PROJECT MANUAL
May 25, 2018

CONCRETE PAVING UNIT COST AS NEEDED
STORM DRAINAGE AT TPS MAINTENANCE

BID PACKAGE

BIDDING DOCUMENTS
PROJECT SPECIFICATIONS

INDEPENDENT SCHOOL DISTRICT NO. ONE
TULSA OKLAHOMA

Chris Hudgins, Executive Director Bond Projects
Charles C. Mason Education Service Center
3027 South New Haven
Tulsa, Oklahoma 74147-0208
Telephone (918) 746-6684
TULSA PUBLIC SCHOOLS

BID DOCUMENTS

SPECIFICATIONS AND DETAILS

For

CONCRETE PAVING UNIT COST AS NEEDED AND
STORM DRAINAGE AT TPS MAINTENANCE

BID OPENING DATE..........................June 14, 2018

BID TIME ........................................... 2:00 PM

NOTICE TO BIDDERS

Before submitting a bid, the Contractor shall carefully examine each of the school sites indicated above, paying particular attention to the existing conditions.

The specific bid documents defining the work involved on each project along with Tulsa Public Schools’ specifications and details form the basis of the work done and are to be included with the successful bidder.
# Project Manual

**Division 00 - Introductory Information and Bidding Documents**

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The following documents are not found in the project manual bid packet but are required to be a part of the contract – on file at owner’s office for bidder’s inspection upon request.

Owner-Contractor Agreement
Work Order
Tax Exempt State
SECTION 00010
SOLICITATION AND NOTICE FOR BIDS

Sealed Bids in duplicate for TULSA PUBLIC SCHOOLS – CONCRETE PAVING UNIT COST, AS NEEDED project will be received and publicly opened and read aloud by INDEPENDENT SCHOOL DISTRICT NUMBER ONE OF TULSA COUNTY, OKLAHOMA, hereinafter referred to as "Owner," in Room 407, the Bond Conference Room, Education Service Center, 3027 S. New Haven Ave, Tulsa, OK, 74114 until 2:00PM, JUNE 14, 2018.

The bidding process will be in compliance with the Public Competitive Bidding Act of 1974. Bids must be accompanied by a bid security in the amount of 5% of the bid. By this notice, all provisions of the act apply to this project and are incorporated into notice by reference.

Upon receipt of an acceptable bid, the contract will be awarded within thirty days after the opening of bids and the written contract executed within sixty days thereafter.

Contractor qualification statement must be submitted seven (7) calendar days prior to bid date to the Owner, if not currently on file.

Attention is called to the fact that a designated completion date for this project site will be established based on the number of calendar days, as stated in the accepted bid, required to complete the Project work. There will be a $2500 Liquidated Damages Clause for each day the contract is not completed. The scheduled completion date will be a very significant and material factor to the owner when selecting the Lowest Responsible Bid. Each Bidder must include (in the space provided on the Bid Form) the number of calendar days, which the Bidder will require to complete the specified Project.

Failure to comply with the above bid requirements will result in return of unopened Bid Proposal.

Bid Documents may be obtained from:
http://www.tulsaschools.org/Community/bond_bids.asp

Owner reserves the right to reject any or all bids and to waive informalities or minor irregularities in any bid.

INDEPENDENT SCHOOL DISTRICT NUMBER ONE OF TULSA COUNTY OKLAHOMA

By Ms. Suzanne Schreiber, Board President

ATTEST:

By Cindy Hutchings, Clerk
SECTION 0020

INSURANCE REQUIREMENTS

Contractor shall obtain insurance of the types and in the amounts described below. The insurance shall be written by insurance companies and on forms acceptable to Owner.

1). Commercial General and Excess Liability or Umbrella Liability Insurance:

Contractor shall maintain commercial general liability (CGL) and, if necessary, commercial excess liability or umbrella insurance with a limit of not less than $1,000,000 each occurrence. CGL insurance should contain a general aggregate with a $2,000,000 limit, and should apply separately to the Project.

   a) CGL insurance shall be written on an ISO occurrence form and shall cover liability arising from premises, operations, independent contractors, at a minimum, contractual liability equivalent to an intermediate form of contractual liability insurance, products/completed operations and personal injury and advertising injury;
   
   b) Owner shall be included as an additional insured on the CGL policy, using ISO Additional Insured Endorsement CG 20101185 or a substitute providing equivalent coverage, and under the commercial excess liability or umbrella, if any. This insurance, including insurance provided under the commercial excess liability or umbrella, if any, shall apply as primary insurance with respect to any other insurance or self insurance programs afforded to or maintained by Owner;
   
   c) There shall be no endorsement or modification of the CGL policy limiting the scope of coverage for liability arising from pollution, explosion, collapse or underground property damage;
   
   d) Waiver of Subrogation. Contractor waives all rights against Owner and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability, excess liability or umbrella liability insurance maintained pursuant to this agreement.

