

272.04 Reinforcing Steel. Reinforcing steel shall be Grade 60 (Grade 400) and conform to the requirements of Section 603.

272.05 Grout. Grout shall be non-shrink conforming to the requirements of ASTM C 1107.

272.06 Pipe. Reinforced concrete pipe used for the principal spillway shall conform to Section 612.

272.07 Gaskets. Gaskets for reinforced concrete pipe shall conform to Subsection 612.03.

272.08 Steps. Steps shall be molded plastic with a reinforcing bar core, and shall conform to the requirements of AASHTO M 31/M 31M, ASTM A 478, and ASTM D 4101.

CONSTRUCTION METHODS.

272.09 Excavation. The Contractor shall excavate to the required depth. The foundation upon which the structure is to be placed shall be compacted to a firm and level surface.

272.10 Outlet Structure.

(a) *Riser.* Concrete risers shall be poured in place or pre-cast. If the concrete risers are pre-cast, the Contractor shall design the lifting lugs, and all hardware required to transport and install the structure. The top slab shall not be used to lift the riser structure. Any space between pipes and the walls of the pre-cast riser shall be filled with grout.

A) The largest dimension of the opening
in the riser of connection of the outfall pipe shall be no greater than the outfall pipe diameter
plus 4" (100 mm).

(b) *Anti-Seep Collars.* The subgrade soil shall be excavated to the dimensions of the bottom half of the collars. Concrete forming the bottom half of the anti-seep collars shall be poured into the excavation using the adjacent soil as the form. Concrete formwork shall be used to form the top half of the anti-seep collars.

(c) *Principal Spillway Outfall Pipe.* The principal spillway pipe shall have Class A pipe bedding. Shims used to establish grade and alignment of the pipe shall be made of concrete. Lumber or bricks shall not be used for shims. Care shall be exercised during backfill to prevent any pipe movement from its horizontal and vertical alignment.

When the principal spillway outfall pipe is to be placed partially or completely in fill, the fill embankment shall be constructed 24" (600 mm) above the proposed top of pipe. A trench shall then be excavated to the required grade with side slopes no steeper than 1:1.

The Contractor shall place bell and spigot pipes with the bell end upstream. The pipe trench shall be kept free of standing water during pipe placement and backfilling using an approved dewatering method.

272.11 Backfill. The backfill material next to pipes and other structures shall be placed to the required elevation in 4" (100 mm) horizontal loose-thickness lifts at the same rate on all sides to prevent damage from unequal loading. Each lift shall be compacted by a manually directed power tamper under and around the pipe and other structures to 90% or more of maximum dry density. Compaction next to castin-place concrete structures will not begin until the concrete has reached enough strength to support the load.

A minimum depth of 24" (600 mm) of hand compacted backfill shall be placed over the pipe before crossing it with construction equipment.

DIVISION 300 – BASES
SECTION 301 SELECT BORROW BASE COURSE

301.01 Description. This work consists of furnishing, placing, and compacting select borrow material on a prepared subgrade.

301.02 Materials. The material used for the select borrow base course shall conform to the requirements of Subsection 209.04, Borrow Type G.

Source of material for the select borrow base course shall conform to the requirements of Subsection 209.05.

Source testing shall conform to the requirements of Subsection 209.06.

CONSTRUCTION METHODS.

301.03 Equipment. The Contractor shall provide equipment of the proper type and weight to do the grading, leveling, and compacting work as specified. Compaction shall be uniformly attained by approved rollers or compactors.

301.04 Preparation of Subgrade. The subgrade shall be properly shaped. It shall also be uniformly and thoroughly compacted in conformance with the lines and grades as shown on the Plans or as established by the Engineer, before any base course material is placed. These operations shall be performed in accordance with Subsection 202.06.

The subgrade shall be maintained as established in Subsection 202.06. Test rolling shall be performed as established in Subsection 202.02.

No base course material shall be placed until the subgrade has been approved by the Engineer.

301.05 Placement of Select Borrow Base Course. Select borrow base course material shall be placed in successive layers. Each layer shall be placed in a level, uniform cross-section not to exceed 8" (200 mm) in depth, loose measurement, unless otherwise approved by the Engineer. The material shall be deposited and promptly spread parallel to the centerline. Each layer shall extend the full plan width.

If a layer does not contain a uniform distribution of moisture and component materials, it shall be disced or processed in a manner to ensure homogeneity. Each layer shall be properly compacted, as specified, before starting the next layer.

Compaction or rolling shall start at the edges and progress toward the center and shall continue until each layer is thoroughly and uniformly compacted to the full width.

In no case shall vehicles be allowed to travel in a single track or form ruts in the base course. If any sharp irregularities are formed, the base course shall be scarified to a depth of 6" (150 mm) and recompacted.

301.06 Performance Requirements. Compaction shall continue until each layer is thoroughly and uniformly compacted to 100% or more of the laboratory maximum density on representative material.

The moisture content of the select borrow base course material at the time of compaction shall be within 2% of the optimum. The material shall either be moistened or dried, as needed, and thoroughly mixed before compaction.

Field compaction shall comply with the requirements of the following AASHTO test methods as modified by the Department:

(a) AASHTO T 99 Method C, Moisture-Density Relationship.
(b) AASHTO T 191, Density By Sand Cone.
(c) AASHTO T 224, Coarse Particle Correction.
(d) AASHTO T 238, Density By Nuclear Methods.
(e) AASHTO T 239, Moisture Content by Nuclear Methods.
(f) AASHTO T 272 Method C, Moisture-Density Family of Curves.

The finished surface of the select borrow base course shall not vary from that required on the Plans by more than ½" (13 mm) when tested with a 10' (3.048 m) straightedge applied to the surface parallel to the centerline of the pavement, and when tested with a template cut to the cross-section of the pavement.

A straightedge meeting the approval of the Engineer shall be supplied by the Contractor at each placement operation. The straightedge shall be constructed of rigid materials that resist warping and bending.

SECTION 302 - GRADED AGGREGATE BASE COURSE

302.01 Description. This work consists of furnishing, placing, and compacting graded aggregate base course materials on a prepared subgrade or base.

302.02 Materials. The material used to construct graded aggregate base course shall conform to the requirements of Section 813 and Section 821, Type B.

CONSTRUCTION METHODS.

302.03 Subgrade Preparation. The subgrade shall be properly constructed in accordance with Subsection 202.06.

No base course material shall be placed until the subgrade has been approved by the Engineer.

302.04 Placement.

(a) *Equipment.* The aggregate materials shall be spread uniformly by an approved spreading machine or box in such a manner that no segregation occurs. A conventional motor grader will not be approved for placement of graded aggregate on mainline roadway sections.

Where it is not possible to use a spreading machine or box in patching or other tight areas, other approved methods can be used only in such manner that no segregation occurs. Water shall be uniformly applied with an approved sprinkling device. Compaction shall be uniformly attained by approved rollers or compactors. No graded aggregate shall be placed until approved equipment is on the Project site and is operational.

(b) *Spreading and Compacting.* Graded aggregate material conforming to the requirements of Section 821 shall be placed in successive layers. Each layer shall be placed in a level, uniform cross-section not to exceed 8" (200 mm) in depth, loose measurement, unless otherwise approved by the Engineer. The material shall be deposited and spread parallel to the centerline, and the layer shall extend to the full width as shown on the Plans. The material shall be handled so that no segregation of fine or coarse particles occurs. No more than 1,0002 (300 m) of material, as measured along the roadway centerline, shall be spread in advance of compaction operations.

Each layer shall be properly compacted as specified, before starting the next layer. Water shall be added before the material is compacted. The water shall be applied in a manner that results in a uniform and adequate moisture content.

Compaction or rolling shall be performed parallel to the roadway centerline starting at the edges and progressing toward the center. It shall continue until each layer is thoroughly and uniformly compacted to the full width as shown on the Plans.

After compacting, all voids in the surface of each layer shall be filled with aggregate meeting the requirements of Section 813, Delaware No. 10. Water shall be applied to the surface and compaction continued. Additional Delaware No. 10 aggregate placement, water application, and compaction shall continue until the layer of base material is well bonded and firm, as determined by the Engineer.

In no case shall vehicles be allowed to travel in a single track or to form ruts in the base course. If any sharp irregularities are formed in the subgrade or base course material, the affected area shall be scarified to a depth of 6" (150 mm) and compacted to conform to the requirements of Section 202 or this Section.

(c) *Performance.* The moisture content of the base course material at the time of compaction shall be within 2% of the optimum moisture content. If the moisture content is not within 2% of optimum, the material shall either be moistened or dried, as needed, and thoroughly mixed before compaction.

Compaction of graded aggregate Type A shall continue until each layer is thoroughly and uniformly compacted into a firm and unyielding surface, to the satisfaction of the Engineer. Compaction of graded aggregate Type B shall continue until each layer is thoroughly and uniformly compacted to 98% or more of the laboratory maximum density obtained on a sample of the same material. If the material is too coarse to use the test methods listed below, compaction shall continue until there is no movement of the material under the compaction equipment.

The determination of compliance with performance requirements as specified in this Subsection shall be in accordance with the following test methods, as modified by the Department:

(1) AASHTO T 99 Method C, Moisture-Density Relationship.
(2) AASHTO T 191, Density By Sand Cone.
(3) AASHTO T 224, Coarse Particle Correction.
(4) AASHTO T 238, Density By Nuclear Methods.
(5) AASHTO T 239, Moisture Content By Nuclear Methods.
(6) AASHTO T 272 Method C, Moisture-Density Family Of Curves.

The finished surface of the graded aggregate base course shall not vary from that required on the Plans by more than ½" (13 mm) when tested with a 102 (3.048 m) straightedge applied to the surface parallel to the centerline of the pavement and when tested with a template cut to the cross-section of the pavement. The actual thickness of the graded aggregate base course shall not be more than ½" (13 mm) less than the thickness shown on the Plans; however, the actual thickness may be greater than that shown on the Plans. Those portions of completed graded aggregate base course not meeting these performance requirements shall be completely removed and replaced with proper material placed in accordance with this Section.

A straightedge meeting the approval of the Engineer shall be supplied by the Contractor at each placement operation. The straightedge shall be constructed of rigid materials that resist warping and bending.

SECTION 304 - ASPHALT STABILIZED BASE COURSE

304.01 Description. This work consists of scarifying, stabilizing with asphalt, compacting, and shaping the base course.

304.02 Materials.

(a) *Asphalt.* Asphalt for stabilization shall be a high-float, medium-setting emulsion conforming to the requirements of Section 809. Other types of mixing grade emulsions may be submitted for laboratory evaluation and approval.

Prior to approval of any emulsion type or source of supply, the Contractor shall submit to the Department2s Materials and Research Section a 1 gal (4 L) emulsion sample for laboratory analysis and mixing evaluation. A laboratory analysis report prepared by the supplier shall accompany the sample.

Laboratory evaluation shall include a determination of mixing qualities of the emulsion and water with silicious sandy soils representative of the soil types found within the Project location and conforming to Subsection 209.04, Borrow Type E. Fast breaking emulsion yielding globules of unmixed asphalt or emulsions which fail to thoroughly and homogeneously blend throughout the emulsion-water-soil mixture will be judged unsatisfactory for use. The moisture content of the soil-emulsion mixed in the laboratory shall range from 5 to 9% with optimum moisture and maximum density determined in accordance with AASHTO T 180 Method A, Modified. Molded soil-emulsion specimens will also be evaluated by air curing, water immersion, absorption, and compression testing.

All testing will be performed at the Department2s Materials and Research Laboratory. Upon completion of all laboratory testing and review of the data, the decision of the Department as to emulsion acceptability will be final. Approval of the material will also be contingent on satisfactory performance under field mixing conditions.

(b) *Water.* Water to be used in the stabilizing process shall conform to the requirements of Section 803.

(c) *Soils.* All materials to be stabilized shall consist of local soils or borrow soils or a mixture of both. These materials shall be free from roots and leaves and any other types of organic matter. Local soils to be stabilized shall be granular in nature and approved prior to use. All borrow shall conform to the requirements of Subsection 209.04, Borrow Type E.

304.03 Equipment. The type, condition, and quantity of equipment furnished shall meet the qualifications necessary for the proper execution of the work within the specified working time. Equipment shall bear the manufacturer2s name plate, on which shall be stamped the model number. All equipment shall be maintained in good condition and be subject to approval prior to and during its use in connection with the Project. Compaction equipment shall also conform to the requirements of Subsection 202.05 (d).

304.04 Construction Methods. Before any stabilization is started, the roadway shall be widened and graded. Ditches and slopes shall be cut, borrow shall be placed, and the entire section shall be formed in accordance with the typical sections shown on the Plans. Where applicable, the requirements of Section 202 shall apply.

ASPHALT STABILIZED BASE COURSE 304

After the prepared roadway has been approved and prior to the addition of asphalt, the base course shall be scarified to the full depth that will give, when mixed with asphalt, a compacted base having a thickness as shown on the Plans and within the specified tolerances. The scarified base course shall then be mixed, and water shall be added or aeration shall take place until the moisture content of the soil to be stabilized is between 90 and 110% of the optimum mixing moisture as determined by the Department. Mixing shall continue until clay lumps and other cohesive materials present are broken up and distributed evenly. The mixing operation shall be considered complete when the moisture content of the material to be stabilized is uniform and between 90 and 110% of the optimum mixing moisture and the soil lumps have been pulverized.

After the base course has been mixed as described in this Subsection, asphalt shall be applied at a temperature between 140 and 170 °F (60 and 77 °C). The quantity of asphalt shall range from 14 to 20 gal/yd³ (70 to 100 L/m³) of compacted thickness of base shown on the Plans, depending on the properties of the soil. The number of gallons per cubic yard (liters per cubic meter) to be applied will be determined by the Department.

No asphalt shall be applied unless the mixing operation can be completed within two and one-half daylight hours following the application of the asphalt. Asphalt shall not be applied to a new section on any succeeding day until those portions which have been mixed previously are aerated and compacted to the specified requirements. If field conditions render the requirements of the preceding sentence impracticable, such as inclement weather, then the Engineer will have the option of waiving the requirements.

Immediately following the application of asphalt, the base course shall be thoroughly mixed with self-propelled mixers. There must be at least two self-propelled mixers of the multiple pass type or one of the single pass type used in this phase of the stabilization operation. During the mixing operation, care shall be taken to avoid cutting below the prepared soil layer and incorporating additional raw soil into the mix. The mixing operation shall be considered complete when the asphalt and soil have been thoroughly mixed to a uniform color free from fat spots, streaks, balls, and uncoated particles throughout the full length, width, and depth of the section.

Following the mixing of the asphalt and soil, a period of aeration shall take place until the moisture content of the mixture is between 75 and 100% of the optimum moisture content as determined by AASHTO T 180 Method A, Modified. Compaction shall then begin, starting at the edges and progressing toward the center of the base course. This compaction shall continue until the base course is shaped and rolled until approved. The thickness of the stabilized base and the surface of the base course will then be tested and shall conform to the tolerances as specified:

(a) *Thickness.* The thickness of the soil asphalt mixture shall be within ½" (13 mm) of the plan thickness and shall be determined from the average of a set of measurements taken through holes made through the finished soil asphalt mixture at intervals not to exceed 500’(150 m) per lane. A set of measurements consists of three holes spaced 5’ (1.5 m) apart in a triangular pattern with the thickness measured to the nearest ¼" (6 mm). Measurements will be made immediately following the finishing operation.
If the average thickness shown by a set of measurements is not within the tolerances specified, additional sets of measurements shall be made at 25’ (7.5 m) intervals forward and backward until at least two consecutive sets of measurements in each direction are within the tolerance specified. Areas represented by averages exceeding the tolerances specified may be required to be reconstructed.

(b) *Surface.* The surface smoothness of the asphalt stabilized base course mixture during and after the compaction and finishing operations shall be tested with a 10’ (3.048 m)

straightedge furnished by the Contractor. The straightedge shall be laid parallel to the centerline. Any irregularities greater than ±½" (±13 mm) shall be satisfactorily corrected.

The base course shall then be opened to traffic, before sealing, for a period of time necessary to cure the stabilized mixture. This curing period shall not be more than 14 days unless otherwise approved. The stabilized base course shall be considered satisfactory for surfacing when the stabilized mixture has attained the following:

(a) a minimum density of 120 lb/ft³ (1925 kg/m³) or a minimum of 95% of the maximum dry density as determined by AASHTO T 180 Method A, Modified;

(b) a moisture content that does not exceed 65% of the optimum moisture content as determined by AASHTO T 180 Method A, Modified; and

(c) base course that is properly shaped and has no soft, wet, or unstable areas.

No stabilization shall start on any project or portion thereof before April 1 of each year. All stabilization shall stop by September 30 of each year.

DIVISION 400 - BITUMINOUS PAVEMENTS
SECTION 400 - HOT-MIX, HOT-LAID BITUMINOUS CONCRETE PAVEMENT

401.01 Description. This work consists of constructing hot-mix, hot-laid bituminous concrete bases and surface courses on either a prepared foundation or an existing surface course.

401.02 Materials. Materials for hot-mix, hot-laid bituminous concrete shall conform to Section 823. Tack coat shall conform to Section 811. Sand for protection of traffic shall conform to Section 804.

401.03 Delivery of Mixture. The mixture shall be delivered at the spreader with a temperature loss not greater than 20 °F (11 °C) from the temperature measured at the plant by the Engineer2s representative.

A minimum of 100 tons (90 metric tons) of hot-mix bituminous concrete per hour shall be delivered to the Project site unless otherwise directed.

EQUIPMENT.

401.04 Hauling Equipment. Trucks used for hauling bituminous concrete shall have tight, clean, smooth metal beds which have been thinly coated with an emulsified oil, soap solution, or other approved release agent to prevent adherence of the bituminous mixture to the bed of the truck. Each truck shall have a securely fastened cover of canvas or other suitable waterproof material that covers the bed from front to back and over the sides. The front of the tarp shall be securely fastened to the body or protected by an air foil. The cover shall have at least three straps to a side and two straps on the back to prevent the cover from ballooning up, to protect the mixture from the weather, and to prevent heat loss. In addition, from September 30 through March 31, the truck bed shall be insulated on the front, sides, and back with plywood or other suitable material. Trucks with heated bodies may be used if the heat is uniformly distributed along the entire area of both side walls. The front and back, unless they are uniformly heated along the entire area, shall be insulated with plywood or other suitable material. All covers used and trucks with heated bodies are subject to the approval of the Engineer. No loads shall be sent out so late in the day that spreading and compacting of the mixture cannot be completed by sunset unless approval for nighttime paving has been granted by the Engineer.

401.05 Pavers. Bituminous pavers shall be self-contained units, provided with an activated screed or strike-off assembly, heated, and capable of spreading and finishing asphaltic concrete in lane widths of the specified typical section and thickness shown on the Plans.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The front of the screed or strike-off assembly shall be equipped with an automatic control device that produces a finished surface of the required evenness and texture without segregation, tearing, shoving, or gouging the mixture. The paver shall be capable of operation at forward speeds consistent with satisfactory laying of the mixture. Stop and go operations of the paver shall be avoided. Equipment used for shoulders and similar construction shall be capable of spreading and finishing the courses in widths shown on the Plans.

The screed of the paver shall be regulated by an automatically controlled grade leveling and slope control device. The device shall be adapted to the type of paver used, and shall provide control for producing a uniform surface to the established grade and a cross slope conforming to the requirements

of the typical section. The device shall also be equipped with the necessary controls to permit the operator to adjust or vary the slope throughout superelevated curves. Grade control shall be accomplished using a sensor following a traveling reference plane not less than 302 (9 m) in length. If deemed necessary by the Engineer, a joint matching shoe referencing to an adjacent mat shall be used.

If the automatic controls fail or malfunction, the equipment may be operated manually for the remainder of the normal working day, provided specified results are obtained. Manual operation will be permitted for constructing irregularly shaped and other areas as approved by the Engineer. If the Contractor fails to obtain and maintain the specified surface tolerance, the paving operation shall be suspended until satisfactory corrections, repair, or equipment replacements are made.

401.06 Rollers. Rollers shall be self propelled, static or vibratory steel wheel type or a combination thereof, or the pneumatic-tire type. All rollers shall be capable of reversing without backlash, and shall be operated according to manufacturer2s recommendations. Steel wheel rollers shall be equipped with scrapers. Pneumatic-tire rollers shall be of the oscillating type, equipped with smooth tires of equal size, diameter, and ply rating, all maintained at the same inflation pressure. Rollers shall have a system for moistening each wheel or roller. The number and weight of the rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Using equipment which results in excessive crushing of the aggregate or marring of the pavement surface will not be permitted.

All rollers shall be approved prior to use. The rollers shall be maintained in a satisfactory working condition, and shall bear the manufacturer2s name plate stamped with the model number and the weight without ballast.

CONSTRUCTION METHODS.

401.07 Application of Tack Coat. A tack coat diluted with 50% water shall be applied on all dry and broom cleaned portland cement concrete and bituminous pavement surfaces. Tack coat shall be applied at a rate of 0.05 to 0.15 gal/yd² (0.23 to 0.68 L/m2), at a temperature of 70 to 160 °F (21 to 71 °C). The application rate appropriate for the surface being overlaid shall have prior approval of the Engineer. The tack coat should be a thin, uniform coating sufficient to bond the overlay to the underlying pavement. Tack coat shall be applied using pressurized distributing equipment with a spray bar or other approved distribution system. Tack coat shall be applied in advance of the hot-mix operation, but no further than is anticipated for the current day2s hot-mix operation.

All contact surfaces of curbing, gutters, manholes, and other facilities shall be coated with a uniform coat of hot asphalt cement (tack) or other approved bituminous material just before the mixture is placed.

401.08 Placing Bituminous Mixtures. Prior to the delivery of the mixtures on the job, the underlying course shall have been brought to line, grade, and cross-section, and all excess patching material, joint material, dirt, and foreign material shall be removed. The mixtures shall be placed only upon a surface that is dry, and only when weather conditions are suitable.

Upon arrival, the mixture shall be dumped into the approved mechanical spreader, and immediately spread and struck off in a uniform layer to the full width required. The placed mixture shall be of such depth that when the work is completed, it will have the thickness shown on the Plans or as specified in the Contract and will conform to the grade and surface contour required. Machine methods of spreading and screeding are required unless otherwise permitted.

Should unevenness of texture, tearing, or shoving occur during the paving operation due to unsatisfactory material, methods, or equipment, the Contractor shall immediately take action to correct

such unsatisfactory work.

The outside edges of the pavement shall be in true alignment, parallel to the centerline of the roadway. On Contracts requiring multiple lifts or courses, the width of the individual lifts shall be arranged such that the longitudinal joints of each successive lift are offset from the previous lift approximately 6" (150 mm). The longitudinal joint in the surface course shall be at the lane line.

The placement of roadway bituminous concrete shall be as continuous as possible. Intersections and irregular areas shall be paved after the adjacent roadway has been paved. Hand spreading with lutes will be permitted where irregularities or obstacles make the use of pavers impractical. The use of garden rakes will not be permitted.

No bituminous concrete shall be placed when the ambient air temperature at the location of the paving operation is below the temperatures indicated for the various types of bituminous concrete mixtures in the following table:

Table 401-A
Minimum Ambient Air Temperature for Placement of Types of Bituminous Material

Material Type	1" (25mm) Lift Or Less	1 to 2" (26 mm to 50 mm) Lift	Greater than 2" (50 mm) Lift
A	65° F (18° C)	N/A	N/A
B	50° F (10 °C)	40° F (4°C)	32° F (0° C)
C	50° F (10° C)	40° F (4° C)	N/A
D	50° F (10° C)	40° F (4° C)	N/A
E	N/A	N/A	32° F (0° C)

Note: Type A - Open graded plant mix wearing surface
Type B - Dense graded base and binder course
Type C - Dense graded surface course
Type D - Fine, dense graded surface course
Type E - Curb mix

No bituminous concrete shall be placed on any frozen surface or when, in the opinion of the Engineer, weather conditions, such as wind and low temperatures, prevent proper spreading, finishing, and compaction of the mixture. Subsequent lifts or courses shall not be placed over another lift or course placed on the same day while the temperature of the previously placed mix is 140 °F (60 °C) or greater. Traffic shall be kept off the bituminous concrete until the mat temperature is less than 140 °F (60 °C).

The Contractor shall fill low places in the base with a leveling material consisting of hot-mix bituminous concrete base course or surface course material. The locations along the base course to receive this leveling course material, the type of material to be used, and the method to be employed in each case shall be as directed. Hot-mix bituminous concrete material shall be placed as directed around all manholes, drainage inlets, valves, or similar features (with slopes 20:1 or flatter) when they are adjusted to the proposed grade. This material may be temporarily placed and shall be removed if directed.

After the hot-mix bituminous concrete base course is placed, it shall not lay exposed for a period longer than ten days. If, due to conditions of emergency, more than ten days elapse, a fog coat of RS-1 or CSS-l-h shall be sprayed uniformly on the exposed base course before placing the wearing course of hot-mix bituminous concrete. In addition, the Contractor shall plan the paving operation so that no bituminous base courses remain unsurfaced after the "winter shut-down" unless authorized by the Engineer.

The paving operation shall be conducted to minimize inconvenience to traffic and to protect

existing and finished surfaces. Unless otherwise permitted, no single lane of any course shall be constructed to a length which cannot be completed to a full width of the pavement the following day. All hot-mix resurfacing operations shall be properly signed at the Contractor2s expense with notice of "Pavement Drop-Off" or "Uneven Pavement" in accordance with the approved traffic control plans.

At locations where the hot-mix is tapered to meet an existing roadway, a tack coat of bituminous material shall be uniformly applied on the tapered area at the rate of approximately 0.15 gal/yd² (0.70 L/m2).

401.09 Deep Lift Base Course. In addition to other tolerances specified in this Section, deep lift bituminous concrete base course shall be constructed in accordance with the following requirements:

(a) The base course shall be placed with an approved paver or spreader in approximately equal layers not exceeding 6" (150 mm) in depth after compaction.