2). Business Auto and Excess Liability or Umbrella Liability Insurance:

Contractor shall maintain business auto liability and, if necessary, excess liability or umbrella liability insurance with a limit of not less than $1,000,000 each accident.

   a) Such insurance shall cover liability arising out of any auto (including owned, hired and non-owned autos);
   
   b) Business auto coverage shall be written on an ISO form. If necessary, the policy shall be endorsed to provide contractual liability coverage equivalent to that provided in the 1990 and later editions of CA 00 01;
   
   c) If the Contract Documents require Contractor to remove and haul hazardous waste from the project site or if the Project involves such similar environmental exposure, pollution liability coverage equivalent to that provided on the ISO Pollution Liability Broadened Coverage for Covered Autos Endorsement (CA 99 48) shall be provided, and the Motor Carrier Act Endorsement (MCS 90) shall be attached;
   
   d) Waiver of Subrogation. Contractor waives all rights against the Owner and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the business auto liability, excess liability or umbrella liability insurance obtained by Contractor pursuant to this Agreement or under any applicable auto physical damage coverage.

3). Workers Compensation Insurance

Contractors shall maintain workers compensation and employers liability insurance.

   a) The employers liability, and if necessary excess liability or umbrella insurance limits shall not be less than $1,000,000 each accident for bodily injury by accident or $1,000,000 each employee for bodily injury by disease;
b) The alternate employer endorsement (WC 00 03 01 A) shall be attached showing Owner in the schedule as the alternate employer.

4). Property Insurance

   a) Contractor shall purchase and maintain in force Builders Risk insurance for the entire Work. Such insurance shall be written in an amount at least equal to the initial contract sum as well as subsequent modifications of that sum. The insurance shall apply on a replacement cost basis and shall be written on a completed form.
   
   b) The insurance as required in subparagraph (a) shall name as insured the Owner, Contractor and all subcontractors and sub-subcontractors on the Project. The insurance policy shall contain a provision that the insurance will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Owner;
   
   c) The insurance as required in Subparagraph (a) shall cover the entire Work as outlined in the project specifications and shall also cover portions of the Work located away from the site but intended for use at the site and shall also cover portions of the Work in transit. The policy shall include as insured property scaffolding, false work and temporary buildings located at the site. The policy shall cover the cost of removing debris, including demolition, as any is made legally necessary by the operation of any law, ordinance or regulation.
   
   d) The insurance as required by this Paragraph shall be written to cover all risks of physical loss except those specifically excluded in the policy and shall insur at least against the perils of fire, lightning, explosion, windstorm or hail, smoke, aircraft or vehicles, riot or civil commotion, theft, vandalism, malicious mischief and collapse;
   
   e) Any deductible applicable to the insurance purchased in compliance with this Paragraph shall be paid by Owner;
   
   f) Before the commencement of Work, Contractor shall provide Owner a copy of the insurance policy obtained in compliance with this Paragraph;
   
   g) Waiver of Subrogation. Owner and Contractor waive all rights against each other and each of their subcontractors, sub-subcontractors, officer, directors, agents and employees for recovery for damages caused by fire and other perils to the extent covered by builders risk or property insurance purchased pursuant to the requirements of this Paragraph or any other property insurance applicable to the Work.
   
   h) Partial occupancy or use of the Work shall not commence until the insurance company or companies providing insurance as required in this Paragraph have consented to such partial occupancy or use. Owner and Contractor shall take reasonable steps to obtain consent of the insurance company or companies and agree to take no action, other than upon mutual written consent, with respect to occupancy or use of the Work that could lead to cancellation, lapse or reduction of insurance;

5) Evidence of Insurance

Prior to commencing the Work, Contractor shall furnish Owner with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, setting out compliance with the insurance requirements set forth above.

   a) All certificates shall provide for 30 days written notice to Owner prior to the cancellation or material change of any insurance referenced to herein;
   
   b) The words “endeavor to” and “but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives” shall be deleted from the cancellation provision of all certificates provided by the Contractor;
   
   c) Failure of Owner to demand such certificate or other evidence of full compliance with these insurance requirements or failure of Owner to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance;
   
   d) Owner shall have the right, but not the obligation to prohibit Contractor or any subcontractor from entering the Project site until such certificates or other evidence that insurance has been placed in the complete compliance with these requirements is received and approved by the Owner;
c) Failure to maintain the insurance in this Insurance Requirement Section shall constitute an event of default pursuant to this Agreement and shall allow Owner to terminate this Agreement to Owner’s option. If Contractor fails to maintain the insurance set forth herein, Owner shall have the right, but not the obligation, to purchase said insurance at Contractor’s expense;

f) Contractor shall provide certified copies of all insurance policies required above within 10 working days of Owner’s written request for said copies.


a) No Representation of Coverage Adequacy. By requiring the insurance as set out in the Insurance Requirement Section, Owner does not represent that coverage and limits will necessarily be adequate to protect Contractor and such coverage and limits shall not be deemed as a limitation on Contractor’s liability under the indemnities provided to Owner in this Agreement or any other provision of the Contract Documents;

b) Cross Liability Coverage. If Contractor’s liability policies do not contain the standard ISO separation of insureds provision or a substantially similar clause, they shall be endorsed to provide cross liability coverage;

c) The insurance requirements set out in this Insurance Requirement Section are independent from all other obligations of Contractor under this Agreement and apply whether or not required by any other provision of this Agreement;

d) Subcontractor’s Insurance. Contractor shall cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified in the Insurance Requirement Section. When requested by the Owner, Contractor shall furnish to Owner copies of certificates of insurance evidencing coverage for each subcontractor.

END OF SECTION
SECTION 00100

ADDITIONAL INSTRUCTIONS TO BIDDERS

1. DEFINITIONS:

Wherever the words herein defined, or pronouns used in the stead, occur in this contract and these specifications, they shall have the meanings herein given.

(a) The word “OWNER” shall mean the Independent School District Number One of Tulsa County, Oklahoma, a public corporation.

(b) The word “CONTRACTOR” shall mean the person, persons, Partnership, company, firm or corporation entering into the contract for the performance of the Work, and the legal representative of said party, or agent appointed to act for said party in the performance of the Work.

(c) The word “SURETY” or “SURETIES” shall mean the bondman or party of parties who have made sure the fulfillment of the requirement of the contract by bonds, including the Payment Bond, and whose signatures are attached to said bonds.

(d) The word “ADVERTISEMENT” shall mean all of the legal publications pertaining to the Work.

(e) The word “SPECIFICATIONS” shall mean, collectively, all of the terms and stipulations contained in those portions of the contract known as Instructions to Bidders, General, Mechanical and Electrical Specifications.

(f) The word “PLAN” shall mean, collectively, all of the drawings pertaining to the contract and made part thereof, and also such supplementary drawings as may be issued from time to time in order to elucidate the drawings or for the purpose of showing changes in the Work as authorized under the section “Changes and Alterations,” or for showing details which are not shown thereon.

(g) The words “CONTRACT PRICE” shall mean either the unit prices or unit price, or lump sum price, named in the contract or the total of all payments according to schedule or prices in the contract, as the case may be.

(h) The word “BID” or “BIDS” shall mean the written statements duly filed with the Clerk of Independent School District Number One of Tulsa County, Oklahoma, for the person or persons, partnership, company, firm or corporation proposing to do the Work and furnish materials called for on plans at the prices named on said statement.

(i) The word “CALENDAR DAYS” shall mean the actual days to complete the contract excluding days due to inclement weather.

2. BONDS:

If the Contract Price is in excess of $50,000.00, Contractor will furnish the following bonds: (i) a Payment Bond (the “statutory” bond required by Section I of Title 61, Okla. Stat., as amended) in an amount equal to 100% of the Contract Price; and (ii) a Performance Bond in such form as directed by Owner in an amount equal to 100% of the Contract Price for work on the project(s) as security for the proper and prompt completion of the Work in accordance with the contract and bidding documents; and (iii) a Warranty Bond in an amount equal to 100% of the Contract Price for work on the project(s) to protect Owner against defects in workmanship and materials for a period of one (1) year from Owner’s acceptance of the Project(s).

Where the Contract Price is $50,000.00 or less, the above bonds will not be required. However, in lieu of the Payment Bond, as to contracts where the Contract Price is $50,000.00 or less, Contractor shall submit, with each payment application, an affidavit of the payment of all indebtedness incurred by the Contractor,
Subcontractors, and all material men for labor, material, rental of machinery or equipment and repair of and parts for equipment as are used or consumed in the performance of the contract. The execution of the affidavit with knowledge that any of the contents of the affidavit are false, upon conviction, shall constitute perjury, punishable as provided by law. Copies of the affidavit form may be obtained from the Bond Office Room 430, Charles C. Mason Education Service Center, 3027 South New Haven Avenue, Tulsa, Oklahoma, 74147.

3. CORPORATE SURETY BONDS:
To be acceptable, a corporate surety bond (including both a bid bond and the payment/performance/warranty bonds of the successful bidder) must be signed by BOTH the bidder, as principal, and by a properly authorized representative of the bonding company. If the bonding company is a corporation, the bond must have attached a power of attorney from the corporation authorizing the person signing the bond on behalf of the bonding company to sign bonds for the bonding company. Only original executed instruments will be acceptable.

The corporate surety issuing the bond must be licensed by the Oklahoma State Insurance Commissioner to issue corporate surety bonds in the State of Oklahoma. The Owner reserves the right to require the bidder to submit evidence that the corporate Surety Company is so authorized. The Corporate Surety on all bonds of the successful bidder must be approved in the Treasury Department's Circular 570. If the Surety Company is not on the list, those bids shall be rejected. A bond written by an "offshore" (non-United States) surety company will not be acceptable.

4. LETTERS OF CREDIT:
If a bidder submits an irrevocable letter of credit in lieu of a bond (either a bid bond or a payment/performance/warranty bond), the irrevocable letter of credit must be issued by a financial institution having an office in the State of Oklahoma and insured by the Federal Deposit Insurance Corporation or Federal Savings and Loan Insurance Corporation. The letter of credit must be written on an approved form available from the Owner.