(b) Base course placed in irregular shaped areas of pavement, such as transitions, turning lanes, crossovers, and entrances, may be placed in a single lift using a grader.

(c) Mix segregation will not be permitted regardless of method of placement. Should segregation occur, paving operations shall be stopped immediately and not resumed until the cause is determined and corrected.

401.10 Compaction. Immediately after the bituminous mixture has been spread and struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.
The surface shall be rolled when the mixture is in the proper condition, and when the rolling does not cause undue displacement, cracking, or shoving. Delays in rolling freshly spread mixtures will not be permitted. The number, weight, and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. The sequence of rolling operations and the selection of roller types shall provide the specified pavement density.
The rollers shall be operated with the drive wheels positioned toward the paver, at speeds slow enough to avoid displacement of the mixture. Rolling shall start longitudinally at the sides, parallel to the centerline of the work, and progress towards the center, overlapping on successive trips by at least one-half the width of the roller. Alternate trips of the roller shall be of slightly different lengths. When paving in echelon or paving a lane which abuts a previously placed lane, the longitudinal joint shall be rolled first, followed by the regular rolling procedure. On superelevated curves, the rolling shall begin at the low side and progress towards the high side by overlapping, longitudinal trips, parallel to the center line. All roller marks shall be rolled out.
The motion of the roller at all times shall be slow enough to avoid displacement of the hot mixtures. All displacement occurring as a result of the reversing of the direction of the roller, or from any other cause, shall be corrected to the satisfaction of the Engineer. To prevent adhesion of the mixture to the wheels of the roller, they shall be kept properly moistened, but excess water will not be permitted.
Along curb, headers, manholes, railroad crossings, and similar structures, and at all places not accessible to the roller, thorough compaction shall be obtained using approved tampers. At all contacts of this character the joints between these structures and the mixture shall be effectively sealed. All mixtures which become loose and broken, mixed with dirt, or in any way defective, shall be removed and replaced with fresh, hot mixture. The replacement mixture shall be immediately compacted to conform with the surrounding area. Areas showing an excess of asphalt cement, as determined by the Engineer, shall be removed and replaced.

401.11 Compaction Testing. Compaction shall be controlled by the following methods at the discretion

of the Engineer:

(a) Bituminous mixtures shall be compacted to a degree of compaction of not less than 92% of the theoretical voidless density obtained by laboratory calculation for surface courses and not less than 90% of the theoretical voidless density obtained by laboratory calculation for base and binder courses. Laboratory compaction is the average density obtained by the Maximum Specific Gravity in accordance with AASHTO T 209 for the mixtures being produced and being placed. The degree of compaction shall be determined through measurement of actual pavement density using a nuclear density gauge in accordance with ASTM D 2950 and a laboratory compacted specimen density using the Maximum Specific Gravity and shall be expressed as a percentage:

(b) At the option of the Engineer, 4" (100 mm) diameter, diamond-bit drilled roadway cores shall be obtained from the constructed pavement mixtures for laboratory pavement density
determination in lieu of the nuclear method.

(c) When theoretical voidless density values are not immediately available, or at the option of the Engineer, pavement compaction may be monitored by measuring the in-place density using a nuclear density gauge and comparing it to a control strip target density. The mean pavement compaction shall be at least 98% of the control strip target density and sufficiently uniform that individual test results are at least 96% of the control strip target density. If any individual test result falls below 96% of target density, the mixture represented by the test will be considered defective and the Contractor shall further compact the sublot. After further compaction, the original test site and one other randomly selected site within the sublot will be tested. The average of the two test results will be included in the mean density for that day2s production. The original test will not be included.

To determine the control strip target density, a control strip with a minimum length of 3002 (90 m) shall be constructed at the beginning of work on each pavement course. Each control strip is to remain in place and become a section of the completed roadway. A control strip shall have an area of approximately 400 yd² (325 m²) and shall be the same depth specified for the pavement course which it represents.

The materials used in the construction of the control strip shall conform to the requirements of the approved job mix formula. They shall be furnished from the same source and shall be of the same type used in the remainder of the pavement course represented by the control strip. The prepared base upon which a control strip is to be constructed shall have the prior approval of the Engineer.

The equipment used in the construction of the control strip shall be approved by the Engineer. It shall be of the same type and weight to be used on the remainder of the pavement course represented by the control strip.

Compaction of the control strip shall commence as soon as possible after the mixture has been spread to the desired thickness, and shall be continuous and uniform over the entire surface. Compaction of the control strip shall be continued until no appreciable increase in density can be obtained by additional roller passes.

Upon completion of the rolling, the mean density of the control strip will be determined by averaging the results of ten nuclear density tests taken at randomly selected
sites within the control strip. The mean density of the control strip shall be the target

density for the remainder of the pavement course which it represents. Compaction shall be expressed as a percentage of the target density:

$$Percent\ Compaction = \frac{\textbf{Nuclear Pavement Density}}{\textbf{Control Strip Target Density}} \times 100$$

If the mean density of the control strip, as determined by cored samples taken in accordance with AASHTO T 230 Method B is less than 95% of the density of laboratory compacted specimens for surface mixtures, or 90% for base mixtures, the Engineer may order the construction of another control strip.

A new control strip may also be ordered by the Engineer if requested by the Contractor when:

(1) A change in job mix formula is made
(2) A change in the material from the same source is observed
(3) There is reason to believe that a control strip density is not representative of the bituminous mixture being placed.

If the densities are not obtained, additional rolling or the use of more approved rollers will be required. All roller marks shall be rolled out.

401.12 Joints. Placing of bituminous concrete shall be as nearly continuous as possible. The roller shall not pass over the unprotected end of the freshly laid mixture except when necessary to form a transverse joint. When necessary to form a transverse joint between old and new pavement or between successive day's work, the joint shall be made by placing a bulkhead or tapering the course. If the course is tapered, the edge shall be cut back to its full depth and width on a straight line to expose a vertical surface to remove the taper prior to placing the next section. It is not the intent of this Section to require an existing (old) pavement to be cut back full depth transversely when the paving work being performed is an overlay tie-in unless such is designated in the Special Provisions or on the Plans. With either method, all contact surfaces shall be coated with an approved tack material before placing any fresh mixture against the joint.

Longitudinal joints shall be rolled directly behind the laying operations. The first lane shall be true to line and grade and have a vertical face. The material being placed in the abutting lane shall be tightly compacted against the vertical face of the previously placed lane. The finishing machine shall be positioned so that the spread material overlaps the edge of the lane previously placed by 1 to 2" (25 to 50 mm), and is left sufficiently high to allow for compaction. Before rolling, the material overlapping the joint shall be carefully deposited adjacent to the joint of the unrolled lane with a lute. When the abutting lane is not placed the same day, or the joint is distorted by traffic or other means, the edge shall be carefully trimmed to line and coated uniformly with tack material. The longitudinal joint in any layer shall offset that in the layer immediately below by approximately 6" (150 mm). However, the joints in the completed surfacing shall be at the lane line.

401.13 Surface Requirements. After final rolling, the surface will be tested longitudinally and transversely by the Engineer using a 102 (3.048 m) rolling straightedge or straightedge at locations selected by the Engineer. The distance between the surface and the testing edge of the straightedge between any two contact points shall not exceed the following limits:

(a) For Base Courses:
(1) Lower courses: ±3/8" (±10 mm)
(2) Top course: ±¼" (±6 mm)
(b) For Surface Courses:

(1) Multiple and single course construction: ±¼" (±6 mm)

Areas found to exceed these tolerances shall be corrected, or removed and replaced by the Contractor, as directed, to conform to the required surface tolerances.

The Contractor shall have available at all times an approved 102 (3.048 m) straightedge for use by the Engineer.

SECTION 402 - HOT-MIX BITUMINOUS CONCRETE AND COLD-LAID BITUMINOUS CONCRETE FOR TEMPORARY ROADWAY MATERIAL (TRM)

402.01 Description. This work consists of furnishing and placing hot-mix bituminous concrete and cold-laid bituminous concrete as temporary roadway material (TRM) for the maintenance and repair of the roadway, for pipe and utility crossings, for driveways and entrances, for temporary ramps up to curbs, and for other areas as directed by the Engineer. TRM under this Section shall not be used for constructing detour roads or other temporary roadway; however, it can be used for their maintenance.

402.02 Materials. Materials for TRM shall conform to the following Sections:

Cold-Laid Bituminous Concrete 815
Hot-Mix Bituminous Concrete 823

402.03 Construction Methods. Repair of the existing pavement and the placement of TRM, hot or cold, shall be done as approved or directed by the Engineer. The work shall be coordinated with all other work and operations necessary to maintain traffic.

SECTION 403 PLANT MIX OPEN-GRADED WEARING SURFACE

403.01 Description. This work consists of furnishing all materials for and constructing an open-graded wearing surface.

403.02 Materials. Materials for open-graded wearing surfaces shall conform to the requirements of Section 823. An approved heat-stable, anti-stripping agent shall be added to all asphalt cement used for open-graded wearing surfaces.

EQUIPMENT.

403.03 Hauling Equipment. All requirements of Subsection 401.04 shall apply.

403.04 Pavers. All requirements of Subsection 401.05 shall apply.

403.05 Rollers. Rollers shall be in good condition and be capable of reversing without backlash. The use of equipment which results in crushing of the aggregate will not be permitted. Rollers shall be steel wheeled capable of exerting a load of not less than 250 lb/in (4.5 kg/mm) of width of compression roll or rolls. Rubber tired rollers will not be permitted on the open-graded wearing surface.

CONSTRUCTION METHODS.

403.06 Placement. The pavement shall be constructed in conformance with the requirements of all applicable Subsections of Section 401.

The mix shall be spread and struck-off to the grade and elevation established. Bituminous pavers shall be used to distribute the mixture either over the entire width of the roadway or over such partial width as may be practicable. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture may be spread and luted by hand tools.

No open-graded wearing surface shall be placed when the ambient temperature is below 65 °F (18 °C).

403.07 Compaction. After the bituminous mixture has been spread and struck off, and the surface irregularities adjusted, the mixture shall be thoroughly and uniformly compacted by rolling. The bituminous mixture shall be rolled in a longitudinal direction, commencing at the outside edge of the roadway and progressing towards the center. Rolling shall be accomplished with a steel-wheeled roller or rollers, conducted in such a manner that shoving, distortion, or stripping will not develop beneath the roller. On superelevated curves, the rolling shall commence on the low side and progress to the high side. The amount of rolling shall be limited to only that necessary for consolidating the bituminous mixture and bonding it to the underlying surface. Excessive rolling shall be avoided.

The completed bituminous mixture shall be protected from all traffic until it has cooled sufficiently to resist distortion, abrasion, or pickup.

The Contractor is advised that early breakdown is essential due to rapid temperature loss of the open-graded mix. It is anticipated that two complete passes of the roller will provide adequate compaction. Density tests on the open-graded wearing surface will not be conducted. The Contractor will be directed to cease rolling when, in the opinion of the Engineer, maximum density has been achieved. Determination will be by visual means. Over-rolling will result in aggregate fracture, which

shall be avoided.

403.08 Joints, Trimming Edges, and Cleanup. Placing of the bituminous mixture shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the Engineer. Transverse joints shall be formed by cutting back the previous run to expose the full depth of the course. A tack coat shall be used on the contact surfaces of transverse joints just before additional mixture is placed against the previously rolled material.

The exposed edges of the completed mat shall be cut off true to the required lines. Material trimmed from the edge, and all other discarded bituminous mixture, shall be removed from the roadway and disposed of by the Contractor.

403.09 Finished Work Samples. The Engineer may cut samples from the pavement for testing. Samples will be neatly cut by a saw or core drill. The Contractor shall supply and place new material to backfill voids left by sampling.

SECTION 404 BITUMINOUS SURFACE TREATMENT

404.01 Description. This work consists of constructing one or more courses of bituminous material and aggregate upon the completed and accepted foundation or existing surfacing.

MATERIALS.

404.02 Asphalt. The asphalt for bituminous surface treatment shall be RC-70 or CRS-1 for the prime coat and RC-250 or CRS-2 for seal coats. All material shall conform to the requirements of Section 811 or 817 whichever is applicable.

The material used shall be applied within the following temperature limits:

Material	Limits
RC-70	80 to 150°F (27 to 66°C)
RC-250	100 to 175° F (38 to 79° C)
CRS – 1	70 to 140°F (21 to 60°C)
CRS – 2	125 to 185°F (52 to 85°C)

404.03 Coarse Aggregate. Coarse aggregate shall conform to the following requirements:

(a) Coarse aggregate for the initial treatment may consist of crushed slag composed of clean, tough, durable pieces of air-cooled blast-furnace slag, reasonably uniform in density and quality, and free of glassy particles, coke, dirt, or other objectionable matter.

(b) Crushed slag in dry condition shall weigh not less than 70 lb/ft³ (1120 kg/m³) when tested according to AASHTO T 19/T 19M, Rodded Method.

(c) Coarse aggregate for initial treatment may also be crushed stone or crushed gravel weighing not less than 95 lb/ft³ (1520 kg/m³) when tested according to AASHTO T 19/T 19M and conforming to the requirements of Section 805.

(d) The slag, crushed stone, or crushed gravel shall conform to the grading requirements of Section 813, Delaware No. 57 or 67.

(e) Coarse aggregate for the two treatments following the initial application shall consist of crushed chips composed of crushed stone, crushed gravel, or crushed slag, conforming to the requirements of Section 813, Delaware No. 8.

404.04 Fine Aggregate. Sand for tack coat shall conform to the requirements of Section 804.

EQUIPMENT.

404.05 Distributors. The distributors used shall be capable of uniformly applying the bituminous material in liquid form. Devices to control the pressure, volume, and temperature shall be provided. Each distributor shall have an approved calibration chart, be equipped with an approved sampling device, and conform to the following:

(a) *Pressure.* The pressure shall be supplied by a positive displacement pump or air compressor. The pressure shall be uniform throughout the entire width of spray. If pressure is supplied by an air compressor, automatic controls must be provided to maintain sufficient and even pressure throughout the application of an entire load.

(b) *Temperature.* The distributor shall be equipped with a heating system that applies heat uniformly across the width of the tank. Provisions shall be made for circulating or agitating the material whenever necessary while heating. The distributor shall be equipped with a thermometer marked in degrees Fahrenheit (Celsius) of sufficient range to determine the actual temperature of the material.

(c) *Tachometer.* All distributors shall be provided with an approved tachometer recording feet (meters) per minute with a tabulation of feet (meters) per load with adjustments. Each load tabulation shall start at zero. There shall also be a totaling tabulation of this instrument.

(d) *Volume.* A tachometer shall give correct readings of the speed, and the volumetric efficiency of the distributor shall ensure the correct volume at various speeds. Tests shall be required to prove the volumetric efficiency of the distributor at various speeds as directed by the Engineer.

(e) *Circulating System.* All pump distributors shall be equipped with a circulating system designed to maintain a homogenous liquid while circulating in the distributor tank. This circulating system shall also be arranged to circulate the material in the tank truck before application.

Air distributors shall be equipped with a device for agitating the bituminous material in the tank trucks when necessary.

(f) *Tests.* Necessary tests shall be made to determine the accuracy of all pressure gauges, tachometers, and pump efficiencies. The tests shall be made by the Contractor when and as required.

(g) *Spray Bars.* Each distributor shall be equipped with spray bars capable of applying material uniformly throughout the entire length of the spray bars when they are extended. Spray bar extensions shall be provided for applying up to a 242 (7.3 m) width in one operation. Spray bars shall be equipped with a cleaning device and a shut-off valve to prevent dribbling, dripping, or streaking.

(h) *Tank Capacity Gauge.* A float or other approved type tank capacity gauge shall be furnished to indicate the volume in the tank in not less than 25 gal (100 L) units. The gauge shall have adjustments for correction.

Tanks shall have a minimum capacity of 750 gal (2800 L).

If the Engineer deems that the equipment applying the material is inadequate or fails to comply with all regulations, the Engineer will order the equipment to be removed from the job and require that another unit be placed on the work.

404.06 Mechanical Spreader. The Contractor shall furnish and operate at least one approved mechanical spreader capable of receiving the material to be spread and being accurately adjusted to distribute the aggregate uniformly at a regulated truck speed.

404.07 Broom Drag. A broom drag shall be furnished and used on the initial application of coarse aggregate. The broom drag shall be a non-revolving type, at least 152 (4.5 m) in length, and shall have at least four rows of brooms. One row must be at each end of the drag.

404.08 Rollers. The Contractor shall furnish and operate at least two power rollers. One power roller shall be three-wheeled, rated by the manufacturer to be between 5 and 8 tons (4500 and 7300 kg). The other power roller shall be a self-propelled, pneumatic-tired roller of approved design and weight, unless otherwise directed.

The tires of the rubber tire roller shall be uniformly inflated. The difference between the pressure in any two tires shall never be greater than 5 psi (35 kPa). The Contractor shall provide means for checking the tire pressure on the job at all times.

CONSTRUCTION METHODS.

404.09 Seasonal and Weather Limitations. Surface treatment shall not be applied during the following conditions:

(a) on any wet or frozen surface,

(b) when the ambient temperature is below 50 °F (10 °C)
(c) between October 1 and April 15, without written permission from the Engineer, and,
(d) when the weather conditions prevent the proper completion of the work, as determined by the Engineer.

404.10 Application. The bituminous surface treatment shall be completed according to the following procedure.

The first application of bituminous material shall not be applied until the moisture content of the foundation is within 2% of the optimum moisture content and the roadway has been properly shaped and approved. An initial application of priming asphalt shall be applied at the rate of approximately 0.5 gal/yd² (2.3 L/m²). Then, approximately 50 lb/yd² (27 kg/m²) of stone or 40 lb/yd² (22 kg/m²) of slag shall be spread from a mechanical spreader. After the initial treatment, two treatments shall be applied using approximately 0.30 gal/yd² (1.4 L/m²) of sealing asphalt and from 17 to 20 lb/yd² (9 to 11 kg/m²) of crushed chips for each application. If slag is used, approximately 0.35 gal/yd² (1.6 L/m²) of sealing asphalt shall be used for each treatment.

404.11 Heating and Application of Bituminous Material. Bituminous materials used for each treatment shall be heated in a manner that ensures even heating of the entire mass and maintained within the specified temperature and pressure range during application. Any material which has been damaged shall be rejected, and any section treated with damaged material shall be removed and replaced.

The bituminous material shall be applied in one application at the rates specified using the pressure distributor for the full width of the treatment, unless otherwise directed.

The nozzles of the spray bar shall be kept clean at all times. If one or more nozzles becomes blocked during the application of bituminous materials, the distributor shall be stopped immediately, and the nozzles shall be cleaned. The streaked areas shall be made uniform using a hand hose or other approved methods.

Joints shall be made by an approved method that ensures proper seal with the preceding application. All excess bituminous material at the transverse junction between distributor loads shall be removed and corrected in a satisfactory manner.

If the Contractor is unable to keep the application uniform, the operation shall be discontinued until a more experienced operator or a better distributor, or both, can be provided; or, the Contractor shall take such other precautions as may be necessary to keep the application within specified limits.

When applying bituminous materials adjacent to structures or curbs, the Contractor shall furnish and use effective means of protecting the structures or curbs from discoloration.

404.12 Spreading of Coarse Aggregate. As soon as the bituminous material has been applied, it shall be uniformly covered with the specified amount of coarse aggregate. The aggregates shall be applied immediately after the application of the bituminous material for prime and seal coats.

Spreading shall be done directly from trucks using approved mechanical spreaders. Trucks or spreaders shall not drive on the uncovered bituminous material.

During the spreading of coarse aggregate, a crew equipped with hand brooms shall broom all areas where the aggregate has been unevenly applied. Additional aggregate shall be placed by hand on all areas not properly covered. If directed, the surface shall then be dragged with a light broom drag until a smooth and even surface is obtained.

404.13 Rolling of Coarse Aggregate. Immediately after brooming and dragging, the coarse aggregate shall be rolled in a longitudinal direction with an approved pneumatic-tired roller or rollers. The rolling

shall begin at the outer edges of the treatment and progress toward the center, each pass overlapping the previous pass by one-half the width of the roller. This rolling shall be continuous. Enough rollers will be required to complete the rolling operation within one hour after the application of the asphalt. The rolling shall be repeated as often as required to ensure thorough keying of the coarse aggregate into the bituminous material.

404.14 Application of Sand. Sand shall be applied to asphaltic tack coats at the rate of approximately 10 lb/yd² (5.4 kg/m²) by means of approved mechanical spreaders or as directed.

404.15 Opening to Traffic. The roadway shall not be opened to traffic after the application of the treatments until bituminous materials have set and the coarse aggregate has embedded sufficiently to prevent picking up or whipping off by traffic.

Signs, barricades, lights, and necessary incidentals for detouring traffic shall be furnished and maintained by the Contractor.

SECTION 405 - BITUMINOUS SURFACE RETREATMENT

405.01 Description. This work consists of one or more applications of bituminous material followed by one or more applications of cover aggregate applied to a surface.

405.02 Materials. Materials shall conform to the requirements of Subsections 404.02 and 404.03.

405.03 Construction Methods. All provisions of Section 404 shall govern except as follows:

(a) The Contractor shall furnish all equipment, tools, labor, and incidentals required to prepare the traveled way so that it will be free from deposits of dirt, loose stone, or other

objectionable material before applying the bituminous material. Each surface or section of the traveled way must be approved before applying the bituminous material.

(b) Prime coats shall be omitted.

(c) The bituminous material application rate may be varied as directed.

(d) The covering aggregate shall be applied at approximately 17 lb/yd² (9 kg/m²), but may be varied as directed.

SECTION 406 HOT-MIX PATCHING

406.01 Description. This work consists of hot-mix patching portland cement and bituminous concrete pavement.

406.02 Materials. Hot-mix bituminous patching material shall conform to the requirements of Section 823.

Graded aggregate base course shall conform to the requirements of Subsection 302.02.

406.03 Construction Methods. Construction methods shall conform to the applicable Subsections of Sections 401 and 302.

The pavement shall be sawed before patching using a concrete cutting machine mounted on a sturdy frame equipped with control devices and a suitable-motor driven-diamond blade circular cutter. The equipment shall be capable of cutting a groove in a straight line to a sufficient depth so that an even, neat joint is cut to allow removal of material without damage to adjacent paving. Water shall be continuously supplied to the cutting element either by a water tank on the equipment or other means.

If the pavement is other than portland cement concrete, the equipment for cutting shall be of a type approved by the Engineer.

.

SECTION 602 CONCRETE STRUCTURES

602.01 Description. This work consists of furnishing and placing portland cement concrete for structures and incidental construction.

MATERIALS.

602.02 Materials. Materials for concrete structures shall conform to the following Section and Subsections:

- Materials for Sealing Joints:
  - Preformed Elastomeric Compression Seals 808
  - Rubber Joint Sealant 808
  - Hot Poured Joint Sealer 808
- Preformed Expansion Joint Fillers, Type III 808
- Portland Cement Concrete 812.02
- Chemical Admixtures 812.02
- Curing Materials:
  - Liquid Membrane Compounds 812.02
  - Polyethylene Sheeting 812.02
  - Waterproof Paper 812.02
- Concrete Mix Composition, Classes A, B, C, and D 812.04
- Bar Reinforcement 824.01
- Bar Reinforcement, Epoxy Coated 824.02

602.05 Sheet Metal For Flashing and Waterstops. Sheet copper shall conform to the requirements of ASTM B 370. Sheet lead shall conform to the requirements of ASTM B 29. Sheet zinc shall conform to the requirements of ASTM B 69.

602.06 Form Oil For Concrete Formwork. Form oil shall be a nonstaining petroleum distillate free from water, asphaltic, and other insoluble residue or equivalent product.

602.07 Waterstops. Waterstops shall be polyvinyl chloride (PVC) compounded as necessary to conform to the requirements of U.S. Army Corps of Engineers Specification CDR-C572. No reclaimed PVC from any sources shall be incorporated in the compounding. The extruded material shall be dense, homogeneous, and free from porosity or other imperfections that could affect its durability or performance.

CONSTRUCTION METHODS.

602.08 Formwork. Except where indicated elsewhere in this Section, forms shall be designed and constructed so they can be removed without injuring the concrete. Forms shall be designed for strength and deflection to resist all loads and pressures of the wet concrete, the weight of the forms, the rate of pour, the affect of vibration, the time of setting, and an addition of 50 lb/ft² (2.4 kPa) of construction live load applied to all horizontal surfaces.

For removable forms, no member shall have a deflection, under total load, in excess of 1/360 of its span length, and in no case shall the deflection exceed ¼" (6 mm), except that deflections of form surfaces for concrete floor slabs where such forms are supported by beams, stringers, or girders may be 1/180 of the span length but not to exceed ½" (13 mm). Where the design of the forms requires deflections in excess of these amounts, the forms shall be cambered.

Concrete shall be assumed to weigh 150 lb/ft³ (2400 kg/m3). Lumber in forms shall be assumed to weigh 4lb per board foot (700 kg/m3). For all other materials, other than lumber in forms, the unit weight of the material shall be used.

Formwork plywood (without backing) shall be used with the face plies running parallel to the span (or perpendicular to supports) for maximum working strength and minimum deflection.

The Contractor shall prepare and submit for approval complete detailed plans of all formwork to be constructed. Working formwork drawings shall be submitted in accordance with Subsection 105.04. The Contractor shall not proceed with formwork construction until its plans have been approved. However, approval of these plans shall not relieve the Contractor of complete responsibility for the safety and adequacy of all formwork.