5. SPECIFICATIONS REGARDING EQUA:
It is not the intent of these documents to have closed specifications and the brand names shown are the desired materials to be used. The name of a certain brand, make or manufacturer does not restrict proposals to the specified brand, make or manufacturer named unless a brand, model or manufacturer is labeled “No Substitution” in the bid. It is not intended to exclude other products, but to convey the type, functional characteristics and quality of the item desired. Any item that the Owner, in its sole discretion, determines and approves to be the equal of that specified considering quality, workmanship, economy of operation and suitability for the purpose intended will be considered. Thus “equal” products of other manufacturers may be considered if the products meet or exceed the stated specifications, and if a detailed explanation of a claim of equivalency is submitted five (5) days prior to the bid opening. It will be the responsibility of the Bidder to provide data on all products so that the Owner can make the comparison and issue an addendum notifying all prospective bidders of the approved substitution.

6. COMPLETION:
Upon completion of the project, the Contractor will notify Owner and Owner’s Representative will make a final inspection of the work. The project shall be completed in good and workmanlike manner and to the satisfaction of the Owner.

7. ETHICS IN PUBLIC CONTRACTING:
By submitting their bid, Bidders certify that their bids are made without collusion or fraud and that they have not offered or received any kickbacks or inducements from any other bidder, supplier, manufacturer or subcontractor in connection with their proposal, and that they have not conferred on any public employee having official responsibility for this procurement transaction any payment, loan, subscription,
advance, deposit of money, services or anything of more than nominal value, present or promised unless consideration of substantially equal or greater value was exchanged.

8. NON-DISCRIMINATION:
Contractor agrees Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, age 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. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting for the provisions of this non-discrimination clause.

9. ERRORS OR OMISSIONS:
The Bidder shall not be allowed to take advantage of any errors or omissions in the specifications. Where they occur, the Bidder shall promptly notify the contact person listed. Inconsistencies in the specifications are to be reported before bids are submitted.

10. BID FORM:
The bid MUST be submitted on the bid form provided in the bid packet. A Xerox copy of this bid form is acceptable. All blanks must be completed.

11. OWNER’S RIGHT TO REJECT BIDS:
The Owner reserves the right to reject any or all bids and to waive informalities or minor irregularities in any bid. The Owner reserves the right to determine whether a bid is responsive and whether a particular bidder has the ability and resources to perform the contract in full and to complete the work of the Project in compliance with the plans and specifications. Decisions to accept or reject any bid, to waive informalities or minor irregularities or to accept substitutions or deviations from plans and specifications shall, subject to the mandatory provisions of the Public Competitive Bidding Act of 1974, rest within the sole discretion of the Owner and shall be conclusive and binding upon the Contractor and all subcontractors.

END OF SECTION
SECTION 00110

SPECIAL CONDITIONS OF THE CONTRACT

The following conditions also apply to this contract:

1. WORK COVERED UNDER THE CONTRACT:

   The scope of the work consists of all new materials, tools, equipment, labor and services, to complete the CONCRETE PAVING UNIT COST AS NEEDED & STORM DRAINAGE AT TPS MAINTENANCE, listed in the "Solicitation and Notice for Bids" in accordance with the "Form of Proposal" and as indicated by the Drawings and by the Specifications included in this Project Manual.

2. MATERIALS AND EQUIPMENT:

   All material and equipment utilized shall be in conformance with these Specifications and with good Standards of practice and shall meet or exceed the latest applicable industry standards such as A.S.T.M., Standards and Specifications along with all applicable local and national codes and ordinances, including B.O.C.A., N.E.C. and N.F.P.A.

   Failure to comply with the terms and conditions of this solicitation or to deliver equipment, supplies or services identified in the Solicitation and Contract at the discount quoted will void the contract award. In the case of failure to deliver goods or provide services in accordance with the contract terms and conditions, Owner, after due oral or written notice, may procure them from other sources and hold the contractor responsible for any resulting additional purchase and administrative costs.

3. CONTRACT METHOD:

   The method of Contract and Management shall be in accordance with the Owner's requirements and guidelines set forth at the time the Contract is signed and a Work Order issued.

4. CONTRACT ADMINISTRATOR:

   This individual shall serve as the monitor of the conditions of the contract and shall work directly with the contractor to schedule and coordinate the performance of services and to provide general direction under the resulting contract. The following individual is identified to use all powers under the contract to enforce its faithful performance for the Owner: Chris Hudgins, Project Supervisor, (918) 746-6684.

5. PRIORITIES AND WORK SEQUENCE:

   The priority will be furnished by the Owner to the successful bidder at the issuance of the Work Order. Completion of the project(s) in a timely manner is critical. The bidder is required to commit to an actual number of days to reach substantial completion of the Project. The number of days bid between the notice to proceed and substantial completion of the Project will be a consideration in determining the successful bidder.

6. CONTRACTOR'S USE OF PREMISES:

   The contractor shall also furnish a schedule of intended workdays to the owner through the Contract Administrator prior to commencing the work at any site and keep all parties informed of any adjustments made necessary by changes of shipping schedules or other causes.
Permission must be obtained from the Owner for temporary use of electric power, water, toilet facilities or other utilities. The Owner's approval must also be obtained for the exact on-site location of any storage of materials, tools or equipment. Owner assumes no responsibility for items stored on school property.

Demolition items and/or debris shall be hauled away from the site after each day's activity and the site always maintained in a clean condition free of any build-up of objectionable scraps, waste material or refuse.

7. **OWNER OCCUPANCY AND PROTECTION OF PROPERTY:**

The owner's Site-based Personnel may occupy portions of the Project site. Therefore, it may be necessary to erect a system of barricades or markers to direct traffic away from the work area for each day's operations. The Contractor shall protect and safeguard against damage to all adjacent or nearby surfaces, materials, hardware, glass, furnishings, signage or other site improvements and/or vehicles if in the area of intended loading and unloading operations.

8. **SALES TAX:** (None Required)

The Contractor is entitled to an exemption from sales tax for materials purchased in order to complete work required by this Contract pursuant to the provisions of OCLA. STAT. tit. 68, § 1356(10). Contractors are advised to omit the State Sales Tax when preparing their Bid.

9. **PROJECT START-UP:**

The contractor shall receive the Owner's Notice to Proceed in advance of commencing the work on the site.

10. **KNOWLEDGE OF SITE AND SCOPE OF WORK REQUIREMENTS:**

All Contractors shall visit the site on which work is proposed and become thoroughly familiar with the existing conditions and with the Bid Documents and the Scope of the Work included prior to submitting their bid. Sign in at the main office when visiting the site(s).

11. **SUBMITTALS AND CLOSING PROCEDURES:**

(Other than Start-up Contract Requirements such as Certificates of Insurance, Bonds, etc.)

A. Submit Schedules of intended workdays and activity planned for each site after receiving Owner's Project Priority list prior to commencing work. Shop drawings and/or product data and samples shall be submitted to Tulsa Public Schools' Contract Administrator covering all items in the Scope of Work for approval prior to manufacture, shipment and installation at the Project site. Submit the number of copies, which the contractor requires plus one copy, which will be retained by Tulsa Public Schools. Furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

B. Unless the contract stipulates "Payment upon Completion" of the project or another method of payment; during Progress of the work, submit a separate "Application and Certificate for Payment"-AIA Document G702 on or about the 25th day of each month for work performed in that same month. A 5% retention shall be calculated and withheld from each Pay Application until the project is substantially complete.

C. Upon Final Completion and Final Acceptance by Owner, submit the following prepared and properly signed Closing Documents:
1. Certificate of Substantial Completion  
   (AIA Document G704)
2. Final Application and Certificate for Payment  
   (AIA Document G702)
3. Contractor’s Affidavit of Payment of Debts  
   and Claims (AIA Document G706)
4. Contractor’s Affidavit of Release of Liens  
   (AIA Document G706A)
5. Consent of Surety Company to Final Payment  
   (AIA Document G707)
6. Contractor’s Affidavit Pursuant to Title 61  
   O.S. - Optional in lieu of items 3 above.
7. Contractor’s Written Warranty for one (1) year against defects in Material or  
   Workmanship.

12. **SUBSTITUTIONS AND DEVIATIONS FROM THE SPECIFICATIONS:**

   Substitutions prior to Bid are covered under Paragraph 5 “Instructions to Bidders”. Any substitution  
   or deviation from the specifications shall not be made without Owner’s prior approval and pursuant  
   to an approved change order stipulating the change in price and change in construction time, if any.

13. **OWNER’S RIGHT TO REJECT BIDS:**

   The Owner reserves the right to reject any or all bids and to waive minor irregularities in any bid. In  
   addition, Bidders should recognize the right of the Owner to reject a bid if said bidder fails to  
   provide any data required in the bid or if the bid is in any way incomplete.

14. **FINAL CLEANING:**

   A. Execute prior to final inspection.
   
   B. Clean surfaces exposed to view; remove temporary labels, stains and foreign substances and  
      polish transparent and glossy surfaces. Clean equipment and fixtures, sweep and vacuum  
      interior areas and rake clean exterior areas. Remove waste and surplus materials, rubbish and  
      construction facilities from the Project and from the site.

15. **SPECIAL TERMS AND CONDITIONS:**

   15.1 **Testing and Inspections:** Owner reserves the right to conduct any test or inspection it may  
        deem advisable to assure supplies and services conform to specifications.
   
   15.2 **Proprietary Indemnity:** Contractor warrants that all products and services used by or  
        furnished by Contractor, do not infringe upon or violate any patent, copyright, trade, secret,  
        trademark, or any other proprietary right of any third party. In the event of claim against  
        Owner, Owner shall promptly notify Contractor and Contractor shall defend and indemnify  
        Owner against any loss, cost expense, claim, or liability arising out of such claim, whether  
        or not such claim is successful.
15.3 Patent and Copyright Materials: Unless otherwise expressly provided in a contract, Contractor shall be solely responsible for clearing the right to use any patented or copyrighted materials in the performance of this contract.