The form drawings shall show all major design values and loading conditions. These include assumed values of live and dead load, rate of placement, temperature of concrete, height of drop, weight of moving equipment which may be operating on formwork, foundation pressures, design stresses, deflection and camber diagrams, and other pertinent applicable information. All pertinent design calculations shall be submitted for walls greater than 10' (3 m) in height. In addition to specifying types of materials, sizes, lengths, and connection details, formwork drawings shall provide for applicable details such as: 1) Anchors, shores, and braces; 2) field adjustment of the form during placing of concrete; 3) waterstops, keyways and inserts; 4) working scaffolds and runways; 5) weepholes or vibrated holes where required; 6) screed and grade strips; 7) crush plates or wrecking plates; 8) removal of spreaders or temporary blocking; 9) cleanout holes; 10) construction, control and expansion joints; 11) chamfer strips; 12) notes to cover conduits and pipes to be embedded; and 13) details on shoring, reshoring, or leaving original shores in place as forms are stripped.

The material to be used for forms for exposed surfaces shall be either plywood, metal in which all bolts and rivet holes are countersunk, fiber, or other approved material. In either case, a plain, smooth surface of the desired contour must be obtained. For surfaces to be given a rubbed finish, the material shall be plywood unless otherwise specifically approved. For curved or special surfaces, the above requirements may be modified.

The form material shall be placed so a smooth surface free from irregularities is obtained. Sheets of material shall be placed so that joints are in regular and true horizontal and vertical lines. Full sized plywood sheets shall be used except where a single smaller piece covers an entire area. Where form lining is used, it shall be used in pieces as large as possible. All joints shall be solidly backed, butted tightly together, and sealed with white lead paste or other approved crack fillers. All holes shall be filled as well as depressions or hammer marks so that the completed surface is as smooth as possible. When steel forms are used, the panels shall be as large as practical and of sufficient thickness to prevent surface irregularities. Panels shall be assembled in uniform patterns and firmly locked and braced

together to form a smooth surface. Bent or irregular panels shall not be used. Round fiber column forms shall be furnished full height and shall be fitted with circular wooden templates at top and bottom and with wooden collars at intermediate points. Fiber forms shall be removed not later than ten days after pouring.

Moldings, fluting, rustification, and other ornamental details shall be formed of material specifically manufactured for the job. Samples or details of the material shall be submitted for approval by the Engineer prior to use.

All lumber shall be free from knotholes, loose knots, cracks, splits, warps, or other defects impairing the strength or the appearance of the finished structure.

When necessary because of thin wall construction, forms shall be daylighted at intervals not greater than 10' (3 m) vertically, the openings being sufficient to permit free access to the forms for the purpose of inspecting, working, and vibrating the concrete.

The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar tight and, to close cracks due to shrinkage, shall be thoroughly soaked with water.

Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed. The interior surfaces of the forms shall be adequately oiled, greased, or soaped to ensure non-adhesion of mortar. Form plywood and/or lumber which is reused shall be free from bulge, warp or damage and shall be thoroughly cleaned. The forms shall be inspected immediately preceding the placing of concrete and any defects shall be remedied and all dirt, sawdust, shavings, or other debris within the forms shall be removed.

Blocks and bracing shall be removed with the forms and in no case shall any portion of the wood forms be left in the concrete. Special attention shall be paid to the ties and bracing and when forms appear to be insufficiently braced or unsatisfactorily built, either before or during construction, the work will be ordered stopped until the defects have been corrected. The forms shall be so constructed that the finished concrete shall be of the form and dimensions shown on the Plans and true to line and grade.

On the structures having cement concrete masonry decks, supported by beams and girders, the forms for the deck slabs shall be so constructed that under full dead load, the slabs will be of the required thickness shown on the Plans and the surface of the roadway will accurately conform to the profile grades, cross-sections and alignments as shown on the Plans. Allowance shall be made for the camber of the beams and stringers as fabricated and erected and also for the additional deflections due to dead load. The depth of haunches between the top of the stringers and the bottom of the slab as shown on the Plans, is theoretical, and due to variations in obtainable camber in the stringers and to usual inaccuracies of fabrication and erection, the depths of haunches to be constructed may vary considerably from the theoretical. The formwork shall be constructed so as to provide for any and all necessary variations in actual depths of haunches required.

602.10 Placing Concrete. No concrete shall be placed until the depth of the excavation and character of the foundation material, the adequacy of the forms and falsework, and the placing of reinforcement and other embedded items have been inspected and approved by the Engineer.

Concrete shall be placed in daylight unless an adequate lighting system meeting the approval of the Engineer is provided.

In preparation for the placing of concrete, all sawdust, chips, and other construction debris and extraneous matter shall be removed from the interior of forms. Hardened concrete and foreign matter shall be removed from tools, screeds, and conveying equipment.

The temperature of the concrete shall not be greater than 90 °F (32 °C), nor less than 50 °F (10 °C) at the time of placing, except where other temperatures are required in this Section. The temperature of concrete for bridge decks shall not exceed 85 °F (29 °C). During hot weather, the Contractor may be required to chill the mixing water, incorporate ice into the concrete mixture as part of the mixing water, or take other measures as prescribed in Section 812 to maintain concrete temperatures below the specified maximum temperatures. In addition, any combination of wind velocity, high air temperatures and low relative humidity, which, in the opinion of the Engineer, will impair the quality of fresh or hardened concrete due to rapid concrete moisture evaporation shall be sufficient cause to discontinue or prohibit concrete placement. The ACI Recommended Practice for Hot Weather Concreting will be used as a guide in assessing the hazards of hot weather.

No concrete shall be used which does not reach its final position in the forms within the time stipulated in Subsection 812.06.

Surfaces other than foundations on which concrete is to be placed shall be thoroughly cleaned and wetted immediately before placing concrete in order to facilitate bonding.

Placing of concrete shall be so regulated that the pressures caused by the wet concrete shall not exceed those used in the design of the forms.

The external surface of all concrete shall be thoroughly worked during the placing by means of tools of an approved type. During the placing of concrete, care shall be taken that the methods of compaction used will result in a surface of even texture free from voids, water, or air pockets, and that the coarse aggregate is forced away from the forms in order to leave a mortar surface.

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. Concrete may be placed with the aid of buckets, chutes, troughs, pipes, or conveyors. Open troughs or chutes shall be metal or metal lined and extend as nearly as possible to the point of deposit. Aluminum will not be permitted as the contact surface for concrete placed through any conveyance.

Chutes on steep slopes shall be equipped with baffle boards or be in short lengths that reverse the direction of concrete movement. Chutes shall not slope greater than 1:2 (vertical to horizontal) or less than 1:3 (vertical to horizontal). Concrete placed with chutes over 25’ (7.6 m) long or not meeting these slope standards shall discharge into a hopper before distribution unless otherwise directed.

All chutes, troughs, and pipes shall be kept clean and free from coatings of hardened concrete by thoroughly flushing with water after each run. The water used for flushing shall be discharged clear of the structure.

Dropping the concrete a distance of more than 5’ (1.5 m) or depositing a large quantity at any point and running or working it along the forms will not be permitted, except that the 52 (1.5 m) limitation will not apply to the dropping of concrete into the forms for the walls of box culverts, or retaining walls unless directed by the Engineer.

Care shall be taken to fill each part of the form by depositing the concrete as near its final position as possible. The coarse aggregate shall be worked back from the forms and worked around the reinforcement without displacing the bars. After initial set of the concrete, the forms shall not be jarred

and no strain shall be placed on the projecting reinforcement or other items embedded in the concrete, except where unavoidable on structures being widened under traffic.

Concrete shall be placed in continuous horizontal layers, the thickness of which generally shall not exceed 10 to 12" (250 to 300 mm). However, slabs shall be placed in a single layer. When it is necessary in an emergency to place less than a complete horizontal layer in one operation, such layer shall terminate in a vertical bulkhead. In any given layer, the separate batches shall follow each other so closely that each one shall be placed and consolidated before the preceding one has taken initial set in order that the fresh concrete shall not be injured and there shall be no lines of separation between the batches. Each layer of concrete shall generally be left somewhat rough to secure efficient bonding with the next layer above. A succeeding layer placed before the underlying layer has become set shall be consolidated in a manner that will entirely break up and obliterate the tendency to produce a construction joint between the layers.

Layers completing a day's work or placed prior to temporarily discontinuing operations shall be cleaned of all laitance and other objectional material as soon as the surface has become sufficiently firm to retain its form. To avoid visible joints as far as possible upon exposed faces, the top surface of the concrete adjacent to the forms shall be finished being smoothed with a trowel.

Horizontal layers so located as to produce a construction joint at a location wherein a feather edge might be produced in the succeeding layer shall be so formed by inset formwork that the succeeding layer will end in a body of concrete having a thickness of not less than 6" (150 mm).

In no case shall the work on any section or layer be stopped or temporarily discontinued within 18" (450 mm) of the top of any face, unless the details of the work provide for a coping having a thickness of less than 18" (450 mm) in which case at the option of the Engineer, the construction joint may be made at the underside of the coping.

Care shall be exercised during the placement of concrete to minimize the coating of reinforcing steel, structural steel, forms, and other items which extend into areas involved in a subsequent placement. In the event coating of the steel does occur, no attempt shall be made to remove the mortar until after the concrete steel bond of the earlier placement has developed sufficiently to withstand a cleaning operation. Any coating of mortar on deformed bars which cannot be removed by hand brushing with a wire bristle brush, or by a light chipping action, will not have to be removed.

The method and manner of placing concrete shall be so regulated as to place all construction joints across regions of low shearing stress and in such locations as will be hidden from view to the greatest possible extent.

The operations of depositing and consolidating the concrete shall, in general, be conducted so as to form a compact, dense, impervious mass of uniform texture which will show smooth faces on exposed surfaces. Any section of concrete found to be defective shall be removed or repaired as directed by the Engineer.

If concrete operations are permitted to extend into the night, the work shall be brightly lighted so that all operations are plainly visible. Lighting requirements are indicated in Subsection 602.24.

602.13 Consolidation of Concrete by Vibration. Concrete, except that placed under water, or as otherwise approved, shall be compacted during and immediately after depositing by means of approved mechanical vibrating equipment.

Internal mechanical vibrators shall be of sturdy construction, with a cutoff switch at the vibrator, adequately powered and capable of transmitting vibrations to the concrete in frequencies of not less than 5000 impulses per minute and shall produce a vibration of sufficient intensity and amplitude to cause settlement of the concrete into place without a separation of the aggregates.

In using internal vibrators, the vibratory element shall be inserted into the concrete at the point of deposit and in the areas of freshly-placed concrete. The time of vibration shall be long enough to accomplish thorough consolidation of the concrete and complete embedment of the reinforcement, to produce a smooth surface free from honeycombing and air bubbles, and to work the concrete into all angles and corners of the forms. However, over-vibrating shall be avoided. Vibration shall continue in a spot only until the concrete has become plastic and shall not continue to the extent that pools of grout are formed. The correct length of time of vibration will depend upon the frequency of the vibration impulses per minute, the size of vibrators and the slump of the concrete.

Internal vibrators shall be applied at points uniformly spaced, not farther than the radius over which the vibration is visibly effective and shall be applied close enough to the forms to effectively vibrate the surface concrete. The vibration shall not be dissipated in lateral motion but shall be concentrated in vertical settlement in consolidating the concrete. Vibrators shall not be used to move concrete.

The vibrating element shall be inserted in the concrete mass a sufficient depth to vibrate the bottom of each layer effectively and in as nearly a vertical position as practicable. It shall be withdrawn completely from the concrete before being advanced to the next point of application.

To secure an even and dense surface free from aggregate pockets or honeycomb, vibration shall be supplemented by working or spading by hand in the corners or angles of the forms and along form surface while the concrete is plastic under the vibratory action.

A sufficient number of vibrators shall be employed so that at the required rate of placement thorough consolidation is secured throughout the entire volume of each layer of concrete. Extra vibrators shall be on hand for emergency use and for use when other vibrators are being serviced.

The use of surface vibrators to supplement internal vibration will be permitted only when satisfactory surfaces cannot be obtained by internal vibration alone, and only upon approval. Surface vibrators shall be applied only long enough to embed the coarse aggregate and to bring enough mortar to the surface for satisfactory finishing.

The use of approved form vibrators will be permitted only when it is impossible to use internal or surface vibrators. When permitted, they shall be attached to or held on the forms in such manner as to effectively transmit the vibration to the concrete and so that the principal paths or motions of the vibration are in a horizontal plane.

602.17 Finishing Concrete Surfaces.

(a) *General.* All concrete surfaces shall be true, even, and free from open or rough places, depressions, or projections. The concrete in all bridge seats, parapets, sidewalks, curbs, railings, and walls shall be brought flush with the finished top surface and shall be struck off with a template and floated to a finish free from irregularities and true to line and grade.

All masonry bearing areas as prescribed in Subsection 605.29 shall be placed to the final elevation specified. They shall be bush-hammered down to within ¼3 (6 mm) of the final elevation and ground with an approved device to a smooth, level, true plain surface which must be within 1/83 (3 mm) of the prescribed bearing elevation. The concrete in the bearing area shall be poured high enough so that no part of the bearing area, after bush-hammering, is lower than the surrounding bridge seating surface.

Unless otherwise specified on the Plans, all surfaces shall be given an ordinary surface finish unless after form removal they are in such a condition that they cannot be repaired to the satisfaction of the Engineer. In these cases, the entire structural unit shall be given a rubbed finish.

(b) *Ordinary Surface Finish.* Immediately following the removal of the forms, all fins and irregular projections shall be removed from all surfaces except from those which are not to be exposed or are not to be water-proofed. On all surfaces, the cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges, and other defects shall be thoroughly cleaned, saturated with water, and carefully pointed and trued with a mortar of cement and fine aggregate mixed in the proportions used in the grade of the concrete being finished. Mortar used in pointing shall be not more than 30 minutes old. The mortar patches shall be cured as specified in Subsection 602.18. All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

(c) *Rubbed Surface Finish.* After removal of forms, the rubbing of concrete shall be started as soon as its condition permits. Immediately before starting this work, the concrete shall be kept thoroughly saturated with water. Sufficient time shall have elapsed before the wetting down to allow the mortar used in the pointing to thoroughly set. The surface to be finished shall be rubbed with a medium coarse carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions used in the concrete being finished. Rubbing shall be continued until all form marks, projections, and irregularities have been removed, all voids filled, and a uniform surface has been obtained. The paste produced by this rubbing shall be left in place.

After all concrete above the surface being treated has been cast, the final finish shall be obtained by rubbing with a fine carborundum stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

After the final rubbing is completed and the surface has dried, it shall be rubbed with burlap to remove loose powder and shall be left free from all unsound patches, paste, powder, and objectionable marks.

(d) *Float Finish.* This finish, for horizontal surfaces, shall be achieved by placing an excess of material in the form and removing or striking-off the excess with a template, forcing the coarse aggregate below the mortar surface. Creation of a concave surface shall be avoided. After the concrete has been struck off, the surface shall be thoroughly worked and floated with a suitable wood, canvas, or cork floating tool. Before the finish has set, the surface cement film shall be removed with a fine brush in order to have a fine grained, smooth but sanded texture.

(e) *Special Surface Finish.* As an alternative to the rubbed surface finish, an acrylic or latex bonded mortar finish may be used when and where designated in the Plans and Special Provisions.

(f) *Tooled Finish.* A tooled finish shall be made on the surfaces previously spaded by cutting into the body of the concrete with a pointing tool or bush-hammer as indicated on the Plans.

602.18 Curing. All exposed surfaces shall be cured by one of the following methods:

(a) *Water Methods.* The concrete shall be kept continuously wet by the application of water for a minimum period of seven curing days after the concrete has been placed.

When cotton mats, burlap, or earth or sand blankets are to be used to retain the moisture, the entire surface of the concrete shall be kept damp by applying water with a nozzle that so atomizes the flow that a mist and not a spray is formed, until the surface of the concrete is covered with the curing medium. The moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow or wash the surface. At the expiration of the curing period, the concrete surface shall be cleared of all curing mediums.

(b) *Membrane Curing Compound Method.* The entire surface of the concrete shall be sprayed uniformly with a liquid membrane curing compound conforming to the requirements of Subsection 812.02.

The membrane curing compound shall be applied after the surface finishing has been completed, and immediately after the free surface moisture has disappeared.

The surface shall be sealed with a single uniform coating of the specified type of curing compound applied at the rate of coverage recommended by the manufacturer or as directed by the Engineer, but not less than 1 gal/150 ft² (0.27 L/m2) of area. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. If the application of the compound does not result in satisfactory coverage, the method shall be stopped and water curing, as set out above, applied until the cause of the defective work is corrected.

At locations where the coating shows discontinuities, pinholes, or other defects, or if rain falls on the newly coated surface before the film has dried sufficiently to resist damage, an additional coat of the compound shall be applied immediately after the rain has stopped at the same rate specified herein.

Any curing compound adhering to a surface to which new concrete is to be bonded shall be completely removed by sandblasting, steel wire brushes, bush-hammers, or other approved means.

The concrete surfaces to which the compound has been applied shall be protected from abrasion or other damage which results in perforation of the membrane film for seven curing days after the concrete is placed. If the film of membrane compound is damaged or removed before the expiration of seven curing days, the exposed concrete shall be immediately cured by the water method until additional compound is applied or until seven curing days have expired.

In the event that the application of curing compound is delayed, the application of water shall be started immediately and shall be continued until application of the compound is resumed or started.

(c) *Waterproof Sheeting Method.* The exposed finished surface of concrete shall be wetted with water, using a nozzle that so atomizes the flow that a mist and not a spray is formed, until the concrete has set, after which the waterproof sheeting shall be placed. Curing shall continue for seven curing days after the concrete has been placed. If the sheeting is damaged or removed before the expiration of seven curing days, the exposed concrete shall be immediately cured by the water method until additional sheeting is placed or until seven curing days have expired.

Waterproof sheeting shall consist of paper or polyethylene conforming to the requirements of Subsection 812.02. The waterproof sheeting shall provide a complete continuous cover of the entire concrete surface. Sheets shall lap a minimum of 123 (300 mm) and shall be securely weighed down or cemented together in such a manner as to provide a waterproof joint.

Should any portion of the sheets be broken or damaged before the expiration of the curing period, the broken or damaged portions shall be immediately repaired with new sheets properly cemented in place.

Sections of sheeting which have been damaged to such an extent as to render them unfit for curing the concrete shall not be used.

(d) *Forms-In-Place Method.* Formed surfaces of concrete shall be cured by retaining the forms in place for a minimum period of seven days after the concrete has been placed.

If the Contractor elects to leave forms in place for a part of the curing period and use one of the other methods of curing included in this article for the remainder of the curing period, the concrete surfaces shall be kept wet during the time the curing methods are being changed.

methods of construction shall be modified as required to obtain satisfactory concrete in the slab. All unsatisfactory concrete shall be removed and repaired as directed by the Engineer.

The amount of sounding and form removal may be moderated, at the Engineer2s discretion, after a substantial amount of slab has been constructed and inspected, if the Contractor's methods of construction and the result of the inspections as outlined above indicate that sound concrete is being obtained throughout the slabs.

The Contractor shall provide all facilities as are reasonably required for the safe and convenient conduct of the Engineer2s inspection procedures.

(b) *Concrete Work.* A smooth, durable riding surface of uniform texture, true to the required grade and cross-section, shall be obtained on all bridge decks.

Concrete shall be placed in accordance with the Contract. Particular emphasis should be placed on proper vibration of the concrete to avoid honeycomb and voids, especially at construction joints, expansion joints, and valleys and ends of form sheets. Pouring sequences, procedures, and mixes shall be approved by the Engineer.

The placing of concrete in bridge decks will not be permitted until the Contractor has satisfied the Engineer that it has adequate personnel and equipment to deliver, place, spread, finish, and cure a minimum of 20 yd³ (15 m3) of concrete per hour, that experienced finishing machine operators and concrete finishers are employed to finish the deck, and that weather protective equipment and all necessary finishing tools and equipment are on hand at the site of the work and in satisfactory condition for use.

Prior to any deck concreting, a "pre-pour" conference will be held with the Contractor and representatives of the Department in attendance. At this time, the Contractor shall present its plan and procedures for deck construction.

Supports for screeds or finishing machines shall be completely in place and firmly secured before placing of concrete will be permitted. Supports shall be set to elevations necessary to obtain a bridge deck true to the required grade and cross-section, with allowance being made for anticipated settlement. Supports shall be of a type and shall be so installed that no springing or deflection will occur under the weight of the finishing equipment, and shall be so located that finishing equipment may operate without interruption over the entire bridge deck being furnished.

Immediately prior to placing bridge deck concrete, the Contractor shall check all falsework and shall make all necessary adjustments. Suitable means such as telltales shall be provided by the Contractor to permit ready measurement by the Engineer of deflection as it occurs.

On continuous steel beam or girder spans, the order of casting shall be as shown on the Plans. On simple spans, and for any section between construction joints for continuous spans, the concrete in the floor slab may be placed by beginning at the end and working along the roadway or by beginning at the side and working across the roadway. The screeding method used shall have been approved by the Engineer.

Screeding operations shall include a mechanical screed of the power-actuated oscillating type. Vibrating screeds will not be permitted unless specifically approved by the Engineer. The screed shall be sufficiently rigid and easy to control in order to provide substantially uniform treatment over the deck surface. Screeds shall be of the transverse type and shall be of sufficient weight to strike off the surface at the specified grade. Longitudinal type screeds shall not be used without prior written approval from the Engineer.

When the longitudinal type screed is used, the over-all length shall be such as to screed independently supported spans up to and including 802 (24 m). In no case shall the length of the screed be less than the full length of the span for spans less than 802 (24 m). When using the longitudinal type screed on independently supported spans exceeding 802 (24 m) in length with a screed length less than the full length of the span, the center half of the span, preferably more, shall be completed first and then the remaining portions completed. Bulkheads or other substantial supports for the screed shall be placed over the abutments and/or piers and at the terminal point of placements within the span. The surface of a previously placed section shall not be used as a bearing area for the screed track until control cylinders have attained a minimum strength of 0.6 f 2c where f 2c is the design minimum laboratory compressive strength as specified on the Plans.

When a transverse screed is used, the screed shall be of a sufficient size to finish the full width of the deck between curbs or parapets unless a longitudinal joint in the deck is specified. In this case, the portion on either side of the joint shall be placed and finished separately. The wheels of the screed shall bear on temporary rails which shall be adequately supported on and directly above the main structural members or on form supports. In case of continuous spans, the form supports shall be fully supported by the principal structural members supporting the deck. The rails shall be sufficiently rigid and strong to permit the screed to finish the surface of the deck within the requirements of this Section. If the rails are placed within the roadway area, they shall be elevated a sufficient distance above the deck to permit the simultaneous finishing by hand of any portion not finished by the screed. Rail supports extending above the roadway surface shall be fabricated and installed in such a manner as to permit their removal to at least 23 (50 mm) below the top surface of the deck slab. Any portion of the rail support to remain in the deck concrete shall be fusion bonded epoxy coated. Where rail supports are placed in that portion of the deck under the curbs or parapets, the supports shall be so placed that they will be at least 23 (50 mm) from the face of the curb parapet walls or outside edge of the slab.

During the screeding operation, an adequate supply of concrete shall be kept ahead of the screed and a slight excess shall be maintained immediately in front of the screed. Workers will not be permitted to walk on the concrete after screeding. The Contractor shall provide a sufficient number of work bridges or other suitable platforms to provide adequate access to the work, and so that screeding, finishing, and curing operations can progress without delay. The work bridge shall be supported outside the limits of the concreting.

An adequate supply of suitable coverings which will protect the surface of the freshly placed bridge deck from rain shall be readily available at the site of the work.

Where the concrete in the deck of a continuous beam or girder span group cannot be placed in one operation, the location of construction joints and sequence of placement shall be in accordance with an approved placement schedule. After the initial placement has been made in any one group of a continuous span, no further placement shall be made until all previously placed concrete in the deck of that group has been in place for at least three days or until the cylinder strength is at least 0.5 *f* 2c.

Roadway surfaces of bridge decks and approach slabs shall be wet cured, as soon as possible, according to Subsection 602.18 (a). Membrane curing compound shall not be used on bridge decks and approach slabs except when cold weather dictates its use. The Engineer will determine when cold weather requires membrane curing. When required, membrane curing compound shall be applied in accordance with the requirements of Subsection 501.11 immediately after the finishing operation. Within 24 hours, the roadway surfaces shall also be covered with waterproof covers as set forth in Subsection 501.13. The waterproof covers shall remain in place for not less than seven days. Extreme care shall be taken to protect adjacent reinforcing steel from the membrane curing compound.

The Contractor shall test the fresh concrete deck surface with a 10' (3.048 m) straightedge, and the Contractor shall rescreed the deck surface as many times as is necessary to ensure a smooth riding surface. The straightedge shall be held in successive positions at the edges, quarter points, and on the centerline, parallel thereto and in contact with the surface. Advancement along the deck shall be in successive stages of not more than one-half the length of the straightedge. The surface shall also be checked transversely at the ends, quarter points, and center of the span. Areas showing high spots or depressions of more than 1/8" (3 mm) in 10' (3.048m) in the longitudinal direction and ¼" (6 mm) in 102 (3.048 m) in the transverse direction shall be struck off or filled with freshly mixed concrete as the case may be. Special attention shall be given to ensure that the surface across joints meets the requirements for smoothness.

After the deck has cured the surface will be tested using either a straightedge, a rolling straightedge, or a California-type profilograph. If surface testing using a California-type profilograph is required, testing and corrective work shall conform to the requirements of Subsection 501.17. Surface testing the cured concrete with a straightedge or rolling straightedge will be performed as described above for fresh concrete. High spots or depressions of more than 1/8" (3 mm) in 10' (3.048 m) in the longitudinal direction and ¼" (6 mm) in 10' (3.048 m) in the transverse direction shall be corrected by patching and/or grinding at no cost to the Department. Any cracking which occurs prior to opening to traffic shall be sealed or repaired in a manner approved by the Engineer at no cost to the Department. The deck shall also be sounded and any delaminated areas shall be removed and replaced in a manner approved by the Engineer at no cost to the Department.