15.4 Audit: Contractor hereby agrees to retain all books, records and other documents relative to this contract for five (5) years after final payment or until audited by the owner, whichever is sooner. Owner, its authorized agents and/or auditors reserve the right to perform or have performed an audit of contractor’s records and therefore shall have full access to the right to examine any of said materials within those five years.

15.5 Open Records: Ownership of all data, materials and documentation originated and prepared for the Owner pursuant to this bid shall belong exclusively to Owner and be subject to inspections in accordance with the Oklahoma Open Records Act.

15.6 Contractor Compliance: Contractor shall comply with all procedural instructions that may be issued from time to time by Owner; however, the terms and conditions of the contract will not change.

15.7 Lead Based Paint: Contractor shall be certified and follow work practices established under the UPA Renovation, Repairing and Painting Program applicable to schools when performing any work which will disturb interior or exterior lead based surface coatings in buildings constructed before 1978. All such work shall be performed in compliance with 40 CFR Part 745.

END OF SECTION
SECTION 00120
SUPPLEMENTAL CONDITIONS TO THE CONTRACT

Standard form “General Conditions of the Contract for Construction,” The American Institute of Architects, Document A201, Fourteenth Edition, 1997, (“General Conditions”) shall apply to the Work, except insofar as the General Conditions are modified, amended, waived, or changed by these Supplementary General Conditions. The following paragraph numbers refer to the paragraphs in the above referenced “General Conditions”:

1.1.1 The last sentence is amended to read as follows: “The Contract Documents include the advertisement or invitation to bid, notice to bidders, instructions to bidders, sample forms, the Contractor’s bid or proposal, any addenda relating to the foregoing and any other documents specifically enumerated in the Owner-Contractor Agreement.”

2.2.5 Delete entire Subparagraph, and substitute the following:

"The Owner shall furnish Contractor with twenty-five (25) copies of Drawings and Project Manuals. Additional copies needed by the Contractor shall be provided and paid for by the Contractor."

3.6.1 Amended by adding the following “Contractor assumes full responsibility for the payment of all contributions and payroll taxes (State and Federal) for all employees engaged on the Work and provide proof of worker compensation coverage for all employees.

3.7.1 Amended to read as follows: “When applicable, Contractor shall secure all permits, licenses and inspections necessary for the proper execution and completion of the Work. Owner will not reimburse Contractor for any fees paid by Contractor for permits and inspections.”

4.3.1 Delete entire Subparagraph, and substitute the following:

"Definition"

"A Claim is any demand or assertion by the Contractor that it should be paid more money than the Contract Sum, as adjusted under the Change Order provisions herein, by the Owner because of action or inaction on the part of Owner, Program Manager, Architect, or any party for whom Owner is responsible, or any party with whom Owner has separately contracted for other portions of the Project, including, but not limited to, any demand or assertion that Contractor’s performance has been delayed, interrupted or interfered with, that Contractor’s performance has been accelerated or suspended, that Contractor’s performance has been wrongfully terminated, that the Contract Documents have been misinterpreted, that there has been a failure of payment, that Contractor has encountered concealed or unknown conditions, that Contractor has encountered hazardous materials, that there are problems with the Contract Documents, or the timing of Architectural approvals or decisions, that actions of the Owner have been intentionally wrongful or deceptive, that Owner is directly or indirectly guilty of negligence or an intentional tort related in any way to the Work, that the amount of time or money granted in a Construction Change Directive is inadequate, that an item treated as a minor change in the Work should have been treated as a Change Order, that a time extension grant was inadequate, or that Contractor is entitled to any other relief, on any legal theory, related to the Work and the Contract."

"Notice Requirement"

"Within five (5) days of the first occurrence of an event that Contractor has any reason to believe might result in a Claim, or within five (5) days of Contractor's discovery of the first occurrence of
an event that Contractor has any reason to believe might result in a Claim, if the first occurrence of
the event was willfully hidden from the Contractor, the Contractor shall file a written document
clearly captioned "Notice of Claim" with Tulsa Public Schools, Program Manager and the
Architect. The notice shall clearly set out the specific matter of complaint, and the impact or
damages which may occur or have occurred as a result thereof, to the extent the impact or
damages can be assessed at the time of the notice. If the impact or damages cannot be assessed as
of the date of the notice, the notice shall be amended at the earliest date this is reasonably
possible.

Add the following Subparagraph:

"Any claim or portion of a Claim that has not been made the specific subject of a notice strictly in
accordance with the requirements of this section shall be waived. It is imperative that Owner have
timely, specific notice of any subject, the impact of which Owner may be in a position to
mitigate."

4.3.3 Add the following sentences:

"Claims Handling During Construction. After receipt of a Notice of Claim, the Owner may elect
to refer the matter to the Architect, Program Manager or another party for review. Contractor will
attend meetings called to review and discuss the Claims and mitigation of the problem, and shall
furnish any reasonable factual backup for the Claim requested. The Owner may also elect to defer
consideration of the Claim until the Work is completed, in which case the same review options
shall be available to the Owner at the completion of the Work. At any stage the Owner is entitled
to refer a Claim to mediation under the Construction Industry Mediation Rules of the American
Arbitration Association, and if this reference is made Contractor and the Owner will take part in
the mediation process. The filing, mediation or rejection of a Claim does not entitle Contractor to
stop performance of the Work. The Contractor shall proceed diligently with performance of the
Contract."