(c) *Surface Texture.* All bridge deck surfaces shall be textured either by mechanical grooving or by manual texturing. Unless otherwise noted in the Contract, texturing will be done by mechanical grooving.

(1) *Mechanical Grooving.* Bridge deck and approach slab surfaces shall be textured by first dragging a fabric over the final screeded concrete and then by sawing transverse grooves in the cured concrete. After final screeding of the surface, the Contractor shall drag multiple-ply damp fabric over the surface to provide a gritty texture. After the bridge deck or approach slab has been cured and attained 75% of the 28-day design compressive strength, the Contractor shall saw uniformly pronounced grooves transverse to the centerlines.

Grooves shall be sawn approximately 1/10" (2.5 mm) wide, 1/8 to 3/16" (3 to 5 mm) deep, and on 1 ½" (38 mm) (nominal) centers. Grooves shall terminate 18 ± 1" (450 ± 25 mm) from the face of the parapet. Grooves shall not be sawn any closer than 2" (50 mm) nor further than 33 (75 mm) from the edge of any joint. When the width of the cutting head on the grooving machine is such that grooves cannot be practically sawn to within the required tolerance for a skewed transverse joint, grooving shall begin on the side of the deck having the acute angle corner, and nominal spacing of the grooves at the starting point shall be 1 ½" (38 mm) on center. In the event that a single pass of the grooving machine cannot be made across the width of the bridge or approach slab, then the mating ends of subsequent passes shall not overlap previous grooves nor leave more than 1" (25 mm) of surface ungrooved.

For bridge lengths over 300' (90 m), a randomly spaced groove pattern shall be used. The random spacing shall be from 1 3/8" (35 mm) centers to 1 5/8" (40 mm) centers, as determined by the Engineer.

Removal of all debris, including slurry, resulting from the grooving operations shall be continuous. Surfaces must be immediately left in a washed and clean condition, free of all slipperiness from the slurry. All debris and surplus material removed from the grooving operations shall be deposited in a truck, or other conveyance, and disposed.

(2) *Manual Texturing.* When specified, after the concrete has been consolidated and struck off and before the concrete becomes non-plastic, the surface shall then receive a transverse texture. Texturing shall be done by use of a wire broom having a single row of tines or a finned float having a single row of fins. The broom or float shall produce transverse grooves that are spaced at intervals of approximately ½ to 3/4" (13 to 19 mm) center to center. The grooves in the hardened surface shall be approximately 0.08 to 0.12" (2 to 5 mm) in width and 0.15 to 0.25" (3 to 6 mm) in depth. The grooving shall be applied to the entire deck surface except that area within 18" (450 mm) from the face of curb.

602.21 Drainage and Weep Holes. Drainage openings and weep holes shall be constructed in the manner and at locations indicated on the Plans, or as directed. No deduction in the computed volume of concrete masonry, except for openings in pipe headwalls, will be made.

602.23 Placing Anchors, Bolts, Grills, and Other Embedments. Anchors, bolts, grills, and other embedments, which are to be placed in the concrete as indicated on the Plans, shall be furnished and placed by the Contractor during construction.

602.25 Defective Work. Any defective work discovered after the forms have been removed shall be immediately removed and replaced. If the surface of the concrete is bulged or uneven, or shows honeycombing that cannot be repaired satisfactorily, the entire section shall be removed and replaced.

Concrete which fails to reach full 28-day design strength (*f* 2c) will be considered defective concrete. If the concrete is determined to not be structurally adequate by the Engineer, then it shall be removed and replaced. If the concrete is determined to be structurally adequate by the Engineer and the concrete can remain in place, the Contractor shall have the following options:

(1) Accept the low strength concrete test results and all remedial action as described in the below categories or;

(2) Challenge the low strength concrete test result by coring the area which the test cylinders represent.

If the Contractor elects to take cores to challenge the cylinder strength results, it shall be the Contractor2s responsibility to obtain two cores (one for the Department and one for the Contractor) at the location determined by the Engineer. After the cores have been obtained, the concrete cores shall be tested for compressive strength in the as-cored moisture condition and the Contractor2s core testing results shall be provided to the Department no later than five working days after verbal notification that the cylinder strength test results were substandard.

If the average of the core testing results (Department and Contractor) are greater than or equal to the specified 28-day design strength, the Contractor shall be paid the full bid price for the concrete in question. If the average core testing results are less than the specified strength, the remedial action as described in the following categories will be required:

Category A: *0 to 250 psi (0 to 1.66 MPa) below 28-day Design Strength*
No repair required, full payment as specified in Subsection 602.27.

Category B: *251 to 500 psi (1.67 to 3.33 MPa) below 28-day Design Strength*
Prorated payment as specified in Subsection 602.27.

Category C: *501 to 1000 psi (3.34 to 6.66 MPa) below 28-day Design Strength*
Prorated payment as specified in Subsection 602.27 plus the application of a protective waterproofing that is approved by the Department2s Materials and Research Section. The coating shall be clear and shall only be applied to the pour area that the core represents.

Category D: *1000 psi (6.67 MPa) or greater below 28-day Design Strength*
Strengthen area of low strength concrete as approved by the Engineer at no cost to the Department.

If the difference in strength between the Department2s results and the Contractor2s independent test laboratory results are greater than 501 psi (3.34 MPa), the core testing results will be considered void and the prorated payment as specified in Subsection 602.27 will be applied to the concrete in question based upon the field-cast cylinders.

DIVISION 700 MISCELLANEOUS CONSTRUCTION
PORTLAND CEMENT CONCRETE

SECTION 701 CURB AND INTEGRAL CURB AND GUTTER

701.01 Description. This work consists of constructing curbs and integral curbs and gutters on a prepared foundation using either fixed forms or slip forms.

MATERIALS.

701.02 Portland Cement Concrete. Portland cement concrete shall conform to the requirements of Section 812, Class B for either fixed-form work or slip-form work.

701.03 Preformed Expansion Joint Material. Preformed expansion joint material shall be ½3 (13 mm) nominal thickness and conform to the requirements of Subsection 808.06.

701.04 Bituminous Joint Sealant. Bituminous joint sealant shall conform to the requirements of Subsection 808.04 (c).

CONSTRUCTION METHODS.

701.05 Preparation of Foundation. The foundation shall be prepared at the required grade to accommodate the elevations, dimensions, and details shown on the Plans. Existing undisturbed soil, where used as foundation, shall be firm and unyielding. All unsuitable material shall be removed and replaced with approved material. When the foundation is to be any material other than existing undisturbed soil, the compaction and density requirements for the Section covering the material shall govern. Where rock is encountered, the grade shall be excavated to 6" (150 mm) below the bottom of the curb and integral curb and gutter and backfilled with approved material.

701.06 Fixed Forms. Fixed forms shall be of wood or metal and shall extend the full depth of the concrete. Composite material forms may be used for radii work. Forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete, and shall not displace more than 3/8" in 10' (10 mm in 3 m) from the vertical or horizontal plane. Forms shall remain in both horizontal and vertical alignment until their removal. Forms shall be clean and coated with an approved form release agent before concrete is placed. Divider plates shall be metal.

701.07 Slip-Forming. When slip-forming is permitted, contraction joints shall be constructed at 20' (6 m) intervals. All surfaces front, top, and back shall be tooled or sawed to a minimum depth of 1" (25 mm) and a minimum width of 1/8" (3 mm). Where slip-forming is used, expansion joints shall be constructed at radius points, structures, obstructions, and 200' (60 m) intervals.

701.08 Placing Concrete. The concrete shall be placed on a moist foundation between the forms, consolidated, and worked sufficiently to bring mortar to the surface. The surface shall be struck off to the required contour and finished smooth and even with an approved float.

Limitations on placing concrete during hot or cold weather shall be as specified in Subsection 501.04.

701.09 Construction of Sections. All transverse joints shall be sealed with approved joint sealant. The sealing shall be performed immediately after the concrete has cured for 72 hours. Longitudinal joints shall be tooled adjacent to rigid pavements and structures and sealed with approved joint filler. This work shall be constructed in sections having a uniform length of approximately 10' (3 m). Sections shall be separated by open joints at least 1/8" (3 mm) wide by use of steel templates. Templates shall be not less than 2" (50 mm) longer than the depth of the curb. Templates shall be secured during the placing of concrete and shall remain in place until concrete has set sufficiently. No sections shall be less than 5' (1.5 m) in length.

701.10 Expansion Joints for Fixed Forms. Expansion joints shall be formed in curb and in integral curb and gutter at 40' (12 m) intervals. When constructed adjacent to concrete pavement, expansion joints shall coincide with the expansion joints in the pavement.

701.11 Finishing. A wood or magnesium float shall be used to rub the surface smooth while the concrete is still green. A steel trowel finish shall next be applied, and finally a soft dampened brush shall be used longitudinally along the surface. Finishing shall be performed to a depth of 23 (50 mm) below the proposed pavement surface elevation.
Before the concrete is given the final finish, the flow line of the gutter shall be checked and any irregularities of more than 1/8" in 10' (3 mm in 3 m) shall be corrected.
Irregularities in grade or alignment of the exposed surfaces shall not exceed 3/8" in 10' (10 mm in 3 m). Vertical alignment shall be sufficiently uniform and regular to ensure complete drainage.

701.12 Removal of Forms. Front forms may be removed as soon as concrete has hardened sufficiently. Rear and side forms shall not be removed for at least 12 hours. Surfaces exposed after 12 hours but prior to 72 hours shall be cured using materials specified in Section 812 or immediately backfilled. Minor defects shall be filled with mortar conforming to the requirements of Section 611.

701.13 Curing. Immediately, upon the completion of finishing, all exposed surfaces shall be cured for 72 hours using curing materials specified in Section 812. During the curing period, pedestrian and vehicular traffic shall not disturb newly completed curb or integral curb and gutter.

701.14 Backfilling. As soon as possible after the removal of forms or completion of the slip-form operation, the spaces adjacent to the curb and integral curb and gutter shall be backfilled to the required elevation with suitable material until firm and solid.

SECTION 705 PORTLAND CEMENT CONCRETE SIDEWALK

705.01 Description. This work consists of constructing portland cement concrete sidewalk on a prepared foundation.

MATERIALS.

705.02 Portland Cement Concrete. Portland cement concrete shall conform to the requirements of Section 812, Class B.

705.03 Preformed Expansion Joint Material. Expansion joint material shall conform to the requirements of Subsection 808.06.

705.04 Curing Material. Curing materials shall conform to the requirements of Subsection 812.02 (i).

CONSTRUCTION METHODS.

705.05 Preparation of Foundation. The foundation shall be formed at the required grade to accommodate the elevations, dimensions, and details shown on the Plans for the bottom of the sidewalk. Where the sidewalk foundation is to be existing undisturbed soil, the foundation shall be firm and unyielding. All soft and yielding or other unsuitable material shall be removed and replaced with approved granular material. When the sidewalk foundation is to be any material other than existing undisturbed soil, the compaction and density requirements for the Section covering that material shall govern. Where rock is encountered, the grade shall be excavated to 6" (150 mm) below the bottom of the sidewalk, backfilled with approved granular material, and thoroughly compacted.

705.06 Forms. Forms shall be of wood or metal and shall extend the full depth of the concrete. Composite material forms may be used for radii work. Forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete, and shall not displace more than 3/8"in 10' (10 mm in 3 m) from the vertical or horizontal plane. Forms shall remain in both horizontal and vertical alignment until their removal. Forms shall be clean and coated with an approved form release agent before concrete is placed.

705.07 Placing and Finishing Concrete. The concrete shall be distributed to the required depth and for the entire width of the slab by shoveling, or an approved method which preserves the integrity of the mixture. Concrete shall be thoroughly spaded along all joints and on the inside of the forms for its entire depth. The concrete shall be leveled and immediately struck-off by means of an approved screed. The screed shall be shaped to the required crown and of sufficient strength to retain its shape under all working conditions.

While the concrete is still moist, it shall be floated with an approved float of either wood or metal to ensure that all irregularities or depressions are filled. The final finish shall be obtained by either a wood float or hair broom. Concrete shall be finished in accordance with Subsection 501.11. If concrete is permitted to be placed during cold weather, it shall be placed in accordance with Section 501.

SECTION 708 - DRAINAGE INLETS AND MANHOLES

708.01 Description. This work consists of the construction of reinforced portland cement concrete drainage inlets and manholes.

MATERIALS.

708.02 Portland Cement Concrete. Portland cement concrete shall conform to the requirements of Section 812, Class B.

708.03 Mortar. Mortar shall conform to the requirements of Section 611.

708.04 Bar Reinforcement. Bar reinforcement shall conform to the requirements of Section 824.

708.05 Castings. Castings for frames and covers shall conform to AASHTO M 105, Class 30. Castings shall be boldly filleted at angles, and the arises shall be sharp and exact. Castings shall be true to pattern in form and dimension and free from pouring faults, sponginess, cracks, blowholes, and other defects that impair the strength and value for the service intended.

708.06 Gratings. Gratings shall be fabricated as shown on the Plans and the Standard Construction Details from cast iron conforming to the requirements of ASTM A 48, Class 30.

708.07 Steps. Drainage inlet steps shall be of the type constructed of molded plastic with a reinforcing bar core, conforming to the requirements of AASHTO M 31/M 31M, and ASTM A 478, and D 4101.

CONSTRUCTION METHODS.

708.08 Excavation. Excavation shall be made to the required depth. The foundation upon which the concrete floor of the drainage inlet is to be placed shall be compacted to a firm, even surface.

708.09 Reinforced Concrete Construction. Reinforced concrete drainage inlets and manholes shall be constructed according to the requirements of Section 602.

708.10 Precast Drainage Inlets and Manholes. Precast drainage inlets and manholes shall be constructed as shown on the Standard Construction Details.
The annular space of joints between precast sections shall be filled with a joint sealant meeting the requirements of AASHTO M 198.

708.11 Frames of Castings. Frames of castings shall be set in full mortar beds.
708.12 Steps. All drainage inlets and manholes which are 4’ (1.2 m) or more in depth, measured from the top of grate or cover to the invert of the lowest pipe, shall have steps installed on the back wall or as specified on the Plans. The steps shall be embedded a minimum of 3” (75 mm) in the wall, protrude out 6” (150 mm) from the wall, start within 24” (600 mm) of the top of grate/lid, end no more than 12” (300 mm) above the lowest invert (except where a pipe is in the backwall), and be spaced vertically at 12” (300 mm) intervals.

708.13 Inlet and Outlet Pipes. Inlet and outlet pipes shall be the same size and type as the connecting pipes shown on the Plans and shall extend through the walls and be flush with the inside of the wall.

If an end of reinforced concrete pipe is cut off, the end shall be cut clean and smoothly finished with mortar so that no bar reinforcement remains exposed. Any space between the pipe and the walls of the precast drainage inlet shall be filled with non-shrink grout conforming to the requirements of ASTM C 1107. The greatest dimension of the opening in the drainage inlet for the pipe shall be no greater than the outside pipe diameter plus 4" (100 mm).

708.14 Backfill. The area around drainage inlets and manholes shall be backfilled with Borrow Type C material to the required elevation. Backfill placement shall be in 6" (150 mm), loose-thickness lifts. Each lift shall be placed and compacted to 95% or more of the maximum density. No backfill shall be placed prior to approval.

SECTION 714 DITCHING

714.01 Description. This work consists of excavating lateral and longitudinal ditches. This work also includes clearing alongside the ditches, as necessary.

714.02 Construction Methods. Ditches shall be excavated as shown on the Plans. All material excavated from the ditches shall be spread on top of the land on each side of the ditch, graded to conform to the surface contours, and blended into the surrounding ground. Where necessary, the land shall be prepared and conditioned in all sections along both sides of the ditch to the width necessary to receive the material. As necessary, the Contractor shall clear the brush alongside the ditches. Brush shall be disposed as specified in Subsection 106.09.

LANDSCAPING AND EROSION CONTROL

SECTION 732 TOPSOIL

732.01 Description. This work consists of furnishing and placing topsoil for planting.

732.02 Materials. Topsoil shall be original surface friable loam topsoil of uniform quality and free from heavy clay, frozen clods, lumps, plants, roots, sticks, and foreign materials harmful to plant growth, such as fragments of hot-mix, concrete pavement, and surface treatment.

Topsoil shall be reasonably free of noxious perennial weeds or wood vegetation and completely void of Johnsongrass (Sorghum halapense) as determined through prior inspection by an authorized representative of the Department.

Topsoil shall have an acidity range of pH 6.0 to pH 7.5, and, if necessary, lime shall be applied, as directed by the Engineer, and incorporated with the furnished topsoil.

Topsoil shall contain not less than 2% nor more than 30% organic matter as determined in accordance with AASHTO T 194.

The method of testing topsoil shall be in accordance with the requirements of AASHTO T 88, Modified; AASHTO T 89, Method B; and AASHTO T 90; and shall meet the following gradation requirements:

Gradation Requirements

Sieve Size	Minimum Percent Passing by Weight
2" (50 mm)	100
No. 4 (4.75 mm)	90
No. 10 (2.00 mm)	80

	Minimum Percent	Maximum Percent
Passing No. 10 (2.00 mm) and retained on No. 200 (75 mm) sieve		
Sand	15	65
Passing No. 200 (75 mm) sieve		
Silt	10	60
Clay	5	40

Topsoil shall not be delivered until samples have been approved by the Engineer.

732.03 Areas From Which Obtained. Topsoil shall be secured from areas from which topsoil has not been previously removed either by erosion or mechanical methods, and it shall not be removed to a depth in excess of the depth approved.

The area or areas from which topsoil is secured shall possess such uniformity of material depth, color, texture, drainage, and other characteristics as to offer assurance that when removed in commercial quantities, the product is homogeneous in nature and conforms to the requirements of this Section.

CONSTRUCTION METHODS.

732.04 Clearing the Area. All areas from which topsoil is to be secured shall be cleaned of all brush, sticks, weeds, stones, bricks, ashes, and other refuse which may hinder or prevent growth.

732.05 Approval of Materials. In securing topsoil from an approved source, should strata or seams of materials be encountered which do not qualify as topsoil, such materials shall be removed from the topsoil or, if required, the source shall be abandoned.

732.06 Placing. Before placing or depositing topsoil upon any section as shown on the Plans, the foundation upon which the topsoil is to be placed shall be approved.

Topsoil shall be spread on these areas to a depth sufficiently greater than that specified on the Plans, so that after natural settlement has taken place the work shall conform to the elevations on the Plans.

732.07 Maintaining the Topsoil. The Contractor shall maintain the topsoil until final completion and acceptance of the Contract. Maintenance shall consist of preserving, protecting, replacing, and such other work as may be necessary to keep the topsoil in a satisfactory condition.

732.08 Final Cleaning. Upon the completion of this work, final cleaning shall be done within the limits of the Project and shall consist of completely cleaning the Project of excess material, sweeping pavements and structures of dirt and rubbish, and removing of any unused material which may mar the appearance of the Project.

SECTION 733 TOPSOILING

733.01 Description. This work consists of refertilizing and placing the topsoil which has been salvaged and stockpiled under Section 202.

733.02 Materials. Topsoil shall be stockpiled and salvaged under Section 202.

733.03 Construction Methods. The placement of topsoil shall conform to the requirements of Section 732. After placement, the Contractor shall refertilize the topsoil in accordance with Subsection 734.03 (a) and (b)(1). Refertilization shall occur a minimum of six months after the initial seeding.

SECTION 734 SEEDING

734.01 Description. This work consists of furnishing and placing seed and soil supplements.

MATERIALS.

734.02 Water. Water shall conform to the requirements of Section 803.

734.03 Soil Supplements.

(a) Limestone shall be ground agricultural limestone and shall contain not less than 85% calcium and magnesium carbonates. Dolomitic lime or magnesium lime shall contain at least 10% magnesium oxide. The limestone shall be ground to meet the following gradation:

Sieve Size	*Percent Passing*
No. 10 (2.00 mm)	100
No. 20 (850 µm)	90
No. 100 (150 µm)	50

(b) Fertilizer shall conform to the following mix requirements:

(1) *Permanent Grass Seeding - Dry Ground, Wet Ground, and Subdivisions; and Temporary Grass Seeding - Dry Ground.*

a. 70 lb/ac (78 kg/ha) nitrogen (N); 50% by weight of the nitrogen content shall be available from ureaformaldehyde.

b. 42 lb/ac (47 kg/ha) available phosphate; phosphorous pentoxide (P2O5) shall be the sum of the water soluble and the citrato-soluble phosphate.

c. 28 lb/ac (31 kg/ha) water soluble potash; potassium oxide (K2O)

(2) *Permanent Crown Vetch Seeding.*

a. 152 lb/ac (170 kg/ha) nitrogen (N), 100% by weight of the nitrogen content shall be available from ureaformaldehyde.

b.100 lb/ac (112 kg/ha) available phosphate; phosphorous pentoxide (P2O5) shall be the sum of the water soluble and the citrato-soluble phosphate.

c. 100 lb/ac (112 kg/ha) water soluble potash; potassium oxide (K2O)

(c) Commercial fertilizer shall be furnished in containers plainly marked with the chemical analysis of the product or, if provided in bulk, a certificate guaranteeing the fertilizer analysis must

accompany each delivery to the Project. No fertilizer shall be used which has not been marketed in accordance with the State and Federal laws.

(d) The ureaformaldehyde specified above shall meet the following requirements:
  (1) The water insoluble nitrogen shall be at least 60% of the total nitrogen.
  (2) The activity index of the water insoluble nitrogen shall be either:
    a. not less than 40% by the Association of Official Analytical Chemists International (AOAC International) method for ureaformaldehyde products, or
    b. not less than 50% by the AOAC International alkaline permanganate method, or
    c. 80% by the AOAC International neutral permanganate method.

(e) Wood cellulose fiber shall be a processed wood product having uniform fiber characteristics which remains in uniform suspension in water under agitation and blends with seed, fertilizer, and other additives to form a homogeneous slurry.
The fiber shall perform satisfactorily in hydraulic seeding equipment without clogging or damaging the system. The slurry shall contain a green dye that provides easy visual inspection for uniformity of application.

734.04 Grass and Agricultural Seeds.

(a) *Seeds.* All seed shall be fresh, clean, from new crop seed, and delivered to the site in original unopened packages in accordance with the Delaware Code and respective State laws.

(b) *Seed Inspection.*
  (1) Blended seed lots shall be mixed in the presence of an authorized representative of the Department. All such blended seed shall also display an official Department2s inspection tag which has been sewn into or otherwise attached to the bag.
    No seed shall be used after the expiration date placed on the official Department's inspection tag by an authorized representative of the Department.
  (2) With all single seed lots, the Contractor shall furnish to the Project inspector two copies of the certified mill analysis for the seed to be used. The Project inspector will compare the mill analysis with the mill tags sewn into the bags of seed for lot number, guaranteed analysis, and certification date.
    If the mill tags and mill analysis data are identical and meet the Project requirements, single seed lots can be used on the basis of verification by the Project inspector.
    If the entire bag of a single seed lot is not used, the weight of the seed used from the bag shall be so noted on the mill tag which shall be left intact on the bag. In addition, the Project inspector will also include the Contract number of the Project and the date on which the seed was used, and so verify the above with its signature on the mill tag. Partial bags which have the above information noted on the mill tag will be accepted for use on Department projects.
    No seed shall be used which has a dated mill analysis or mill tag older than nine months.

(c) *Permanent and Temporary Seeding.* The Seeding Chart on the following pages shall be used for the following specified seeding:
  Permanent Grass Seeding - Dry Ground,
  Permanent Crown Vetch Seeding,
  Permanent Grass Seeding - Wet Ground,
  Permanent Grass Seeding - Subdivisions,
  Temporary Grass Seeding - Dry Ground, and

Temporary Grass Seeding - Wet Ground.

Seeding Chart					Modification Factors for Seeding Rate Pounds per acre (kilograms per hectare)			Modifications Factors for Seeding Periods	
Species	Max % Weed	Min % Purity	Min % Germi-nation	Seeding Rate lb/ac (kg/ha)	Seeding Period A (2/16-4/15)	Seeding Period B (4/16-8/15)	Seeding Period C (8/16-2/15)	North District	Central and South Districts
Permanent Grass Seeding – Dry Ground									
Hard Fescue blend (Festuca trachyphylla) Perennial Ryegrass (Lolium perenne)	0.15 0.15	98 98	85 90	100 (113.0) 10 (12.0)	Add 5lb/ac (6.0kg/ha) (Agrostis Alba) + 65lb-ac (73.0kg/ha) Winter Rye (Secale cereal) From 2/16 – 3/1	Add 4lb/ac (6.0 kg/ha) Korean or Kobe Lespedeza (Lespedeza stipulacea)	Add 5lb/ac (6.0 kg/ha) Redtop (Agrostis alba) +65lb-ac (73.0kg/ha) Winter Rye (Secale cereal) From 10/15 – 2/15		Add 3lb/ac (4.0 kg/ha) Weeping Lovegrass (Eragrostis cuvula) during Seeding Period B
Total Seed Quantity lb/ac (kg/ha)				**110 (125.0)**	**180 (204.0)**	**114 (130.0)**	**180 (204.0)**		**117 (134.0)**
Permanent Crown Vetch Seeding									
Crown Vetch (Coronilla varia) Annual Ryegrass (Lolium multiflorum)	0.35 0.15	99 95	70 90	30 (34.0) 22 (25.0)	Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 2/16 – 3/1	Add 4lb/ac (6.0 kg/ha) Korean or Kobe Lespedeza (Lespedeza stipulacea	Add 5lb/ac (6.0 kg/ha) Redtop (Agrostis alba) +65lb-ac (73.0kg/ha) Winter Rye (Secale cereal) From 10/15 – 2/15		
Total Seed Quantity lb/ac (kg/ha)				**52 (59.0)**	**117 (132.0)**	**56 (64.0)**	**122 (138.0)**		
Permanent Grass Seeding – Wet Ground									
Redtop (Agrostis alba) Creeping Bentgrass (Agrostis palustris) Sheep Fescue (Festuca ovina) Rough Stalked Bluegrass (Poa trivialis)	0.75 0.75 0.50 0.50	95 98 98 98	90 90 85 80	40 (45.0) 25 (28.0) 35 (40.0) 25 (28.0)	Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 2/16 – 3/1		Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 10/15-2/15		
Total Seed Quantity lb/ac (kg/ha)				**125 (141.0)**	**190 (214.0)**		**190 (214.0)**		
Permanent Grass Seeding – Subdivisions									
Hard Fescue Blend (Festuca trachyphylla) Perennial Ryegrass (Lolium perenne)	0.15 0.15	98 98	85 90	100 (113.0) 10 (12.0)				Add 50lb/ac (56.0kg/ha) Kentucky Bluegrass (Poa pratensis) during seeding periods A, B, C	
Total Seed Quantity lb/ac (kg/ha)				**110 (125.0)**				**160 (181.0)**	

Seeding Chart					Modification Factors for Seeding Rate Pounds per acre (kilograms per hectare)			Modifications Factors for Seeding Periods	
Species	Max % Weed	Min % Purity	Min % Germi-nation	Seeding Rate lb/ac (kg/ha)	Seeding Period A (2/16-4/15)	Seeding Period B (4/16-8/15)	Seeding Period C (8/16-2/15)	North District	Central and South Districts
Temporary Grass Seeding – Dry Ground									
Annual Ryegrass (Lolium multiflorum	0.15	95	90	40 (45.0)	Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 2/16 – 3/1		Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 10/15 – 2/15		
Total Seed Quantity lb/ac (kg/ha)				**40 (45.0)**	**105 (118.0)**		**105 (118.0)**		
Temporary Grass Seeding – Wet Ground									
Annual Barnyard grass/Duck Millet (Echinocloa spp)	1.0	90	90	40 (45.0)	Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 2/16 – 3/1		Add 65 lb/ac (73.0 kg/ha) Winter Rye (Secale cereal) from 10/15 – 2/15		
Total Seed Quantity lb/ac (kg/ha)				**40 (45.0)**	**105 (118.0)**		**105 (118.0)**		

Seeding Chart Notes

1 The seed shall be a blend of certified Bluegrass varieties with no one variety representing more than 25% by weight of the total, at least one variety must be a Mid-Atlantic ecotype.

2 Combination of improved certified varieties with SR-3000 representing a minimum of 50% by weight of the total.

3 Germination shall include a total of 60% minimum quick germination or normal sprouts plus a minimum of 20% hard seed.

4 *Permanent Seeding - Wet Ground* should be used on saturated or seasonally flooded areas as dictated by defined wetland limits on the Plans.

5 Festuca ovina shall be an improved variety of Sheep Fescue as approved by the Department. Selection should be based on performance within the Mid-Atlantic region as determined by the most current National Turfgrass Evaluation Program Progress Report.

6 Wet, bare ground, leaf litter covered or partially vegetated retention ponds, traps, or basins, or all intermittently flooded sites in general may be seeded with *Temporary Seeding - Wet Ground*. No wood fiber mulch shall be added to the hydroseeder. In addition, no mulching item should be included with this seeding. Unless indicated on the Plans, Echinocloa spp. is equivalent to E. muricata, E. crusgalli, or E. walteri. No fertilizer or limestone shall be applied with this seeding.

7 No Johnsongrass seed (Sorghum halapense) or Canada Thistle (Cirsium arvense) shall be allowed under the maximum allowable percentage of weed seeds and in accordance with Section 1, Chapter 24, Title 3 of the Delaware Code.

8 Add 3 lb/ac (4.0 kg/ha) Weeping Lovegrass on all slopes 1:3 (vertical to horizontal) or steeper and greater than 10" (250 mm) vertically in height throughout the Central and South Districts during all seeding periods to *Permanent Grass Seeding - Dry Ground*, *Permanent Crown Vetch Seeding*, and *Permanent Grass Seeding - Wet Ground*.

734.05 Seed Inoculant. The inoculant for *Permanent Crown Vetch Seeding* shall be a pure culture of nitrogen fixing bacteria selected for maximum vitality and for the ability to transform nitrogen from the air into soluble nitrates and deposit them in the soil. Inoculant shall consist of purely bred cultures and shall not be used later than the date indicted on the container. Four times the normal amount of

inoculant as indicated on the packaging shall be used for wet application. The inoculant shall be kept as cool as possible until used. Since temperatures above 75 to 80 °F (24 to 27 °C) weaken the bacteria, the Contractor shall take every precaution possible while handling the inoculant.

CONSTRUCTION METHODS.

734.06 General. This work shall consist of preparing the ground and furnishing and placing all lime, fertilizer, and seed on the areas indicated on the Plans and as specified by the Engineer. This work shall include, in addition to the lime, fertilizer, and seed, the specified quantity of inoculant and mulch required in the seeding slurry when placing crown vetch. The Engineer reserves the right to stop seeding operations whenever conditions are determined to be unfavorable. All materials used on this Contract shall be obtained by the Contractor from a dealer or manufacturer whose product is shown by analysis to fulfill the guarantee claimed by the producers.

Permanent Seeding - Wet Ground and *Temporary Grass Seeding - Wet Ground*, where specified for dry application by the kilogram, shall be seeded through a hand spinner type spreader. Areas specified for this method of application shall be remote sites not otherwise accessible with wet application equipment.

734.07 Seeding Slopes Flatter than 1:3 (vertical to horizontal).

(a) *General.* All topsoil placement and grading where specified shall be completed before seeding. This shall apply to the following specified seeding:
Permanent Grass Seeding - Dry Ground,
Permanent Grass Seeding - Wet Ground,
Permanent Grass Seeding - Subdivisions,
Temporary Grass Seeding - Dry Ground, and
Temporary Grass Seeding - Wet Ground.

(b) *Seedbed Preparation for Dry Ground Areas with Topsoil.* The area to be seeded shall be thoroughly loosened to a depth of not less than 6” (150 mm). The topsoil shall be original surface friable loam topsoil conforming to Section 732. The topsoil shall be of uniform quality, free from gravel and stones retained on a 2” (50 mm) sieve, heavy clay, frozen clods, lumps, roots, sticks, and foreign materials harmful to plant growth, such as 2” (50 mm) or larger fragments of hot-mix, concrete, and surface treatment. If shaped to the prescribed grade, the seedbed shall be considered satisfactory and shall require no further work.

However, when the area to be seeded is partially sodded, barren, weedy, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily removed, and the soil shall then be scarified or otherwise loosened to a depth of not less than 6” (150 mm). Clods and lumps shall be broken. Rubbish, rocks, fragments 2” (50 mm) or larger of hot-mix, concrete, surface treatment, and other extraneous matter shall be removed clear of the seeding site.

No seedbed preparation will be required for *Permanent Grass Seeding - Wet Ground*, *Temporary Grass Seeding - Wet Ground*, or *Temporary Grass Seeding - Dry Ground*.

(c) *Quantities of Material.* The quantity of limestone as specified according to Subsection 734.03 (a) shall be applied at the rate of 3000 lb/ac (3400 kg/ha). Fertilizer, wood cellulose fiber, and other required seeding agents shall be applied in accordance with Subsection 734.03.

The quantity of seed applied shall be in accordance with the Seeding Chart under Subsection 734.04.

(d) *Application Equipment.* All wet application equipment shall have a tank equipped with an agitation system capable of keeping all of the solids in a state of complete suspension at all times

during the seeding operation. All dry application equipment to include drop or hopper type spinner spreaders and drills shall require that all seed be blended by the seed supplier and so certified prior to dumping or loading to reduce seed segregation.

(e) *Wet Application of Lime, Fertilizer, Wood Cellulose Fiber, Seed, Inoculant, and Any Coloring or Binding Agents.* The Contractor shall apply all ingredients specified for the seeding operations described in Subsection 734.07 (a) according to both manufacturer2s equipment and material specifications and as set forth according to individual seeding requirements as specified under Subsection 734.03.

Permanent Grass Seeding - Dry Ground shall be used in accordance with this Section on all areas not delineated or defined as wetlands that are flatter than 1:3 (vertical to horizontal) in grade and on areas behind guardrail to the top or breakpoint of slope. The only exception shall apply to slopes 1:3 (vertical to horizontal) or steeper in urban areas as described under Subsection 734.08. In these areas, topsoil shall be required at a depth of 63 (150 mm) in accordance with Sections 732 and 733 respectively.

Permanent Grass Seeding - Wet Ground shall be used in accordance with this Section on all areas delineated or defined as wetland on the Plans with the exception of dry fill such as stormwater pond embankments and dikes or regraded areas comprised of fill above the original wetland profile. Areas stripped under Section 202 and specified for *Permanent Grass Seeding - Wet Ground* shall be covered with 63 (150 mm) of topsoil in accordance with Section 733. Permanent dry fill areas above the original wetland profile, as described above, shall be seeded under *Permanent Grass Seeding - Dry Ground*.

In stormwater management ponds with permanent pools *Permanent Grass Seeding - Wet Ground* shall be used on the slope between the permanent pool water level and the contour line 22 (0.6 m) above the water level. In ponds without permanent pools, this seeding mix shall be applied from the pond bottom to the elevation reached during flood routing 13 (25 mm) of runoff (water quality extended detention).

Permanent Grass Seeding - Subdivisions shall be used in accordance with this Section on all areas defined as legal subdivisions or residential communities where maintenance is provided by the Department from curb to curb only or is limited to the raveled way and shoulders. Areas specified for *Permanent Grass Seeding - Subdivisions* shall be topsoiled with 63 (150 mm) of approved topsoil in accordance with Section 732.

Temporary Grass Seeding - Dry Ground shall be used in accordance with Subsection 734.03 on all areas that represent dry ground areas disturbed during actual construction and/or prior to the establishment of permanent grades as determined by the Engineer in the field.

Temporary Grass Seeding - Wet Ground shall be used on wet, bare ground, leaf litter covered or partially vegetated retention ponds, traps, basins, and all intermittently flooded areas during construction.

(f) *Dry Application of Lime, Fertilizer, and Seed.* Only the ingredients described shall be applied by dry application. All lime, fertilizer, and seed shall be applied each as a separate operation when using dry methods of application. Dry application of lime, fertilizer, and seed shall apply to all forms of seeding described under Subsection 734.07 (e).

(g) *Responsibility for Seeded Areas.* The Contractor shall perform all seeding and mulching in accordance with this Section in the presence of the Engineer. If all work as noted is performed in complete accordance with this Section to the satisfaction of the Engineer, all seeding and mulching so approved shall be accepted.

The Department retains the right to request that the Contractor reseed any and all areas where a satisfactory stand of grass or crown vetch or both as determined by the Engineer does not exist at the time of the final inspection.

If the Engineer determines that reseeding is necessary, the Contractor shall begin reseeding within five working days of an oral or written request from the Engineer.

at triple the normal rate of inoculant in the presence of the Project inspector. The inoculant and crown vetch seed must be mixed with an approved wetting or bonding agent.

(g) *Responsibility for Seeded Areas.* The responsibilities for seeded areas shall conform to the requirements of Subsection 734.07 (g).

SECTION 735 MULCHING

735.01 Description. This work consists of furnishing, placing, and anchoring mulch over seeded areas.

735.02 Materials.

Small Grain Straw. Straw for mulching shall be from oats, wheat, rye, or other approved grain crops that are free from noxious weeds, mold, or other objectionable material. Straw mulch shall be in an air-dry condition and shall be suitable for placing with an approved mechanical blower.

735.03 Construction Methods.

Small Grain Straw. Straw mulching shall be used on all slopes flatter than 1:3 (vertical to horizontal) with the exception of slopes or sites not accessible to tracking or crimping tools and equipment. In these situations, straw-coconut fiber blankets or bonded fiber matrix shall be used.

Small grain straw shall be uniformly and evenly applied immediately after seeding has been completed.

An approved mechanical blower shall be used to apply the straw. Straw mulch applied by blowers shall provide a loose depth of not less than 1/2 nor more than 2" (13 nor more than 50 mm). Ninety-five percent of the blown and shredded straw mulch shall be 6" (150 mm) or more in length when in place.

Straw mulch shall be applied at the rate of 4000 lb/ac (4500 kg/ha) and secured by one of the following methods:

(1) *Crimping Method.* This method of incorporating the straw into the ground shall be accomplished with the use of crimping device that produces horizontally oriented indentation. Straw mulch shall be incorporated into the soil to a minimum depth of 2" (50 mm). The crimping device shall be approved by the Engineer.

(2) *Tracking Method.* This method may be used on all sites mulched with straw and shall involve the use of steel-cleat track-type equipment driving up and down the slopes producing horizontally oriented indentations with the cleats. Cleats shall be capable of incorporating the straw mulch into the soil to a minimum depth of 1 ½" (40 mm). The equipment used and the method of tracking shall be approved by the Engineer.

SECTION 736 SODDING

736.01 Description. This work consists of preparing the ground area, and furnishing and placing approved sod.

MATERIALS.

736.02 Sod. Sod shall be well rooted from high quality seed of known origin and native to the locality of the work. The Department reserves the right to visit the proposed sod source prior to the granting of a source approval. Sod shall be stripped, delivered, and laid within a period of 36 hours. Sod stripped and delivered but not laid within this period shall be reinspected and approved by the Engineer prior to use.

If Fine Fescue-Bluegrass sod is used, it shall contain the following percentages by weight in the blend:

Creeping Red Fescue (Festuca rubra L. subsp. Rubra) 10%
Chewing Fescue (Festuca rubra L. subsp. commutata Gavd.) 20%
Hard Fescue (Festuca longifolia Thuill.) 55%
Kentucky Bluegrass (Poa pratensis L.) 15%

The varietal makeup of the Fine Fescue-Bluegrass sod must be submitted to the Engineer for approval prior to the actual cutting and lifting of the sod.

Sod shall be free of objectionable grassy and broadleaf weeds. Sod shall be considered free of such weeds if less than five such plants are found per 100 ft² (10 m²) of area. Sod shall not be acceptable of it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canadian thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, or bromegrass.

Sod shall be reasonably free of thatch, diseases, nematodes, and soil-borne insects. All sod must display the official State Certification tags of the state from which the sod originated. The same shall apply to all sod shipped intra-state with prior inspection and tagging through the Delaware State Department of Agriculture.

736.03 Water. Water shall conform to the requirements of Section 803.

CONSTRUCTION METHODS.

736.04 Cutting Sod. Before stripping, sod shall be mowed uniformly at a height of 1 to2 ½" (25 to 65 mm). Sod shall be machine cut at a uniform soil thickness of 5/8 ± ¼" (16 ± 6 mm), at the time of cutting. Measurement for thickness shall exclude top growth and thatch. The sod pad size shall be cut to a minimum uniform width of 12" (300 mm) and a minimum length of 12" (300 mm).

736.05 Placing. Sod shall be placed only when the soil is moist and favorable to growth. Sod shall not be placed between November 1 and April 1, unless weather and soil conditions are considered favorable and permission is granted.

736.06 Preparation of Grade. The area to be sodded shall be shaped and finished to the lines and grades indicated on the Plans, and the surface loosened prior to placing the sod. The Contractor shall water the slope before the sod is placed.

736.07 Laying the Sod. The sod shall be placed on the prepared surface with the edges in close contact. Each strip or section of sod shall be fitted and tamped into place with hand tampers of not less than 100 in² (64 000 mm²) in area.

After slopes of either cuts or fills have been shaped to conform to the finished grade and crosssection shown on the Plans, the shoulders and toes of the slope shall be rounded off to a 5' (1.5 m) radius, or as otherwise indicated in the Plans.

On all slopes, sod shall be laid with the long edges parallel to the contour starting at the bottom of the slope. Successive strips shall be neatly matched, and all joints staggered or broken. When placing sod in drainage ditches, the length of the strip shall be laid parallel to the direction of the flow of the water. Where the sod may be displaced during sodding operations, the workers, when replacing it, shall work from ladders or treated planks to prevent further displacement.

Each strip or section of sod placed on slopes 1:2 (vertical to horizontal) and steeper, and surface drainage V-shaped or flat bottom ditches or gutters, shall be staked securely with at least two stakes or pins spaced not more than 24" (600 mm) apart with the flat side against the slope. Stakes shall either be wood wedges or T-shaped wire pins. Wood wedges shall be ½ by 1 by 63 (13 by 25 by 150 mm) to ½ by 1 by 12" (13 by 25 by 300 mm), as required by soil conditions, and driven so that the last 1" (25 mm) remains above the top of the sod. T-shaped wire pins shall be machine bent from 15" (380 mm) pieces of 8 gage (4.1 mm) low carbon bright steel with a 8" (200 mm) leg, a 4" (100 mm) head, and a 1" (25 mm) secondary drive and driven flush with the top of the sod.

When sodding adjacent to a sidewalk, curb, pavement, or retaining walls, sufficient allowance shall be made in grading for the thickness of the sod, so that when placed, the sod shall be flush with the tops of such structures. The sod shall be tamped to ensure tight joints and a smooth level surface. As the top of the slope is reached, the sod shall be trimmed to a line placed at a fixed distance from the break of the bank and along the entire length of the cut or fill. The top of the bank shall have been previously graded, so that the sod, when applied, comes flush with the average level of the top of the bank. All surfaces shall be uniform in appearance and reasonably true to line and grade.

The Contractor shall water the sod immediately after placement to a depth sufficient so that the underside of the new sod pads and soil immediately below the sod are thoroughly wet. The sod shall be kept moist until growth is established. All sod in which shrinking, burning, or turning brown occurs shall be rejected, removed, and replaced.

A satisfactory stand of grass from sod, as determined by the Engineer, shall be required. To be acceptable, a stand of grass from sod must display an even flush of growth and show evidence of soil surface contact, minimal undermining, and minimal erosion.

SECTION 748 PAVEMENT MARKINGS

748.01 Description. This work consists of supplying and installing pavement markings on the individual lifts of pavement material and the final surface of the roadway.

748.02 Definitions. There shall be two types of pavement markings as described below:

(1) *Temporary Markings.* Temporary markings, which replace those removed by milling or planing of pavement, are placed on individual sublifts of paving materials or on final travel surfaces, and which are kept in service for less than four weeks. Temporary markings shall be applied as specified in the Traffic Control Manual.

(2) *Permanent Markings.* Permanent markings are usually placed on the final travel surface. Permanent markings shall always be applied in accordance with the MUTCD.

Any of the two types of markings may be used in the following applications except as limited by the MUTCD.

(1) *Lane Line.* Lines of marking material placed between lanes of traffic.

(2) *Edge Line.* Lines of marking material placed on the right hand side of a travel lane with two way traffic or both sides of a traveled way having one way traffic.

(3) *Center Line.* Lines of marking material placed between lanes of traffic traveling in opposite directions.

(4) *Detour Markings.* Markings which are placed to cause or require traffic to move from the normal or previous travel path. All detour markings shall be installed using standard marking patterns as specified in the MUTCD.

(5) *No Passing Zones.* Any centerlines between opposing directions as on a multilane highway shall be applied in accordance with the MUTCD, or as directed by the Engineer, for all temporary or permanent markings.

MATERIALS.

748.03 Approved Materials. The Department periodically conducts tests of various pavement marking materials to determine which materials are suitable for use on Delaware roads. A list of approved materials is available from the Engineer. There is no approved list of materials for temporary paint. The paint used for temporary marking need only be paint intended for use on roadway materials and retain sufficient amounts of beads to remain reflective.

748.04 Alkyd Type Thermoplastic Material. The thermoplastic material that is available in white and highway yellow shall be homogeneously composed of pigment, filter, resins, and glass reflectorizing spheres. It shall melt uniformly with no evidence of skins or unmelted particles. It shall not deteriorate on contact with sodium chloride, calcium chloride, or other de-icing chemicals or because of oil content of paving materials or oil drippings. It shall be tested in accordance with AASHTO T 250 and M 249 or with the appropriate method in FED-STD-141C or ASTM designation.

The thermoplastic material shall be suitable for application immediately after compaction of the final lift of asphaltic concrete. The thermoplastic shall be neither permanently discolored nor softened by contact with hot-mix bituminous concrete.

The white thermoplastic material shall not exceed a yellowness index of 0.15.

The yellow color shall reasonably match color chip No. 13538 of FED-STD-595B. The test shall be performed at 77 °F (25 °C).

(1) *Alkyd Binder.* The binder shall consist of mixture of synthetic resins, at least one of which is solid at room temperature, and high boiling point plasticizer. At least one-third of the binder composition shall be solid maleic-modified glycerol ester resin and shall be no less that 18% by weight of the entire material formulation. The binder shall not contain petroleum based hydrocarbon resins.

(2) *Composition.* The pigment, glass beads, and filler shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt, and foreign materials or objects and shall comply with the following requirements.

Composition (percent by weight)

Component	*White*	*Yellow*	*Black*
Alkyd Binder	18.0 minimum	18.0 minimum	18.0 minimum
Glass Beads	30 – 40	30 – 40	0.00 maximum
Titanium Dioxide	10.0 minimum	- - -	0.0 maximum
Calcium Carbonate and Inert Fillers	42.0 maximum	50.0 maximum	52.0 maximum
Yellow Pigment	52.0 maximum	50.0 maximum See Note (a)	- - -

Note (a): Amount of yellow pigment, calcium carbonate, and inert filers shall be at the option of the manufacturer, providing all other requirements of this specification are met.

(3) *Physical Characteristics*.

(a) *Specific Gravity.* The specific gravity of the thermoplastic traffic line material shall not exceed 2.15.

(b) *Storage Life.* Any unused material which does not conform to the requirements of the specification for a period of one year shall be replaced by the manufacturer at no cost to the Department.

(c) *Set Time.* When applied at a temperature range of 412 ± 12 °F (211 ± 7 °C) and at a thickness of 0.0625 to 0.1253 (1.5 to 3.0 mm), the material shall set to bear traffic in not more than two minutes when the air temperature at 50 ± 4 °F (10 ± 2 °C), and not more than ten minutes when the air temperature is 90 ± 4 °F (32 ± 2 °C).

(d) *Color.** Daylight reflectance at 45 degrees - 0 Degrees:
White: 75%
Yellow: 45%

(e) *Bond Strength.** The bond strength to the pavement shall exceed 1,800 psi (1.24 MPa).

(f) *Resistance to Cracking at Low Temperature.** Applied to concrete blocks, and cooled to 201 ± 4 °F (94 ± 2 °C), the material shall show no cracks.

(g) *Impact Resistance.** The impact resistance shall be a minimum of 10 in lb (1.13 N m) upon test specimens.

(h) *Softening Point.** Tested in accordance with ASTM D 36, the materials shall have a softening point of 216 ± 14 °F (102 ± 8 °C).

(i) *Flowability.** Tested for flowability, the white thermoplastic shall have a maximum residue of 18% and the yellow thermoplastic shall have a maximum residue of 21%.

(j) *Flowability Extended Heating.** After extending the heat period by four hours and 30 minutes, when tested for flowability, the thermoplastic shall have a maximum residue of 28%.

* For the tests (d) through (j), the thermoplastic material shall be heated under agitation for four hours plus or minus five minutes at 424 ± 4 °F (218 ± 2 °C) prior to the start of the test.

748.05 Glass Spheres.

(a) *Pre-Mixed in the Material.* The glass spheres shall be uncoated and shall conform to the requirements of AASHTO M 247, Type 1.

(b) *Surface Applied.* The glass spheres shall conform to the requirements of AASHTO M 247, Type 1, except that the beads must be moisture resistant coated to conform to the requirements of procedure 4.4.2 (AASHTO M 247) and a maximum of 5% shall pass the No. 80 sieve (180 µm) screen. Glass spheres shall have a minimum of 70% true spheres on each sieve and 80% true spheres overall.

748.06 Packaging and Marking. The thermoplastic material shall be packaged in suitable containers to which it will not adhere during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb (23 kg). Each container shall designate the color, binder (alkyd), spray or extrude, user information, manufacturer2s name and address, batch number, and date of manufacture. Each batch manufactured shall have its own separate number. The label shall warn the user that the material must be heated in the range of 400 to 440 °F (204 to 227 °C).

748.07 Vendor Qualification. In order to be eligible to supply the required pavement marking materials, evidence of three years successful services for alkyd-based materials in transverse and/or symbol applications shall be provided in writing. Successful service shall be evidenced by color stability, retention of retroreflective properties, crack resistance, and lack of softening or permanent discoloration due to exposure to oil and grease drippings for the required three year period. The documentation must be from three projects in areas with similar climactic conditions within the United States.

748.08 Equipment. The equipment used to apply pavement markings shall conform to the following requirements:

(1) *Paint Equipment.*

(a) Shall be able to apply double centerlines simultaneously (except temporary markings may be applied separately).

(b) Shall be capable of applying paint and glass beads to pavement at same time, leaving no more than 2" (50 mm) of painted line without glass beads at the beginning or end of a line.

(c) Shall be capable of hand gun operation for applying special markings. (This may be a separate piece of equipment.)

(2) *Truck Mounted Paint Equipment.*

(a) Shall have steerable gun carriages.

(b) Must be able to apply double centerlines simultaneously.

(c) Shall be capable of pneumatically applying glass beads 1" (25 mm) behind the spray pattern of the paint gun.

(d) Shall have an automatic, electrically controlled skipline mechanism capable of retracing the existing 10' (3 m) stripe and 30' (9 m) skip or applying a new 10' (3 m) stripe and 30' (9 m) skip.

(3) *Thermoplastic Equipment.*

(a) Shall provide for constant mixing and agitation of the material.

(b) Shall apply the material to the road surface in a molten state at the temperature specified in Subsection 748.08 (c)(1) by screed extrusion means.

(c) Shall apply glass beads instantaneously upon the installed line to ensure adhesion.