4.3.6.1 Add the following Subparagraph:

"Calculating Claim Amount"

"In calculating the amount of any Claim the following standards will apply:

1. No indirect or consequential damages will be allowed.

2. All damages must be directly and specifically shown to be caused by a proven wrong.
No recovery shall be based on a comparison of planned expenditures to total actual
expenditures, or on estimated losses of labor efficiency, or on a comparison of planned
manpower to actual manpower, or any other analysis that is used to shown damages
indirectly.

3. Damages are limited to extra costs specifically shown to have been directly caused by a
proven wrong.

4. The maximum daily limit on any recovery for delay shall be the amount estimated by the
Contractor for job overhead costs divided by the total number of calendar days of
Contract Time called for in the original Contract."

5. No monetary costs shall be allowed for delay.

5.2.1 In the first sentence, delete "as soon as practicable" and substitute "within seventy-two (72)
hours."

00120-2
5.2.5 Add this new Subparagraph:

"The Contractor shall not subcontract the work as a whole. The approval of Subcontractors in no way relieves the Contractor from full responsibility for performance and completion of the Work and its obligations under the Contract Documents."

5.3.1 Delete the remainder of the second sentence beginning with the words "and shall allow to the Subcontractor."

5.4.2 Delete entire Subparagraph and substitute the following:

"Owner shall only be responsible for compensating Subcontractors for work done or materials furnished after the date Owner gives written notice of its acceptance of the subcontract agreement."

5.5 Add this new Paragraph:

5.5 "RESPONSIBILITY"

5.5.1 "Contractor shall be fully responsible for the performance of its Subcontractors.

6.1.1 Delete the entire Subparagraph, and substitute the following:

"The Owner reserves the right to perform other construction work, maintenance and repair work and school program operations at the site and near the site during the time period of the Work. Owner may perform other work with separate contractors or with its own forces. On renovation/addition projects, the Owner shall have access to the site and all buildings on the site at all times. On new construction, the Owner shall have access to the site and all buildings during normal business hours."

8.3.1 Amended to read as follows: "The Contractor shall not be entitled to compensation for any loss, cost or expense, sustained by reason of delay in completion of the Work from any cause whatever."

10.1.2 Add this new Subparagraph:

"The Contractor shall be responsible for the protection and security of the Work and the Project, until he receives written notification that the Substantial Completion of the work has been accepted by the Tulsa Public Schools."

10.2.8 Add this new Subparagraph:

"In an emergency affecting the safety of persons or property, the Contractor shall notify the Owner, Program Manager and Architect immediately of the emergency, simultaneously acting at his discretion to prevent damage, injury, or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 4.3 and Article 7."

10.3.1 Delete entire Subparagraph and substitute the following:

"Contractor is responsible for reviewing all Asbestos Hazard Emergency Act Management Plans on file with Owner and for obtaining sign-off from Tulsa Public Schools Hazardous Materials Bureau prior to commencing the Work. In no event shall the Contractor engage in the disturbance or removal of asbestos or polychlorinated biphenyl (PCB). In the event the Contractor encounters on the site material reasonably believed to be asbestos or PCB which has not been rendered
harmless, the Contractor shall immediately stop work in the area affected and report the condition
to the Architect in writing. If the portion of the Work that is stopped is critical to overall
completion, the Contractor shall reschedule the Work, if possible, to minimize the impact of the
stoppage. The work in the affected area shall not thereafter be resumed except by written
agreement of the Owner and Contractor if in fact the material is asbestos or PCB and has not been
rendered harmless. The work in the affected area shall be resumed when the asbestos or
polychlorinated biphenyl (PCB) has been removed, or when it has been rendered harmless. If the
Work is stopped due to the presence of such materials, Owner shall arrange for the removal and/or
rendering harmless of such materials prior to Contractor being allowed to proceed. The Owner
shall have the option of arranging for removal by a qualified, adequately insured third party
tendered to Contractor, and mutually agreed to by both parties, as a Subcontractor in which case a
Change Order will be issued for the cost of this subcontract. Any tendered Subcontractor must
indemnify the Contractor and the Owner with regard to its work. In the case of such a tender,
Owner will not hold Contractor responsible for the work or other actions of the tendered
Subcontractor, and Contractor's approval of tendered Subcontractor shall not be unreasonably
withheld. In those instances in which the presence of such materials was set forth in the
Hazardous Materials documents or in which Contractor had other notice of such through
information given to Contractor by Owner or its representative prior to the commencement of the
Work, Contractor shall not be entitled to a Claim for any delays, disruption or interference it
encounters. In those instances of work stoppage due to the existence of such hazardous materials
which were not set forth in the Hazardous Materials Control plans and of which Contractor had no
other prior notice, Contractor may be entitled to a Claim for extension of time due to the work
stoppage.”