748.09 Application.

(a) *General.* The Contractor shall protect all pavement markings until track free. In the event any vehicle should cross wet pavement markings, the damaged markings shall be removed by sand blasting, heat, or other methods acceptable to the Department and replaced.
All necessary markings shall be installed before the end of the workday. Whenever work is interrupted by weather, the markings shall be installed as soon as possible. Due to safety requirements, this Section shall overrule Subsection 101.39 which prevents work on holidays.
The Contractor shall furnish to the Department the applicable warranty for the material to be installed to ensure proper performance.
Thermoplastic pavement markings shall not be applied on portland cement concrete and other concrete surfaces.

(b) *Paint.*

(1) This specification is to cover the application of pigmented binder (white and yellow) and optical glass spheres system to the highway surface with specialized equipment.

(2) The reflective surface shall be obtained by applying optical glass spheres at the rate of 5 lb/gal (0.6 kg/L) of paint onto and into the pigmented binder in one operation as specified under this Subsection. The number of gallons (liters) of paint used and the number of pounds (kilograms) of beads used shall be determined. Rate application will be calculated by dividing the gallons (liters) of paint used for the day into the number of pounds (kilograms) of beads used for the day, and the result should be 5 lb/gal (0.60 kg/L) within ±2%. If the result does not meet this limit, the day's work shall be redone.

(3) Pigmented binder (paint), white or yellow, shall be applied by the Contractor according to the paint manufacturer2s recommendations. The paint shall only be applied when ambient air temperature is 40 °F (4 °C) or higher. The wet film thickness shall be 0.015 ± 0.0013 (0.38 ± 0.03 mm).

(c) *Thermoplastic Alkyd Type Material.*

(1) *Application.* For optimum adhesion, the thermoplastic material shall be installed in a molten state at a temperature between 400 to 425 °F (204 to 218 °C) on a clean, dry, and solvent free surface. The Contractor shall clean off pavement surface dirt and grease where necessary by approved removal methods. Thermoplastic pavement marking materials shall not be applied when pavement temperatures are below 50 °F (10 °C) or when the surface of the pavement shows evident moisture.

A primer sealer if recommended by the manufacturer of the thermoplastic material
shall be applied prior to the installation of thermoplastic material on the pavement if required by the Department. The primer shall be void of solvent and water prior to the installation of thermoplastic material.

The material shall readily apply to the pavement from either manual or self propelled application equipment by the screed/extrusion method wherein one side of the

shaping die is the pavement and the other three sides are contained by a part of suitable equipment for heating and controlling the flow of material.

The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly upon any type of old thermoplastic line, provided that the initial material was properly bonded, or on worn paint line showing considerable pavement exposure. Such new material shall bond itself to the old line in such a manner that no splitting or separation takes place.

The application equipment shall conform to the requirements of this Subsection and be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be accomplished in a true arc. The heating kettle and application equipment shall conform to the requirements of the National Fire Underwriters of the National Fire Protection Association and of the State.

The equipment used to install hot applied thermoplastic material by contract under
this Section shall be constructed to provide continuous uniform heating to temperatures exceeding 400 °F (204 °C), mixing, and agitation of the material. The conveying parts of the equipment between the main material reservoir and the line dispensing device shall prevent accumulation and clogging. All parts of the equipment which come in contact with the material shall be constructed for easy accessibility for cleaning and maintenance. The equipment shall operate so that all mixing and conveying parts, including the line dispensing aprons or similar appliances which the dispenser overruns, will not be permitted. The equipment shall provide for traffic marking application of varying widths in even multiples of 4 or 6" (100 or 150 mm).

Glass spheres shall be applied to the surface of the completed stripe by drop-on or pressure spray methods at an approximate uniform rate of 0.100 lb of glass spheres every square foot (0.49 kg of glass spheres every square meter) [0.033 lb/ft of 4" (50 g/m of 100 mm)] from automatic dispenser attached to the striping machine so that the glass spheres are dispensed closely behind the installed line. The glass sphere dispenser shall be equipped with an automatic cut-off control synchronized with the cut-off of the thermoplastic material.

(2) *Patterns*. The thickness measurement prior to application of drop-on glass beads shall be 0.125" (3.18 mm) for crosswalks and stop bars and 0.090" (2.28 mm) for lanelines, centerlines, and edgelines.

Calibration shall be done by placing black tapes, film, or metal plates of known and uniform thickness in the area to be striped. Once the striper has passed over, the sample is removed by making sharp cuts with a knife and measurement of the stripe plus base are made with a micrometer or vernier calipers with a proper correction for the base.

For longitudinal lines, these thickness checks shall be made every 1,600' (500 m) or more frequently at the judgment of the Engineer. For symbols and intersection markings, the frequency of checking shall be at the option of the Engineer. These thicknesses shall be considered as the average of two or more measurements made in a 3' (1 m) distance.

Longitudinal lines shall be offset at least 2" (50 mm) from construction joints and 2" (50 mm) to the inside of shoulder breaks of pavement. Openings 6" (150 mm) in length shall be provided at 20' (6 m) intervals in edgelines placed on the inside of super elevated curves to prevent ponding of water on the pavement surface.

The finished lines shall have well defined edges.

The typical skip pattern shall be based on a 40' (12 m) cycle made up of a 10' (3 m) painted surface and a 30' (9 m) space.

(d) *Reflectivity for Paint and Alkyd Type Thermoplastic Material.*

After satisfactory completion of all striping work and written notification from the Contractor, the Department will test the striping to ensure it has the minimum reflectivity. The testing will be completed within 30 calendar days from notification. The Contractor shall accept lower average readings derived from late testing due to the Contractor's failure to notify the Engineer. The Contractor may request that tests be conducted on completed phases or portions of the work. Approval of such a request will be at the discretion of the Engineer. Testing will be done using a Delta LTL 2000 Retrometer (30 meter geometry). Five readings will be taken per line per 1 mile (1.6 kilometer). Projects less than 1 mile (1.6 kilometer) in length will have a minimum of five readings per line.

The required minimum initial reflectivity reading in millicandellas for alkyd thermoplastic markings shall be:

White 300

Yellow 200

For alkyd thermoplastic markings below these minimums and above 125 millicandellas, payment will be reduced as described under Basis of Payment.

All markings (paint and alkyd thermoplastic) with an average reflectivity below 125 millicandellas shall be removed and replaced at the sole expense of the Contractor.

(e) *Guarantee for Alkyd Type Thermoplastic Material.*

Acceptance of this project will be contingent upon successful completion of a 180 day observation period under traffic beginning upon the satisfactory completion of all striping work required by the Contract.

During the 180 day observation period the thermoplastic Pavement Marking Material furnished and installed under this Contract shall be warranted against failure due to blistering, excessive cracking, bleeding, staining, discoloration, oil content of the pavement materials, smearing and spreading under heat, deterioration due to contact with grease deposits, oil, diesel fuel, or gasoline drippings, chipping, spalling, poor adhesion to the pavement materials, vehicular damage, and wear. Any markings that have not performed satisfactorily during the 180 day observation shall be replaced by the Contractor at no expense to the Department.

Marking replacement shall be performed in accordance with the requirements specified herein for the initial application, including but not limited to possible surface cleaning, pavement marking removal, seasonal and weather limitations, etc.

The Contractor shall replace or renew, entirely at his/her expense, the amount of pavement markings deemed by the Engineer to have failed to perform useful service during the period noted above. The replacement material installed under this guarantee shall be the same as the original material.

SECTION 760 PAVEMENT – MILLING

760.01 Description. This work consists of milling or planing existing bituminous concrete and portland cement concrete pavement.

760.02 Construction Methods. The pavement milling machine shall be one which is suitable for the use in milling and planing bituminous and portland cement concrete pavements.

Milled materials shall be reused or otherwise disposed of as specified in Subsection 106.09.

SECTION 762 SAW CUTTING PORTLAND CEMENT AND HOT-MIX, HOTLAID BITUMINOUS CONCRETE

762.01 Description. This work consists of mechanically saw cutting patch edges or tie-in joints into existing pavement.

BITUMINOUS CONCRETE

762.02 Construction Methods. The equipment used shall be a saw cutting machine capable of cutting portland cement concrete and hot-mix, hot-laid, bituminous concrete pavements. The machine shall consist of a suitable motor driven diamond blade circular cutter with control devices, mounted on a sturdy frame. The equipment shall be capable of cutting a groove in a straight line to a sufficient depth so that an even, neat joint will be cut to allow removal of material without damage to the adjacent pavement. A continuous water supply shall be supplied to the cutting element either by a water tank on the equipment or by other means. Equipment other than that specified for saw cutting may be used if the material to be cut is hot-mix, hot-laid bituminous concrete. When saw cutting portland cement concrete for removal of pavement, the depth of saw cut shall be the full depth of the pavement.

SECTION 803 WATER FOR MIXING PORTLAND CEMENT CONCRETE

Water used in mixing, curing, or other designated applications shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water will be tested in accordance with AASHTO T 26. Water known to be of potable quality may be used without testing. Where the source of water is relatively shallow, the intake shall be enclosed to exclude silt, mud, grass, or other foreign materials.

The water shall conform to the following requirements:

Hydrogen ion concentrations	4.5 to 8.5 pH
Total solids	5000 ppm
Total chlorides	300 ppm
Soluble SO4	500 ppm
Total alkalis as Na2 plus 0.658K2O	500 ppm
Organic content	2000 ppm
Compressive strength, minimum	90% of control
Time of setting, Vicat	±60 minutes from control and within the specifications of AASHTO M 85

SECTION 804 FINE AGGREGATE

Fine aggregate for use in portland cement concrete shall conform to the requirements of AASHTO M 6, except the grading shall be:

Sieve Size	*Percent Passing*
3/8" (9.5 mm)	100
No. 4 (4.75 mm)	95 - 100
No. 50 (300 µm)	5 - 30
No. 100 (150 µm)	1 - 10
No. 200 (75 µm)	0 – 4

*Fineness Modulus:*2.3 to 3.1

The organic impurities requirement will be waived for fine aggregate specified for uses other than in portland cement concrete.

SECTION 805 COARSE AGGREGATE

Coarse aggregate shall conform to the requirements of AASHTO M 80 except no gravel, crushed gravel, or crushed concrete shall be used. Also, the requirements of Section 2.1, percentage of wear, Los Angeles Test, shall not be more than 45%. If air-cooled, blast-furnace slag is used, it shall weigh not less than 70 pounds per cubic foot (1.12 metric tons per cubic meter) when tested according to AASHTO T 19/T 19M.

SECTION 810 ASPHALT CEMENT

Asphalt cement shall be prepared by the refining of crude petroleum using methods conforming to industry standards. The asphalt cement shall conform to the requirements of AASHTO M 226, Table 2.

When tested by ignition, the inorganic insoluble residue content of the asphalt cement shall not exceed 0.25% by weight.

SECTION 812 PORTLAND CEMENT CONCRETE

812.01 Description. This material consists of portland cement, fine aggregate, coarse aggregate, water, and admixtures mixed in the specified proportions for the various classes of concrete.

812.02 Materials.

(a) *Portland Cement.* Portland cement shall conform to the requirements of Section 801.

(b) *Water.* Water shall conform to the requirements of Section 803.

(c) *Fine Aggregate.* Fine aggregate shall conform to the requirements of Section 804.

(d) *Coarse Aggregate.* Coarse aggregate shall conform to the requirements of Section 805.

(e) *Gradation.* Coarse aggregate shall conform to the requirements of Section 813, No. 57.

(f) *Air Entrainment Agent.* An air-entrainment agent conforming to the requirements of AASHTO M 154 shall be introduced into the mixer by an approved automatic dispenser.

(g) *Chemical Admixtures.* Chemical admixtures shall conform to the requirements of AASHTO M 194 for the seven types as follows:

Type A - Water Reducing
Type B - Retarding
Type C - Accelerating
Type D - Water Reducing and Retarding
Type E - Water Reducing and Accelerating
Type F - Water Reducing, High Range
Type G - Water Reducing, High Range and Retarding

For concrete Classes A and D, calcium chloride or other admixtures containing detrimental amounts of chloride salts shall not be used in the concrete. The chloride content of bridge deck concrete shall not exceed 0.10% by weight of cement.

(h) *Fly Ash.* Fly ash may be used as an additive in concrete in order to promote workability and plasticity. Fly ash shall conform to the requirements of Section 822.

(i) *Curing Materials.* Curing materials shall be as follows:

(1) *Liquid Membrane Compounds.* The material shall conform to the requirements of AASHTO M 148, for Type 2, Class A or B white-pigmented liquid curing compound. Acceptance for continued use will be based upon satisfactory field performance.

(2) *Polyethylene Sheeting.* Polyethylene sheeting shall conform to the requirements of AASHTO M 171.

(3) *Waterproof Paper.* Waterproof paper shall conform to the requirements of AASHTO M 171. The name of the manufacturer shall be marked or imprinted clearly on the paper for proper identification.

(4) *Water Cure.* The water shall conform to Section 803.

(j) *Samples.* The source of fine aggregate, coarse aggregate, cement, additives, and admixtures shall be submitted to the Department2s Materials and Research Section prior to any concreting operations in sufficient time so mix design verification may be performed.

Coarse and fine aggregates for use in portland cement concrete mixtures will also be evaluated for potential alkali-silica reactivity using ASTM C 1260 Mortar Bar Method and may be evaluated by ASTM C 295 Petrographic Examination. Furthermore, if available, field service records of the aggregate in concrete will be evaluated. Aggregate sources determined to be reactive with cement alkali will be permitted in concrete mixtures using either low alkali (0.6% or less) cement or Type IP cement. Use of high alkali cement will be permitted with these aggregates provided one of the following options is used to modify the cement matrix:

(1) Substitution of 35 to 50% of the portland cement with ground granulated blast furnace slag conforming to AASHTO M 302, Grade 100 or Grade 120;

(2) Substitution of 7 to 10% of portland cement with silica fume conforming to the requirements of AASHTO M 307; or

(3) A minimum 20% substitution of portland cement with fly ash conforming to Section 822; or

(4) Use of a lithium-based admixture at a dosage rate based upon the sodium oxide equivalent (AASHTO M 85) of the portland cement component of the concrete. The lithium dosage shall be 1 lb (1 kg) of lithium hydroxide monohydrate per 1 lb (1 kg) of sodium oxide equivalent of the portland cement, with a minimum dosage of 0.60% by weight of the portland cement. Other approved lithium compound may be used but shall be dosed in equivalents of lithium hydroxide monohydrate. All lithium salts shall be certified as non-hazardous based on the heavy metal content. Mixing shall be as per manufacturer's recommendation.

(k) *Fiber Reinforcement*. Fiber reinforcement shall conform to the requirements of Subsection 824.02(j).

812.03 Handling and Storing Materials.

(a) *Aggregate.* Aggregate stockpiles shall be placed on hard, clean, and well drained surfaces of acceptable materials such as portland cement concrete, or hot-mix bituminous concrete and be of sufficient thickness to withstand the loadings of construction equipment. If, at any time, the surfaces break up so as to possibly contaminate the aggregate stockpiles, the concrete operation shall be immediately stopped until such time that the surfaces may be repaired. Prior to stockpiling aggregates, the Department2s Materials and Research Section shall be contacted for approval of the base surface material. Coarse and fine aggregate shall be kept separate during

transportation, handling, and storage until batched. If necessary, suitable partitions shall be constructed to prevent mixing of the fine and coarse aggregates.

Aggregate stockpiles shall be constructed in horizontal layers not exceeding 5' (1.5 m) in depth in order to avoid segregation. Segregated material shall be removed from stockpiles and disposed of or remixed to the satisfaction of the Engineer.

Fine aggregate shall be stockpiled at the batch plant a minimum of 24 hours prior to batching or longer if required until surplus water has disappeared and the material has a uniform free moisture content. Wet fine aggregate shall not be placed where it becomes mixed with material being used for batching. Suitable partitions shall be constructed to prevent mixing of the wet fine aggregate and the fine aggregate being used for batching. Batching direct from the washing plant will not be permitted.

Haul roads to the concrete plants shall be of such base as to prevent any deleterious materials from being incorporated into the stockpiles and into the concrete itself. If at any time, deleterious materials are found in the stockpiles, the concrete operation shall be immediately stopped.

(b) *Cement.* Reclaimed cement or cement that shows evidence of hydration, such as lumps or cakes, shall not be used. All cement shall be stored in suitable weatherproof structures that protect the cement from dampness.

(c) *Fly Ash.* Fly ash which shows evidence of hydration, such as lumps or cakes, shall not be used. All fly ash shall be stored in suitable weatherproof structures that protect the fly ash from dampness and other contamination.

(d) *Admixtures.* Admixtures shall be stored and handled in such a manner that contamination or deterioration is prevented. Admixtures shall not be used unless thoroughly agitated to the satisfaction of the Engineer or the Engineer's agent. Partially frozen admixtures shall not be used. When the amount of admixture required to give the specified results deviates appreciably from the manufacturer's recommended dosage, the use of this material shall be discontinued unless conditions justify a change in the dosage.

812.04 Composition of Mix. The Engineer will determine the proportions of materials to be used that will produce a workable, dense, concrete conforming to the requirements of Table 812-A for the class of concrete specified. ACI design methods will be used as a guide in determining aggregate proportion. Exceptions to these requirements are as follows:

(a) The producers of prestressed, precast reinforced concrete items complying with these specifications shall determine mix design proportions for concrete proposed for use. The mix design proportions shall be submitted to the Department2s Materials and Research Section for approval prior to use.

(b) The Contractor shall submit to the Department2s Materials and Research Section sources of all materials and mix design proposed for production of Class D concrete prior to any work. Such submission shall be made in sufficient time for preparation of laboratory or field trial mixes and 28-day strength determinations. Field trial mixes shall be made at the concrete supply location and shall consist of 3 yd^3 (2.3 m3) (minimum) batches of concrete. All materials, equipment, and labor required to produce the field trial mixes shall be supplied by the Contractor.

(c) For slip-form paving, concrete shall be Class B with the following restrictions:

(1) The composition of the mix shall be such to produce concrete with a slump of 1 to 2 ½" (25 to 65 mm) when tested at the time of placement in accordance with AASHTO T 119.

(2) Concrete shall be "central mixed".

(3) Transportation of the concrete shall be only by approved trucks that demonstrate satisfactory loading at the central mix plant and unloading at the Project site.

(4) The design strength shall be 3500 psi (24 MPa) compressive strength at 28 days.

The Engineer will determine the proportions of materials to be used that will produce a workable, dense concrete conforming to the requirements of this Section, Class B as modified above. Should proportions determined by the Engineer vary due to changes in the material originally submitted, no additional compensation will be made. To improve mix workability and consistency, the Contractor may substitute at its expense up to 50% of the Type I portland cement in the Class B mix with ground granulated blast-furnace slag meeting the requirements of AASHTO M 302, Grade 120. The ground slag-portland cement blend will be approved by the Engineer prior to use and may be adjusted at the discretion of the Engineer as field conditions warrant. ACI design methods will be used as a guide in determining aggregate proportions that will produce a workable, plastic concrete having the specified design strength. Should the proportions determined by the Engineer vary due to changes in the materials originally submitted by the Contractor, no additional compensation will be made.

(d) Producers wishing to use fly ash as an additive or a partial replacement for portland cement, shall determine the mix design proportions for the concrete proposed for use. Fly ash use as partial replacement for portland cement in mixtures containing Type I (PM) or IP cement is prohibited.

For mixes containing fly ash, laboratory testing, which is the responsibility of the producer, shall be performed documenting the design2s conformance to all requirements and noting that air entrainment is of special concern. Identification of the sources of materials, the mix design proportions, and the results of the laboratory testing of the proposed mix design shall be submitted to the Department2s Materials and Research Section for approval prior to use of the design. The producer shall supply appropriate samples of the design materials. The Contractor shall allow for up to five weeks for evaluation by the Department2s Materials and Research Section.

When a mix containing fly ash is used, the Contractor shall perform extra sampling and testing of the concrete mixture, as deemed necessary by the Engineer, in order to detect possible harmful variations in the quality of the mix before forms and supports are removed and loading applied. Samples shall be cured in the same ambient temperature as the placed material, in order to more accurately represent the strength of the placed material. Delays due to slow strength gain from a fly ash mix shall not be considered for an extension of time allowed for the completion of the Project.

812 PORTLAND CEMENT CONCRETE

The requirements of each class of concrete specified are included in the following table:

Table 812-A

Class of Concrete		A	B	C	D
Design Compressive Strength, f_c at 28 days, (Note 1)	psi (MPa)	4500 (30)	3000 (20)	2000 (15)	4500 (30)
Design Cement Content, minimum, (Note 2)	sacks/yd³ (sacks/m²) lb/yd³ (kg/m³)	7 1/2 (9.8) 705 (418)	6 (7.8) 564 (334)	4 1/2 (5.9) 423 (251)	7 1/2 (9.8) 705 (418)
Design Water to Cement Ratio, W/C = Weight Cement (Note 3)		0.40	0.45	0.60	0.40
Required Air Content, % (Note 4)		4-7	4-7	4-7	4-7
Required Slump, (Note 5)	in (mm)	2-4 (50-100)	2-4 (50-100)	2-4 (50-100)	2-4 (50-100)
Required Admixtures (AASHTO M 194) (Notes 6 & 7)		A, D, F, G	A, D, E, F, G	A, D, E, F, G	A, D, F, G
Notes 8, 9, 10 and 11 refer to all classes of concrete					

Note 1: In addition to meeting the specified *f* 2c design compressive strength, Class D concrete shall achieve *f* cr , which is the required average compressive strength for *f* 2c. The required average compressive strength, *f* cr , shall be the minimum compressive strength required for mix approval and shall be in excess of the 4500 psi (30 MPa) design compressive strength, *f* 2c. The degree of excess compressive strength necessary shall depend on expected uniformity of concrete production as per criteria established in the ACI Standard 214. Upon establishment of standard deviation data, the following ACI 318M required average compressive strength values shall govern acceptance of the trial mix proportions:

f cr= 4900 psi (33.8 MPa) if standard deviation is less than 300 psi (2.1 MPa)
= 5050 psi (34.8 MPa) if standard deviation is within 300 to 400 psi (2.1 to 2.8 MPa)
= 5200 psi (35.8 MPa) if standard deviation is within 400 to 500 psi (2.8 to 3.5 MPa)
= 5400 psi (37.2 MPa) if standard deviation is within 500 to 600 psi (3.5 to 4.1 MPa)

If the standard deviation exceeds 600 psi (4.1 MPa), the concrete production facility shall be unacceptable for Class D concrete production. A probability of not more than one in ten tests falling below the specified compressive strength will be used to compute the required compressive strength. The average 28-day compressive strength of two companion molded 6 by 12" (152 by 305 mm) or 4 by 8" (102 by 203 mm) cylinders prepared from the same batch of concrete shall be considered a "test".

Note 2: For Class D concrete, the average compressive strength and coefficient of variations shall be computed upon the availability of 28-day compressive strength data comprising a minimum of 15 tests from the concrete production plant. Should these determinations indicate an excessive margin of safety, the concrete mix may be modified to produce a lower average compressive strength as approved by the Department2s Materials and Research Section, but in no case shall the cement content be reduced to less than 7 sacks/yd³(658 lb/yd³) [9.2 sacks/m3 (390 kg/m3)]. Should determination indicate a lower average compressive strength or a higher coefficient of variation than anticipated, the quality of the concrete will be evaluated, and mix proportions adjusted as required; however, cement content may not exceed 8 sacks/yd³ (752 lb/yd³) [10.5 sacks/m3 (446 kg/m3)].

Note 3: Water to cement ratio may be expected to vary ±5% depending on varying atmospheric and other related conditions.

Note 4: Water reducing admixtures shall be required in all concrete. The quantity and AASHTO type or combination of AASHTO types of admixtures shall be determined by the Contractor depending on the ambient temperature,

concrete temperature, time of day, thickness of concrete, concrete mix proportions, etc. and the amount and proper type of superplasticizer and/or retarder necessary. The Contractor shall be responsible for the quality of the concrete placed in any weather or atmospheric condition. Failure to achieve a satisfactory product shall be corrected as directed by the Engineer at the Contractor2s expense.

Note 5: If a Type F or G admixture is used, the maximum slump shall be 8" (200 mm).

Note 6: The total chloride content of concrete mixtures, when tested in accordance with the requirements of AASHTO T 260, shall not exceed the following:

a. Prestressed concrete:0.06%.

b. Conventionally reinforced concrete in a moist environment and exposed to chloride deicing salts or marine conditions:0.10%.

c. Conventionally reinforced concrete in a moist environment or areas with potential moisture condensation but not exposed to chloride:0.15%.

Limits are expressed as a percentage of the total weight of the portland cement and fly ash in the concrete mix.

Note 7: In calculating the "Water to Cement Ratio" for mixes containing cementitious materials other than portland cement, the weight of the portland cement plus the weight of the cementitious material represents the weight of cement.

Note 8: Consistency of the mix shall be determined by AASHTO T 119. Air content shall be determined by AASHTO T 152, Modified, or AASHTO T 196. Making and curing concrete test specimens shall be in accordance with AASHTO T 23 and it shall be the responsibility of the Contractor to ensure that the seven- and 28-day cylinders are cured for the first 24 to 48 hours in an environment to provide satisfactory moisture and temperature control as per AASHTO T 23.

Note 9: Concrete shall be placed only if the surface evaporation rate, as affected by ambient air temperature, concrete temperature, relative humidity, and wind velocity is less than or equal to 0.15 lb/ft² (0.73 kg/m2) per hour. The Contractor shall determine and document the evaporation rate at the site of the concrete placement, subject to verification by the Engineer. The chart contained in "Plastic Cracking of Concrete" by Delmar Bloem for the National Ready Mixed Concrete Association and published in ACI 305R-89 shall be used to determine the loss of surface moisture for the concrete. The chart may be obtained from the Department2s Materials and Research Section.

Note 10: Fixed-form concrete shall meet all requirements of Class B except the 28-day compressive strength shall be 3500 psi (24 MPa).

Note 11: The Contractor has the right to modify their mix design for any class of concrete. The modified mix design will be reviewed by the Engineer prior to approval. The approval will be based upon tests performed by the Contractor and approved by the Engineer.

Note 12: Class D concrete shall have fiber reinforcement added at the rate of 1.5 lb/yd³ (0.90 kg/m³).

812.05 Mix Temperature Limitations. The Contractor shall be responsible for the quality of the concrete placed in any weather or atmospheric conditions.

The concrete shall have a temperature of 70 ± 20 °F (21 ± 11 °C) at the time of placement unless prior permission has been granted to exceed these tolerances; however, concrete for bridge decks shall not exceed 85 °F (30 °C).

In hot weather, the water or aggregate, or both shall be cooled as necessary to maintain the concrete temperature within the specified limits. When the temperature of the plastic concrete reaches 84 °F (29 °C) at the mixing plant, particular attention shall be given to the sprinkling and wetting of the foundation and forms, the maintenance of the coarse aggregate stockpile in a saturated surface-dry condition through use of stockpile sprinklers, the placing and finishing operations, and the prompt starting of the curing operation. When the temperature of the plastic concrete reaches 90 °F (32 °C) at the mixing plant, immediate steps shall be taken to cool the mixing water or aggregate, or both in order to maintain a plastic concrete temperature of 90 °F (32 °C) or less. If such actions are not successful in reducing the concrete temperature, mixing operations shall cease.

812.06 Delivery Restrictions. The time elapsing between the introduction of water to the mix and the placing of the concrete shall be 30 minutes maximum for non-agitating type haul equipment or

60 minutes maximum for agitating type haul equipment. For Class B slip-form concrete, the time elapsing between the introduction of water to the mix and the placing of the concrete shall be 45 minutes maximum for non-agitating type haul equipment of 60 minutes maximum for agitating type haul equipment. Any concrete which has not been placed within these time limits will be rejected for use in the work. These delivery time restrictions may be extended by the Department2s Materials and Research Section when an approved water reducing and set retarding admixture is used provided the concrete remains workable for the use intended.

The interval between placing successive loads shall be as directed, however, in no case shall the interval exceed 20 minutes in order that concrete in place shall not have become partially hardened prior to placing successive batches, unless approved in writing by the Engineer.

The method and time of delivery shall be controlled by plant slips signed by the Engineer and issued to the truck driver. The slips shall indicate the name and location of the plant, the size and proportions of the batch, type of admixture used, and the time the mixer is charged. Upon arrival on the job, each slip shall be delivered to the Engineer and will be completed to show the time the concrete is discharged from the truck.

The Contractor shall notify the Department2s Project and plant inspectors at least 24 hours prior to the placement of any concrete so that inspection services can be provided.

812.07 Plant and Equipment Requirements

(a) *General Requirements.* All concrete batch plants offered for Department approval shall be equipped for automatic batching and proportioning of all cement, aggregates, and water and for visual observation of automatic insertion of admixtures.

All currently approved concrete batch plants shall retain approved status, unless the approval is rescinded for failure to comply with the batch plant requirements specified herein and the requirements of the current version of AASHTO M 157 for concrete batch plants. In the case where approval is rescinded, reinstatement shall be on the basis of the requirements for automation as specified for approval of plants in the previous paragraph.

The batch plant and all equipment and facilities necessary for performing the work will be inspected and approved by the Engineer as to design, capacity, and condition well in advance of the start of construction. The batch plant shall conform to the requirements of AASHTO M 157, except as modified herein.

A laboratory of 150 ft² (14 m2) minimum shall be provided for the exclusive use of the Engineer at all portland cement concrete facilities. The producer shall furnish all heat, lights, air conditioning, telephone, electric, bottled drinking water, tables, desk, chairs, file cabinets, and all testing equipment or devices to control the production and quality of the concrete. Approved sanitary facilities shall be furnished and maintained.

Inspection of all equipment incidental to the production and transportation of concrete will be performed by the Engineer either on an annual basis or prior to commencement of work on the Contract. If at any time during construction, the equipment is not performing satisfactorily, it shall be repaired prior to re-use. If the concrete plant is to be used for night pours, ample lighting shall be provided to satisfactorily illuminate the aggregate stockpiles along with all areas where the Engineer or the Engineer's representative will be performing testing.

(1) *Bins and Hopper.* The bins shall be in good condition and have adequate separate compartments for fine aggregates and for each required size of coarse aggregate. Each compartment shall be designed to discharge efficiently and freely into the weighing hopper. Means of control shall be provided so that as the quantity desired in the

weighing hopper is being approached, the material may be added slowly and shut off with precision.

The hopper and its appurtenances shall be constructed to eliminate the retention of varying tare materials on any of its parts and operated to ensure a rapid and complete discharge without shaking and jarring the scales.

(2) *Weighing Equipment.* The scales for weighing material shall be either of the horizontal beam or the springless dial type and shall be the product of an established manufacturer. They shall be of rugged design, constructed to support the hopper or hoppers and with minimum adjustments consistent with the accuracy required. Scale levers shall be of such design, construction, and material to permit frequent handling without damage.

Pivots shall be of steel, sufficiently hardened and tempered to ensure minimum wear under a heavy volume of weighing. They shall be accurately set in substantial mountings to ensure a permanent spacing of the knife edges under all conditions of loading and to prevent them from being loosened by the vibration incident to usage.

Multiple weigh beams on scales to be used for weighing more than one kind of material shall have as many beams as there are different kinds of material to be weighed on the scales. All weigh beams shall be horizontal. The trig loop shall allow movement of the weigh beam above and below the horizontal position for proper operations of the telltale dial as hereinafter specified. The free end of the weigh beam shall be equipped with a suitable device for indicating clearly and accurately the horizontal position of the weigh beam.

Provisions such as a telltale dial shall be made for indicating to the scale operator that the required load in the weighing hopper is being approached. Such a device shall indicate at least the last 200 lb (90 kg) of load.

Poises shall be constructed so they cannot be easily removed from the beam and shall be equipped with a device to hold them firmly in place. Poises and weigh beam shall be made of noncorrosive material and shall be of sufficient hardness to prevent excessive wear.

Graduated dials shall be provided with suitable markers placed outside the glass cover and set closely in front of the dial for use in determining the position of the dial indicator for predetermined loads in the weigh hopper. Provisions shall be made to prevent dirt from collecting in and around the dial mechanism. Means shall be provided for obtaining and maintaining proper alignment between the dial and the part of the scale which transmits the load to the dial. The dial face shall be of a material which is not affected by moisture. The value of the graduations of scales weighing 5000 lb (2250 kg) or less shall not be greater than 5 lb (2.25 kg). The value of the graduations of scales used in weighing over 5000 lb (2250 kg) shall not be greater than 0.1% of the rated capacity of the scales.

Scales shall be so constructed that they are maintained within a maximum tolerance of 0.5% of the net load in the hopper.

Clearance shall be provided between the scale parts and the hopper or bin structure to prevent displacement of or friction between the scales due to vibration or any other cause.

Each scale installation shall be provided with at least 10 standard 50 lb (eleven standard 20 kg, one standard 5 kg, and two standard 1 kg) weights, available for use at the plant at all times for checking scale accuracy. These weights shall be checked for true weight at the Engineer's discretion.

The weights shall be made of high quality cast iron and shall be cast and finished in such a manner that foreign material will not adhere to the surface.

All batching controls shall be positioned so as to allow the operator full view of all scales and admixture dispensers.

The weighing equipment, including dials, weigh beams, bins, and operating levers shall be so arranged that the Department2s representatives have a clear and unobstructed view of the weighing operations at all times.

All working parts of the scales, particular knife edges, shall be protected to prevent any material, except windborne material, from falling upon or against them. Suitable windbreaks shall be constructed, when necessary, to prevent variation of the scale mechanism by winds. All working parts of the scales shall be readily accessible for inspection and cleaning.

The individual aggregates, as weighed, shall be within 1% of the required weight, and the total weight of the aggregates shall be within 1% of the required total weight.

All scales shall be checked regularly as determined by the Engineer.

(3) *Water Supply.* Water shall be measured by volume or by weight. The device for the measurement of water shall be readily adjustable and shall under all operating conditions be accurate within 1% of the quantity of water required for each batch. The device shall be so arranged that the measurements are not affected by variable pressure in the supply line. Measuring tanks shall be equipped with outside taps and valves to provide for calibration unless other means are provided.

(4) *Admixture Dispensers.* Equipment for dispensing air entrainment or other admixtures shall be of approved design and calibrated prior to being approved. Recalibrations will be made as required by the Engineer.

The flasks and discharge hoses shall be transparent and so arranged that the Engineer has a clear and unobstructed view of the dispensing operation at all times.

(5) *Automatic Batch Selector.* The automatic batch plant shall be controlled by means of an approved automatic batch selector set to deliver accurately, and in proper sequence, the designated weight of cement and aggregates, and the weight or volume of water and admixtures required for the concrete mixture. The batch selector controls shall be locked or sealed during the operation, and no changes in selector controls or weight settings shall be made except in the presence of the inspector.

For safety reasons, pozzolans, if used, shall be weighed and added after the portland cement has been weighed and added.

Provisions may be included to vary the size of the batch without affecting the basic proportions of the concrete mix being produced.

(6) *Interlocks.* All batching equipment in automatic plants shall be interlocked so that a new weighing cycle cannot be started until the weigh hopper is empty, the scales are in balance, and the discharge gates and the supply valves included in the system are closed.

(7) *Mixer.* The mixer shall be of approved design and shall be operated as recommended by the manufacturer. The pickup and throw-over blades shall be replaced or repaired when any part or section is worn 13 (25 mm) or more below the original height of the manufacturer2s design. The mixer shall be kept free from accumulations of hardened concrete inside the mixing drum.

The mixer shall be equipped with an approved timing device or, in the case of truck mix concrete, the use of revolution counters or other methods acceptable to the Engineer.

(b) *Specific Requirements.*

(1) *Central Mixed Portland Cement Concrete.*

a. *Description.* Central mixed portland cement concrete shall consist of portland cement concrete manufactured from previously approved materials, proportioned and mixed in a central mixing plant and transported to the Project in approved vehicles.

b. *Mixing.* Concrete shall be mixed in a batch mixer, as previously described, for a period of not less than 60 seconds for mixers with capacities of 10 yd³ (7.65 m3) or less. For mixers of greater capacity, the Engineer shall determine the mixing time, based on mixing efficiency. The Engineer reserves the right to adjust the mixing time to any extent necessary to obtain concrete of desired uniformity. Mixing time starts when all the materials, excluding water, are in the mixer. The batch shall be so charged into the drum that some water shall enter in advance of the aggregates and shall continue to flow for a period of not less than five nor more than ten seconds after all aggregates are in the drum. The entire contents shall be removed from the drum before succeeding batches are introduced. Unless otherwise permitted, the maximum batch size shall be the manufacturer's rated capacity for that mixer.

c. *Moisture Meter.* An automatic electrical moisture meter, equipped with adjustable controls, shall be installed at the Engineer2s discretion to measure accurately and continuously the moisture content of the fine aggregate. The meter probe shall be kept cleaned and maintained at all times.

(2) *Truck Mixed Portland Cement Concrete.*

a. *Description.* Truck mixed portland cement concrete shall be proportioned and dry batched using previously approved materials, with water added for mixing at the plant. Delivery shall be made in approved mixer trucks. Batching and mixing shall be under the supervision of the Engineer.

b. *Mixer Truck.* Truck mix units shall be designed for both mixing and agitation and shall be equipped with a watertight drum suitably mounted and powered, and fitted with properly designed blades. The mixing unit shall be capable of combining the aggregates into a thoroughly mixed and uniform mass of concrete and of transporting and discharging the concrete without segregation. The pickup and throw-over blades shall be replaced or repaired when any part or section is worn 1" (25 mm) or more below the original height of the manufacturer2s design. The inside of the mixer drum shall be kept free from accumulations of hardened concrete.

Water supply equipment for truck mixers shall include a water storage compartment of sufficient capacity to hold mixing water for concrete and wash water required to wash the mixer after depositing concrete in all cases. The equipment shall include an external water gauge calibrated to 1 gal (5 L) intervals and suitable cut-off valves to regulate the quantity of water delivered to the mixer. These cut-off valves must be maintained in first class working order. A truck mixer with a leaky valve will not be permitted on the Project.

The size of the batch which may be charged into the truck mix unit shall not exceed the manufacturer's rated capacity for the unit when operated as a mixer. If the manufacturer's rating is not stamped on each mixing unit, the rated capacity will be determined by the Engineer. Any mixer which shows a variation

in consistency of concrete of more than 1" (25 mm) slump during the discharge of any single batch shall not be permitted to operate until repaired so as to produce concrete of the required uniformity.

c. *Mixing.* Each batch of concrete mixed in truck units shall be mixed not less than 70 nor more than 100 revolutions of the mixer and at the rate of rotation specified by the manufacturer as the mixing speed. Additional mixing of more than 100 revolutions, if required, shall be done at the rate of rotation specified by the manufacturer as agitation speed. Immediately prior to the addition of water, the drum shall be operated at mixing speed. The mixing period shall be started at the time the cement and water come in contact and there shall be a minimum of 30 revolutions. This operation will be supervised by the Engineer who will indicate on the delivery ticket the time the mix started, the time that the drum is empty, and the time that the entire batch is in place.

d. *Inspection Platform.* An inspection platform of suitable dimensions and with reasonable access and safety shall be provided at the plant for the viewing of truck mix concrete by the inspector.

(c) *Transportation.*

(1) *Vehicle.* The vehicle in which portland cement concrete is transported shall be an approved type of agitator truck, equipped with a watertight revolving drum, suitably mounted and powered, and fitted with properly designed blades capable of transporting and discharging the concrete without excessive abrasion and segregation.

The agitator unit shall be so constructed as to ensure rapid delivery of the concrete without loss of ingredients and to effect complete discharge of each batch.

Low slump portland cement concrete as used in slip-form paving may also be transported in open trucks designed for that purpose and may be either agitator or nonagitator types, provided that no segregation or loss of water detrimental to the mix, as determined by the Engineer, occurs during transportation and that the concrete delivered to the Project meets the requirements specified.

Both agitator and non-agitator truck types shall be capable of having the dump end elevated so that the concrete will be discharged at sufficient height to permit chuting without segregation.

(2) *Size of Batch.* The size of the batch which may be transported in these units shall not exceed the manufacturer's rating for the unit when used as an agitator. If the manufacturer's rating is not stamped on each mixing unit, the rated capacity will be determined by the Engineer.

(d) *Portland Cement Concrete Made by Volumetric Batching and Continuous Mixing.*

(1) *Description.* Portland cement concrete made by the volumetric batching and continuous mixing method is permissible for concrete used in bridge deck overlays using latex concrete, headwalls, steps, utility encasement, manhole and inlet bottoms, gutters, curbs, headers, barrier curbs, sidewalks, island pavements, fence and sign post footings, signals, light standard and meter cabinet footings, junction boxes, and small pour items as approved by the Engineer.

(2) *Mixing on the Project in a Continuous Mixing Type Truck Mixer.* Continuous mix concrete shall consist of materials accurately proportioned by volumetric measurement from bins on the truck mixer and shall be hydrated and mixed on the truck mixer at the site of the work.

The concrete shall be mixed in an approved type mixing unit that is part of the truck carrying the dry ingredients. The mixing unit shall be an auger type mixer incorporated in the truck2s discharge chute or other suitable mixing mechanism approved by the Engineer, shall produce concrete of uniform consistency, and shall discharge the mix without segregation.

A metal plate or plates shall be attached to the truck mixer in a prominent place. The plate or plates shall be plainly marked with the gross volume of the unit in terms of mixed concrete, operating speed, and the cement constant of the mixer in terms of a revolution count required to deliver 94 lb (42.6 kg) of cement, all as rated by the manufacturer.

The truck mixer shall be equipped with a cement bin of sufficient capacity to store and supply the quantity of dry cement required to produce the maximum volume concrete capacity of the truck mixer as rated by the manufacturer. The cement bin shall be free of moisture and contamination at all times.

The truck mixer shall be equipped with aggregate bins of sufficient capacity to store separately the quantities of fine and coarse aggregates required to produce the maximum volume concrete capacity of the truck mixer as rated by the manufacturer. Suitable means, approved by the Engineer, shall be provided to prevent contamination or intermixing of the fine and coarse aggregates during loading and transporting. Aggregate bins shall be covered when there exists a possibility of moisture entering the bins.

The truck mixer shall be equipped with water tanks of sufficient capacity to store the quantity of water required to produce the maximum volume concrete capacity of the truck mixer as rated by the manufacturer and at the slump specified for each concrete section.

If concrete additives are to be used in the mix, suitable means, approved by the Engineer, shall be provided for storing the additives on the truck and incorporating them in the mix. Suitable means shall also be provided on the truck mixer to permit the Engineer to check the rate of flow of the additive into the mix.

The truck mixer shall include a feeder unit mounted under the compartment bins to deliver the ingredients to the mixing unit.

Each bin on the truck shall have an accurately controlled individual gate or feeding mechanism to form an orifice for volumetrically measuring the material drawn from each respective bin compartment. The cement bin feeding mechanism shall be set to discharge continuously and at a uniform rate a given volumetric weight equivalent of cement during the concrete mixing operation. The gates of the aggregate bins shall be calibrated at the various openings to discharge the volumetric weight equivalent of aggregate required for various concrete mixes.

The truck mixer shall be so constructed as to allow the Engineer to check the calibration of the gate openings and meters by means of weight test samples.

The calibration of the gate openings and meters shall be checked and certified either on a semi-annual basis or prior to work on the Contract. A copy of the Certification shall accompany the truck mixer at all times. If, at any time during construction, a piece of equipment is not performing satisfactorily, it shall be repaired satisfactorily prior to reuse.

A ¼ yd³ (0.19 m3) box constructed of suitable rigid materials shall be with the machine at all times for calibration purposes.

Each truck mixer shall be equipped with an accurate revolution counter indicator permitting the reading of the volumetric weight equivalent of cement discharged during the concrete mixing operation.

Each truck shall be equipped with fine and coarse aggregate dials to permit accurate adjustments of the gates of the aggregate bins for volumetric proportioning of aggregates.

Each truck mixer shall be equipped with a water meter or gauge to register the discharge rate of water by volume entering the mix.

Each truck mixer shall be equipped with positive automatic means of maintaining the operating speed of the proportioning and mixing operation independent of the drive engine of the truck, and within 8% above or below that established by the manufacturer and noted on the aforementioned metal plate as the speed at which the machine will accurately proportion concrete. Such positive automatic means shall automatically shut down the proportioning and mixing operation when the operating speed varies by more than the above tolerance. A tachometer shall be mounted on the unit to indicate the operating speed.

All indicators, dials, meters, tachometer, and controls shall be in full view and near enough to be accurately read or adjusted by the operator while mixing concrete.

Handling, measuring, and batching of materials shall conform to the applicable requirements of the Section in which the concrete is being placed.

Cement and aggregates shall be proportioned, measured, and batched by a volumetric weight equivalent method. Separate batching equipment and storage bins will not be required and the materials shall be batched in a continuous mixing truck type mixer.

The concrete will be rejected if there is any evidence of improper batching, mixing, excessive segregation, use of excessive mixing water, or if the amount of entrained air is other than as specified.

Tolerances in proportioning the various ingredients are as follows:

Cement (weight percent)	0 to +4
Fine aggregate (weight percent)	±2
Coarse aggregate (weight percent)	±2
Admixtures (weight or volume percent)	±3
Water (weight or volume percent)	±3

Each truck load of ingredients shall be accompanied by a sufficient number of delivery tickets such that the operator may supply one copy of the delivery ticket to the Engineer for each project and for each kind of concrete delivered. The delivery tickets shall show the brand name and type of cement, the calibrated cement constant of the machine in terms of the revolution indicator count, the source of aggregates, and the size of the coarse aggregate. The delivery tickets shall be signed by the mixer operator. The mixer operator shall enter on the tickets the name of the Project, the name of the Contractor, the revolution counter readings indicating the volumetric weight equivalent of cement discharged during that mixing operation, the aggregate dial settings, and the section for which the concrete is delivered. The operator shall sign each completed ticket and furnish one copy to the Engineer.

812.08 Placing and Curing. Placement and curing of portland cement concrete shall conform to the requirements of the Section for which it is being used.

SECTION 813 GRADING REQUIREMENTS MINIMUM AND MAXIMUM PERCENTAGES PASSING

Del. No.	Sieve Size (square openings), millimeters except where noted													
	4" (100)	3 ½" (90)	3" (75)	2 ½" (63)	2" (50)	1 ½" (37.5)	1" (25)	¾" (19)	½" (12.5)	3/8" (9.5)	No.4 (4.75)	No.8 (2.36)	No.16 (1.18)	No.100 (150mm)
1	100	90-100		25-60		0-15		0-5						
2			100	90-100	35-70	0-15		0-5						
3				100	90-100	35-75	0-15		0-5					
57						100	95-100		25-60		0-10	0-5		
67							100	90-100		20-55	0-10	0-5		
8									100	85-100	10-30	0-10	0-5	
10										100	85-100			10-30

	Sieve Size (square openings), millimeters except where noted				
	3/8" (9.5)	No. 4 (4.75)	No. 10 (2.00)	No. 40 (425mm)	No. 200 (75mm)
"RICE"	100	70-100	0-20	0-10	0-5

SECTION 823 HOT-MIX, HOT-LAID BITUMINOUS CONCRETE

823.01 Description. This material consists of hot-mix, hot-laid bituminous concrete bases and surface courses.

MATERIALS.

823.02 Asphalt Cement. The asphalt cement shall be AC 20 with a viscosity grade conforming to the requirements of Section 810. Tank trucks used to deliver asphalt cement shall be equipped with an approved sampling device. The delivery temperature of the material shall not exceed the maximum mixing temperature.

823.03 Fine Aggregate. Fine aggregate is defined as all material passing the No. 8 (2.36 mm) sieve and shall consist of clean, hard, durable crushed stone.

In Job Mix Formula Types B, C, and D, which are defined in Subsections 823.19, 823.20, and 823.21, up to 15% of the fine aggregate may be washed concrete sand, conforming to the requirements of Section 804. If the stability, as determined by the Laboratory Marshall Method in accordance with AASHTO T 245, is less than 1200 lb (5.3 kN), the fine aggregate sand percentage shall be reduced or excluded. All carbonate and serpentine aggregate shall be prohibited in the final roadway wearing surface course on any roadway having a minimum average daily traffic volume (ADT) of 8000 vehicles and a posted speed of 35 mph (60 km/h) or greater.

823.04 Coarse Aggregate. Coarse aggregate shall be all material retained on the No. 8 (2.36 mm) sieve and shall conform to the requirements of Section 805. All carbonate and serpentine aggregate shall be prohibited in the final roadway wearing surface course on any roadway having a minimum average daily traffic volume (ADT) of 8000 vehicles and a posted speed of 35 mph (60 km/h) or greater.

823.05 Antistripping Additive. When specified for use by the Engineer, or when the Tensile Strength Ratio (TSR) is less than 80 as determined in accordance with AASHTO T 283, a heat-stable, antistripping chemical additive conforming to the requirements of Section 829 shall be blended with the asphalt cement in accordance with Subsection 823.16.

823.06 Laboratory. At all batch and dryer drum mixing plants, the Contractor shall provide a building suitable for a field laboratory in which to house and use the equipment necessary to carry on the various tests required, including bituminous extractions and gradations.

The building shall be for the use of the Engineer and inspectors for testing and recording purposes and shall be so located that activities at the plant are plainly visible from one window of the building.

The building shall have a minimum of 600 ft² (55 m2) of floor space and be of acceptable dimensions. It shall be weatherproof and have at least two windows and a door, all equipped with acceptable latches and locks. The building shall be maintained to the satisfaction of the Engineer. Satisfactory lighting, heating, and air conditioning shall be supplied. The air conditioning equipment shall be capable of maintaining the room temperature throughout the laboratory at 77 ° (25 °C) at all times.

The Contractor shall furnish all water, including drinking water, fuel, telephone, heat, and power to conduct all necessary tests. Tables, desks, chairs, and work tables shall be provided and maintained as required. Approved sanitary facilities shall be furnished and maintained.

If approved, the laboratory may be a part of another building, in which case it shall be completely partitioned off from the remainder of the building.

823.07 Testing Equipment. All production plants shall be equipped with all the necessary equipment from the equipment list supplied by the Department2s Materials and Research Section. The Contractor shall ensure that the laboratory contains equipment of approved make and design and shall maintain the equipment to the satisfaction of the Engineer.

Approval of the plant will be contingent upon meeting the requirements of Subsection 823.06 and this Subsection.

823.08 Inspection of Mixing Plant Operations. The Engineer or the Engineer's representative shall have access at all times to all parts of the mixing plant for checking the adequacy of the equipment in use, inspecting the conditions and operation of the plant, verifying the weights or proportions and character of materials, and determining and checking the temperatures being maintained in the preparation of the mixtures.

MIXING PLANTS.
The two types of mixing plants are Batch Type and Continuous Mixing Type.

823.09 Batch Type. Bituminous concrete plants will not be approved unless they are automated.

The automatic batch plant shall be controlled by means of an approved automatic batch selector. The batch selector shall control and deliver, accurately and in proper sequence, the designated weight or volume of bituminous material and aggregates required for the bituminous concrete mixture and shall automatically time the mixing operation. The batch selector controls shall be locked or sealed during the operation, and no changes in selector control or setting shall be made except in the presence of the Engineer's representative.

(a) *Interlocks.* The plant shall be equipped with interlocking cut-off circuits to interrupt and stop the automatic cycling of the operation at all times when errors in weighing or proportioning occur, or when there is a malfunction of any portion of the control system.
(b) *Equipment Failure.* If the automatic proportioning devices become inoperative, the plant may be permitted to batch and mix bituminous materials for a period of not more than 48 hours from the time of the breakdown, if approved by the Engineer. Written permission of the Engineer shall be required for a period of operation longer than 48 hours without automatic proportioning.

823.10 Plant and Machinery. The mixing plant used by the Contractor in preparation of the bituminous concrete shall be capable of producing a minimum of 75 tons (68 metric tons) per operating hour and shall comply with the following requirements:
(a) *Cold Feed.* The plant shall be provided with a separate cold bin or tunnel opening for each size and type of mineral aggregate used in the mix. In addition, each cold bin or tunnel opening shall be equipped with a calibrated gate and mechanical feed to provide a uniform and concurrent flow of aggregates prior to their introduction into the drier.
(b) *Drier.* The drier shall be a rotating cylinder type suitably designed to heat and dry the aggregates, and shall continually agitate the aggregates during heating. The drier shall be capable of preparing aggregate to the full rated capacity of the paving plant.
(c) *Burner.* The burner shall be of an approved design and shall be automatically controlled.
(d) *Sieves.* All plant sieves shall be designed, constructed, and operated so that all aggregates are sieved to their specified sizes and proportions, and shall have a capacity, when operated at normal speed, slightly in excess of the maximum capacity of the mixer.

(e) *Bins.* The plant shall include storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. Bins shall be arranged to ensure separate and adequate storage of appropriate fractions of the mineral aggregates, and the plant shall be equipped to feed such material into the mixer within ±0.5% of the total batch weight. Separate dry storage shall be provided for filler or hydrated lime when used, and the plant shall be equipped to feed such

material into the mixer within ±0.5% of the total batch weight. Each bin shall be provided with overflow pipes, sized and located to prevent material backing up into other compartments or bins. Each compartment shall be provided with an individual outlet gate that prevents leakage when closed. The gates shall cut the flow off quickly and completely. Bins shall be constructed so that samples can be readily obtained. Bins for continuous mix plants shall be equipped with adequate telltale devices to indicate the position of the aggregates in the bins at the lower quarter points. Each compartment shall be designed to prevent the overflow of material into other bins.

(f) *Weigh Box or Hopper.* The plants shall have a weigh box of sufficient capacity to hold the maximum amount of the aggregate material for one batch. The weigh box or hopper shall be supported on fulcrums and knife edges, and constructed such that it cannot be easily thrown out of alignment or adjustment. Weighing hoppers must be free from contact with all edges, ends, sides, supporting rods or columns, or with other equipment that will in any way affect their proper functioning. In addition, there must be sufficient clearance between the hopper and supporting devices so that foreign materials will not accumulate. The discharge gate of the weigh box must be positioned to prevent aggregate separation when dumping in the mixer. If necessary, baffles shall be inserted or other means provided to discharge the materials in a blended condition.

(g) *Aggregate Scales.* Scales for the weighing of aggregates shall be of standard make and design and shall be accurate to 0.5% throughout their range. The scale shall consist of a digital readout connected to a load cell. All digital readouts shall be so located that they will be in plain view of the operator and the Engineer or the Engineer's agent. No weighing of aggregates shall be permitted where vibration from the plant mechanisms or any other source prevents accurate reading of the scale. The value of the gradations of scales weighing over 5000 lb (2250 kg) shall not be greater than 0.1% of the rated capacity of the scale.

(h) *Bitumen Scales.* The digital scale shall have a capacity of at least 15% in excess of the quantity of bituminous material used in a batch. The controls shall be constructed so that they may be locked at any setting and automatically reset to the reading after the addition of bituminous material to each batch. The readout shall be in full view of the mixer operator and the Engineer and the Engineer's agent and shall be graduated in increments not greater than 1 lb (0.45 kg). The flow of bituminous material shall be automatically controlled. All of the bituminous material required for one batch shall be discharged in not more than 20 seconds after the flow has started. The size and spacing of the spray bar openings shall provide a uniform application of bituminous material the full length of the mixer. The section of the bituminous line between the charging valve and spray bar shall be provided with a valve and outlet for checking the meter when a metering device is substituted for a bituminous material bucket.

The equipment used to measure the bituminous material shall be accurate to ±0.5%. The bituminous material bucket shall be a non-tilting type with a loose sheet metal cover. The length of the discharge opening or spray bar shall be adequately heated. The capacity of the bituminous material bucket shall be at least 15% in excess of the weight of bituminous material required in any batch. The plant shall have an adequately heated, quick acting, non-drip, charging valve located directly over the bituminous material bucket.

(i) *Test Weights.* The Contractor shall provide and have readily available at least 10 standard 50 lb weights (eleven standard 20 kg, one standard 5 kg, and two standard 1 kg weights), for checking the scales during operations.

The weighing equipment, in addition to complying with the above requirements, must have adjusting devices which will provide for the readjustment of any part that, being out of adjustment or balance, prevents the scale from functioning properly.

(j) *Asphalt Control System.* The proper amount of bituminous material in the mix, within the tolerance specified for the job mix, shall be provided by either weighing or metering.

Heating of asphalt cement shall be by steam coil, hot oil, or other approved methods. Under no circumstances shall a flame from oil or other fuel be permitted to come in direct contact with the heating tanks. The asphalt circulating system shall be sized to give proper and continual circulation of asphalt cement throughout the operating periods.

(k) *Thermometric Equipment.* An armored thermometer, reading within the ranges used, shall be fixed in the asphalt line at a suitable location near the weigh bucket discharge valve. The plant shall also be equipped with an approved dial scale thermometer and an electric pyrometer or other approved thermometric instrument placed at the discharge chute of the drier to automatically register and record the temperature of the heated aggregates. This device shall also be in full view of the burner controller or the head feeder. The Engineer reserves the right to judge the efficiency of the above instruments and direct the replacement of the instruments with some approved temperature recording apparatus. Further, the Engineer may require the Contractor to submit daily charts of the recorder2s readings.

(l) *Mixer Unit.* The mixer shall be a heat-jacketed, insulated, batch mixer, of the standard pugmill type, or an approved heat-jacketed, insulated, rotary drum-type mixer. Rotary mixers shall be equipped with a sufficient number of paddles or blades set in position to produce properly mixed batches of any material required under these Specifications. When the clearance in the twin pugmill exceeds 1" (25 mm), either the shortened blades or the worn liners (or both) shall be replaced to reduce the clearance to less than the allowable 1" (25 mm) maximum. The mixer shall be provided with an approved, accurate time lock that will lock the discharge gates until the specified mixing time has elapsed. In no case shall the rated capacity of the mixer specified on the manufacturer's name plate be exceeded. If sufficient mixing and coating is not obtained, the Engineer reserves the right to direct the Contractor to increase the mixing time. Deviations in sizes of batches will be permitted to provide for mixing batches 25% below the rated capacity of the mixer. When slag coarse aggregate is used, no increase will be permitted in the size of the batch above the rated capacity of the mixer.

(m) *Dust Collector.* All plants shall be equipped with an approved dust collector system. Provisions shall be made to waste the collected material or to return it uniformly to the aggregate mixture as directed. All State and local air pollution control regulations and ordinances shall be followed.

(n) *Safety Requirements.* An adequate and safe stairway to the mixer platform and guarded ladders shall be placed at all points required for accessibility to all plant operations. All gears, pulleys, chains, sprockets, and other dangerous moving parts shall be thoroughly guarded and protected. Ample and unobstructed space shall be provided on the mixing platform. A clear and unobstructed passage shall be maintained at all times in and around the truck loading space, and this space shall be kept free of drippings from the mixing platform. A platform shall be located at the truck loading space to permit easy and safe inspection of the mixture as it is delivered into the trucks. The platform and steps shall have safety handrails. Easy and safe access shall be provided to the location above the mixer where sampling of the aggregate in the bins is to take place. Adequate overhead protection shall be provided where necessary. All other Federal, State, or local safety requirements shall be followed.

(o) *Platform Truck Scales.* All plants shall be equipped with platform truck scales to weigh empty and loaded trucks. Truck scales shall be of approved design and kept in good condition. Scales shall be mounted in a concrete foundation that will ensure their remaining level and plumb. Scales shall be mounted to weigh the entire truck. All platform truck scales shall be approved by the appropriate Sealer of Weights and Measures and have seals attached at the beginning of each season or at such other times, as may be deemed necessary. Manufacturer's Certified Scale Checks may be accepted. Split weighing will not be approved.

823.11 Continuous Mixing Type. The use of continuous mixing plants will be permitted for the preparation of hot-mix bituminous concrete, provided such plants conform to the requirements listed below and to the general requirements for all plants.

(a) *Gradation Control Unit.* The plant shall include a means for accurately proportioning each size of aggregate by either weighing or volumetric measurement. When gradation control is by volume, the plant shall include feeders mounted under the compartment bins. Each bin shall have an accurately controlled individual gate to provide an orifice for volumetrically measuring the material drawn from each bin compartment. The orifice shall be rectangular with one dimension adjustable by a positive mechanical means, and shall be provided with a lock. Indicators shall be provided in each gate to show the gate opening in millimeters.

Mineral filler, if specified, shall be proportioned separately and added to the mix to obtain uniform distribution.

(b) *Weight Calibration of Bitumen and Aggregate Feed.* The plant shall include a means of calibrating gate openings and meters using weight test samples. The aggregate fed out of the bins through individual orifices shall be bypassed to a suitable test box, confining the material from each compartment in a separate box. The plant shall be equipped to conveniently handle test samples weighing up to 800 lb (360 kg) and to weigh them on accurate scales. Means shall be provided for calibrating the flow of bitumen.

(c) *Synchronization of Aggregate and Bitumen Feed.* Positive interlocking control between the flow of aggregate from the bins and the flow of bitumen from the meter or other proportioning source shall be provided. This device shall include a mechanical interlock or other positive method of accurate control.

(d) *Mixer Unit Continuous Method.* The plant shall include a continuous mixer of an approved twin pugmill type, heat-jacketed, and capable of producing a uniform mixture within the permissible variations from the job mix specifications. The angular position of the paddles on the shafts shall be adjustable, and the paddles shall be reversible to retard the flow of the mix. The mixer shall carry a manufacturer's plate giving the net volumetric contents of the mixer at the several heights inscribed on a permanent gauge and the rate of feed of aggregate per minute at plant operating speed.

Unless otherwise required, determination of mixing time shall be by the weights method under the following formula. The weights shall be determined for the job by tests made by the Engineer

$$\textit{Mixing Time}\ (s) = \frac{\textbf{Pugmill Dead Capacity In Pounds (kg)}}{\textbf{Pugmill Output in Pounds per Second } \left(\frac{\textbf{kg}}{s}\right)}$$

The production capacity of the continuous mix plant shall be not less than 75 tons (70 metric tons) per hour 42 lb/s (19 kg/s).

(e) *Discharge Hopper.* The discharge end of the pugmill shall be equipped with a hopper, or other approved device for truck loading that will eliminate segregation of the mixed material.

PROCEDURE FOR BATCH OR CONTINUOUS TYPE PLANTS.

823.12 Preparation of Asphalt Cement. All asphalt cement shall be uniformly heated in tanks to a temperature of 250 to 350 °F (120 to 175 °C). Asphalt shall be maintained within these temperature limits.

823.13 Preparation of Mineral Aggregates. Before entering the mixer, the aggregates shall be dried and heated to a temperature of not more than 375 °F (190 °C), except for recycled mixes. Flames used for drying and heating shall be properly adjusted to avoid injury to the aggregate.
Immediately after heating, the aggregates shall be screened into separate bins, ready for batching and mixing with asphalt cement.

823.14 Preparation of the Mixture. Each size of hot aggregate and the asphalt cement shall be weighed separately to accurately determine the correct portion of each constituent in the mix. The mixing temperature and tolerance will be given by the Department's Materials and Research Section for the type of material being produced.

The mixture shall consist of coarse aggregate, fine aggregate, mineral filler if required, and asphalt cement. The exact proportions within the limits specified shall be regulated to produce a satisfactory non-boiling mixture with all the particles fully coated.

After the hot fine and coarse aggregates are introduced into the twin pugmill, a minimum dry mix time of 6 seconds shall be required unless otherwise directed by the Engineer. The asphalt cement shall be added in an even sheet the full width of the mixing chamber. After the asphalt cement is added, mixing shall be continued for a minimum of 30 seconds, or until the aggregates are coated and well mixed.
The processed bituminous concrete mixture may be held in an approved storage system in accordance with Subsection 823.17.

823.15 Dryer-Drum Mixers. The plant shall be specifically designed for dryer-drum mixing and shall be capable of satisfactorily heating, drying, and mixing the bituminous mixtures. The aggregate shall enter the drum from the burner-end and shall travel parallel to the flame and the exhaust air stream. The system shall be equipped with automatic burner controls. Heating shall be controlled to prevent damage to the aggregate or the asphalt cement. The temperature of the mixture when discharged from the mixer shall be within the range specified by the Department's Materials and Research Section for the type mix being produced. The rate of flow through the drum shall be controlled to obtain a homogeneous mixture with uniformly-coated particles. In no case shall the quantity of mixture produced exceed the manufacturer's rated capacity.

Each cold feed bin shall have an adjustable gate with an indicator to reference the opening setting. A device shall be installed on each of the aggregate feeders to indicate when the flow of material from the bin is not sufficient to allow accurate proportioning through the feeder gates. These indicators shall be positive in action and shall actuate a clearly visible or audible signal to attract the plant operator's attention, and they shall stop the flow of materials to the drum when the level of material in the bin is too low for accurate proportioning. In addition, for those particular cold bins in which aggregate material tends to either bridge or lump together causing temporary interruptions in feeds, a vibrator or other suitable means shall be provided to ensure uniform flow out of bins so that aggregate material does not bridge or lump. All cold feed bins including mineral filler silos shall be accurate to 0.5% of the total weight delivered by that particular bin or silo. The order of aggregate feed onto the composite cold feed belt shall be from coarse to fine. An independently mounted scalping screen shall be installed if directed by the Engineer.

Asphalt cement shall be introduced through a continuously registering, cumulative indicating meter by a pump specifically designed for dryer-drum plants. The meter shall be located in the asphalt line to continuously register the asphalt discharge to the mixer and arranged to allow diversion of the discharge through the meter to a container for measurement. The meter shall be equipped with a nonsetback register and shall have an accuracy within 1% by weight of the material actually being measured in any given period of time. The temperature of the asphalt shall be monitored by a thermocouple which shall be calibrated prior to the annual asphalt feed calibration to within 4 °F (2 °C) of a certified mercury thermometer and shall have a digital display on the control panel. The accuracy of the pump and meter shall be verified annually and whenever designated by the Engineer with the Engineer's agent present to document the calibration.

The aggregate feed and the asphalt flow systems shall be interlocked by a blending system that automatically regulates the asphalt flow and immediately corrects for variations in aggregate flow. The system shall provide positive weight measurement of the combined cold aggregate feed by use of a belt scale. The combined cold aggregate feed shall be continuously recorded on a nonsetback register. Feed of material to the belt scale shall be controlled to ensure that the combined aggregate flow is between 50 and 100% of the rated capacity of the scales at normal operation. The plant shall be equipped so that the proportion of each aggregate can be individually varied. The plant shall also be equipped so that the total aggregate rate can be varied without affecting the proportions. The plant shall be equipped with a moisture compensating device in the control panel to automatically correct for the moisture in the aggregate passing over the belt scale. The plant shall be required to use the most recent moisture values obtained to ensure accurate asphalt proportioning. Moisture determinations for the combined aggregate will be made periodically during each day2s operation. The plant shall also be equipped with a device in the control panel to automatically correct for the specific gravity of the asphalt.

Safe, adequate, and convenient facilities shall be provided for obtaining representative asphalt and aggregate samples. The plant shall be equipped with a sampling device capable of providing a sample of sufficient size from the full width of the combined aggregate cold feed flow. The sampling device shall be designed so that samples may be taken while the plant is operating at normal production rates. Safe, adequate, and convenient facilities shall be provided for calibrating the asphalt flow and the aggregate flow. The manufacturer2s recommendations shall be followed for calibration. To calibrate the aggregate flow system, means shall be provided to permit a positive and uniform diversion of the aggregate in sufficient quantity to accurately check the weight of aggregate per period of time. To calibrate the asphalt metering system for proper proportioning, an asphalt distributor or other equipment approved by the Engineer shall be made available so that accurate tare, gross, and net weights may be obtained for the diverted asphalt discharge. The rate of flow of the total aggregate and asphalt flow shall not vary by more than 2.0% by weight from the required quantity of each.

The dryer-drum mixer shall be capable of simultaneously heating and mixing the introduced aggregate and asphalt to produce an acceptable, thoroughly coated mix meeting the required temperature and mix designs. Pyrometers or other thermometric instruments shall be located at the discharge chute of the dryer-drum mixer to automatically register the temperature of the mix.

823 HOT-MIX, HOT-LAID BITUMINOUS CONCRETE

Prior to mixing of hot-mix bituminous concrete in drum mix plants, the gradation of all stockpiled aggregate material shall be checked for grading requirements conforming to Section 813 and shall be approved prior to use. Aggregate from the approved stockpiles shall be selected based on a percentage of the stockpile sizes to meet the appropriate job mix formula gradation according to Subsections 823.20, 823.23, and 823.24. Samples from the cold feed conveyor shall be taken to ensure that the proper gradation requirements are being met prior to the addition of asphalt for production of hot-mix.

823.16 Antistripping Additive Blending - All Plants. Blending of the additive and asphalt cement shall be accomplished at the bituminous concrete production plant during the production of bituminous material, through the use of an approved in-line metering and blending system. The holding tank shall be thermostatically controlled for heat and shall have a recirculating line for uniform heat control. The additive temperature shall be maintained at a uniform mix temperature at least 24 hours prior to production to ensure uniform additive viscosity. There shall be a diverter valve in the recirculating line from the pump for calibration purposes, which shall deliver a full stream from the additive pump at a height equivalent to the addition input to the main asphalt line. Additive pumps shall be calibrated on a daily basis or whenever deemed necessary by the Engineer. The calibration shall be done by plant personnel and witnessed by a representative of the Department's Materials and Research Section.

823.17 Storage Systems - All Plants. The system shall be capable of conveying the hot-mixture from the plant to the storage bins and storing the hot-mixture without a reduction in temperature and with no segregation of the mix or oxidation of the asphalt. The mixture, as delivered for the work, shall comply with all specified quality requirements.

The conveyor system may be either a continuous or skip bucket type. The continuous type shall

be enclosed and heated to effectively control the mix temperature. The skip bucket type must be large enough to transport and mass dump an entire batch into the bins.

The storage bins shall be designed to prevent segregation of the mix during discharge from the conveyor into the bins. The bin discharge gates shall be designed to prevent segregation of the hotmixture while loading into trucks. Approval for the use of storage bins may be withdrawn when excessive heat gain or loss, uneven
heating, segregation of the aggregate, or migration or oxidation of the asphalt occurs due to the operation or use of storage bins. Mixtures may be retained in heated storage bins for 12 hours, provided that material and mixture qualities are maintained.

MIXTURE REQUIREMENTS.

823.18 Applicable Testing Methods. The following standards shall be used to test the qualities of the mixture.

AASHTO T 164	Method A, Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
AASHTO T 166	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
AASHTO T 209	Maximum Specific Gravity of Bituminous Paving Mixtures
AASHTO T 245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
AASHTO T 269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
AASHTO T 283	Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
AASHTO T 287	Asphalt Cement Content of Asphalt Concrete Mixtures by the Nuclear Method

Samples of the actual mixture in use will be taken as many times daily as determined by the Engineer. The mixture must be maintained uniform throughout the Project within the above tolerances. Should the mix produced not meet the above requirements or the Contract performance needs, changes in the mix design or mixing procedure shall be made immediately in a manner approved by the Engineer.

If an additional source of supply for materials is submitted and approved, the job mix formula shall be readjusted as necessary by the Contractor and submitted to the Engineer. All job mix formulas submitted and found unacceptable shall be readjusted to the satisfaction of the Engineer.

823.19 Job Mix Formula Types A, B, C, D, and E. The general composition limits prescribed in this Section are master ranges of tolerance to govern mixtures made from all raw materials conforming to the requirements of Sections 804 and 805. The composition limits are maximum and minimum in all cases. Closer control may be required for job materials used for specific projects according to the job mix formula. No work shall be started on the Contract, and no mixture will be accepted for the work, until the proposed job mix formula has been approved. The Contractor shall submit a written proposal indicating the single definite percentage for each sieve fraction of aggregate and for the asphalt that the Contractor chooses as the fixed percentage for each component in the mix. The proposal shall also indicate the temperature at which the Contractor shall furnish the mixture at the plant. The approval of the job mix formula shall bind the Contractor to furnish paving mixtures that not only meet the master ranges, but also meet the exact formula set for the Project, within the allowable tolerances.

823.20 Gradation for Job Mix Formula Types A, B, C, D, and E.

Sieve Size	Type A (%)	Type B (%)	Type C (%)	Types D & E (%)	Job Mix Tolerance (%)
2½" (63 mm)	100	- - -	- - -	- - -	±7
2" (60 mm)	90-100	- - -	- - -	- - -	±7
1½" (37.5 mm)	60-90	- - -	- - -	- - -	±7
1¼" (31.5 mm)	- - -	100	- - -	- - -	±7
1" (25.0 mm)	40-75	95-100	- - -	- - -	±7
3/4" (19.0 mm)	- - -	75-95	- - -	- - -	±7
1/2" (9.5 mm)	30-65	50-85	100	- - -	±7
3/8" (19.0 mm)	- - -	45-70	85-100	100	±7
#4 (4.75 mm)	20-45	30-50	50-75	80-100	±7
#8 (2.36 mm)	- - -	22-38	33-59	70-90	±4
#30 (600 µm)	- - -	9-23	14-32	30-55	±4
#50 (300 µm)	- - -	6-18	7-26	15-40	±4
#200 (75 µm)	2-10	3-10	3-10	5-15	±2
A.C., %	2.0-4.0	3.5-5.5	4.5-6.5	6.0-8.5	±0.4
Temp. °F	225-275	275-325	275-325	275-325	±20°F
Temp. °C	(107-135)	(135-163)	(135-163)	(135-163)	±11

The percentages for aggregates are based on the total weight of aggregate. The percentages for asphalt cement are based on the total weight of the mix.

Washed gradations of final products shall be used to determine the amount of No. 200 (75 µm) material. The washed dust to effective asphalt ratio shall be between 0.6 and 1.2 for the final mixture.

823.21 Marshall Properties for Job Mix Formula Types A, B, C, D, and E.

Specific Requirements	Mix Type			
	A	B	C	D & E
Air Voids, % (Compacted Specimen)	- - -	3.0-5.0	3.0-5.0	3.0-5.0
Stability, (minimum)	750lb (3.4 kN)	1000 lb (5.3 kN)	1000 lb (5.3 kN)	1000 lb (5.3 kN)
Flow, 0.01 in (0.25 mm)	8.0-20.0	8.0-20.0	8.0-20.0	8.0-20.0
Voids in Mineral Aggregate (VMA)*, % (minimum)	11.5	13.0	16.0	18.0

* The VMA shall be calculated from the combined bulk specific gravities of the aggregate and the actual asphalt cement content determined by the laboratory testing.

823.22 General Uses for Job Mix Formula Types A, B, C, D, and E.

Type A - Open plant mix base course
Type B - Dense graded base and binder course
Type C - Dense graded surface course
Type D - Fine, dense graded surface course
Type E - Curb mix

823.23 Bituminous Concrete Base Course Mixture. Mix and gradation requirements for the base course mixture shall be as follows:

(a) Mix Requirements:

Asphalt Content	3.0 - 4.5% of total mixture weight
Air Voids	3.0 - 6.0
Stability	1000 lb. (4.5 kN), minimum
Flow-	8.0 - 18.0 (0.01 in) [0.25 mm]

(b) Gradation Requirements:

Sieve Size	*Percent Passing*
1 ½" (37.5 mm)	100
3/4″ (19.0 mm)	75 - 100
3/8″ (9.5 mm)	48 - 80
No. 8 (2.36 mm)	20 - 48
No. 30 (600 µm)	10 - 30
No. 50 (300 µm)	7 - 25
No. 200 (75 µm)	3 - 10

During production of the base course mixture, the gradation of the aggregates may vary between the specified limits, but such variations shall be gradual. Sudden variation from coarse to fine and fine to coarse on any sieve will not be tolerated.

823.24 Plant Mix Open-Graded Wearing Surface Mixture. The open-graded wearing surface shall be composed of a mixture of approved aggregate and asphalt cement. Gradation shall be as follows:

Sieve Size	*Master Range Percent Passing*	*Tolerance from Job Mix (±)*
½″ (12.5 mm)	100	0
3/8″ (9.5 mm)	88 - 98	3
No. 4 (4.75 mm)	25 - 42	5
No. 8 (2.36 mm)	5 - 15	3
No. 200 (75 µm)	2 - 5	1.5

Asphalt cement shall be from 6.0 to 8.0% of the total mixture weight (to be determined by Laboratory Tests). The temperature of the asphalt cement shall not be greater than 310 ± 10 °F (154 ± 6 °C) when introduced into the mixer.

A heat-stable, antistripping additive conforming to the requirements of Subsection 823.05 shall be added to all asphalt cement used for open-graded surface course. The amount of the additive used shall be between 0.25 and 1.0% by weight of the asphalt cement as recommended by the additive manufacturer and approved by the Departments Materials and Research Section.

The additive shall be thoroughly and uniformly blended with the asphalt cement at the hot-mix production plant in accordance with Subsection 823.16.

The target temperature (± 10 °F) [±6 °C] of the mix leaving the mixer shall be established by the Department on the basis of laboratory tests. A target temperature of 240 ± 10 °F (116 ± 6 °C) is typical.

Aggregate shall conform to the requirements of Section 805, except slag will not be permitted. The use of limestone or serpentine aggregate or natural sand, washed or unwashed, is prohibited. The use of washed concrete sand is also prohibited.