11.3.1 Amended to read as follows: “The Contractor shall purchase and maintain, at Contractor’s
expense, property insurance upon the entire Work at the site to the full insurable value thereof.
This insurance shall include the interests of Owner, Contractor, Subcontractor and Sub-
subcontractors in the Work and shall insure against perils of fire and extended coverage on a
‘broad-form, all risk’ basis for physical loss of damage, including theft, vandalism and malicious
mischief. Such insurance shall be purchased from a carrier licensed to do business in the State of
Oklahoma. Certificates of such insurance shall be delivered to the Department Manager of
Building Planning, Maintenance and Plant Operations of Owner prior to commencement of the
Work. Said certificates shall provide that the carrier must give Owner at least thirty (30) days
prior written notice before cancellation or reduction of the coverage for any reason. If not covered
by the above insurance, Contractor shall also purchase and maintain similar coverage on portions
of the Work stored off site or in transit when such portions of the Work are to be included in an
Application for Payment under Subparagraph 9.3.2. Until substantial completion of the Work, all
risk of loss shall be upon Contractor.”

11.3.4 Eliminated.

11.4 PROPERTY INSURANCE

11.4.1 Delete entire Subparagraph, and substitute the following:

"Until the Work is completed and accepted by the Owner, the Contractor shall purchase and
maintain property insurance upon the entire Work at the site to the full insurable value thereof.
The property insurance shall also cover portions of the Work stored off site after written approval
of the Owner of the value established in the approval, and also portions of the Work in transit.
This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-
subcontractors in the Work and shall insure against the perils of fire and extended coverage
including flood and earthquake and shall include "all risk" insurance for physical loss or damage
including, without duplication of coverage, theft, vandalism and malicious mischief. The
insurance shall cover reasonable compensation for Architect’s and Program Manager’s services
and expenses required as a result of an insured loss. This “all risk” policy shall be written
incorporating Actual Completed Value Form and General Change Endorsement incorporating the
following language:

"Permission is given for the Project insured hereunder to become occupied, the insurance
remaining in full force and effect until such time as the Project has been accepted by the Owner,
all as currently approved by the Laws for the State of Oklahoma."

"The policy shall include coverage for Explosion, Collapse and Underground (XCU). Such
insurance shall be evidenced by the kind of policy which does not have to be adjusted or reported
upon periodically but provides constant insurance at full one hundred percent (100%) of all
insurable values as they are created during construction by performance of the Contract. The
Certificate of Insurance must include the names of the insured Contractor and the Tulsa Public
Schools."

11.4.1.2 **Delete** entire Clause, and substitute the following:

"Loss under such All Risk Builder's Risk Insurance shall be made payable jointly to the Tulsa
Public Schools and to the Contractor by name (and, if separate mechanical contracts are awarded
to each, by name, of the plumbing, heating, ventilating and electric contractors)."

11.4.1.3 **Delete** entire Clause, and substitute the following:

"In the case of loss under the risks covered, and of collection by insured, the Owner shall act as
trustee for all parties concerned as their interests may appear."

12.1.3 **Add** this new Clause:

"Where nonconforming work is found, the entire area of work involved shall be corrected unless
the contractor can completely define the limits to the Architect's satisfaction. Additional testing,
sampling, or inspecting needed to define nonconforming work shall be at the Contractor's expense.
He shall employ the Owner's testing laboratory if such services are reasonably required by the
Architect. All corrected work shall be retested at the contractor's expense. Extra Architectural or
Program Manager Services required to analyze nonconforming work shall be paid for by the
Contractor."

13.1.1 **Delete** entire Subparagraph, and substitute the following:

“District Court in and for the County of Tulsa, State of Oklahoma shall have sole jurisdiction in
any action brought under this contract.”

13.6.1 Amended to read as follows: "Any moneys not paid within thirty (30) days after they become due
and payable under the terms of this Contract shall bear interest at the rate of six percent (6%) per
annum from and after said thirty (30) day period."

14.2.5 **Add** this new Subparagraph:

"If a Performance Bond has been furnished and the Contractor is declared by the Owner to be in
default under the Contract, the Surety shall promptly remedy the default by completing the
Contract in accordance with its terms and conditions, or by obtaining a bid or bids in accordance
with its terms and conditions. Upon determination by the Owner and the Surety of the lowest
responsible bidder, the Surety will arrange for a contract between such bidder and the Owner, and
make available as work progresses sufficient funds to pay the cost of completion less the balance
of the Contract Sum, but not exceeding the Penal Sum of the bond and other costs and damages
for which the Surety may be liable under the bond. The phrase 'balance of the Contract Sum' as
used herein shall mean the total amount payable by the Owner to the Contractor under the
Contract and amendments thereto less the amount previously paid by the Owner to the Contractor.

END OF SECTION
BID PACKAGE
FORM OF PROPOSAL

For

CONCRETE PAVING UNIT COST AS NEEDED & STORM DRAINAGE AT TPS MAINTENANCE

BID OPENING AT 2:00 PM, THURSDAY, JUNE 14, 2018

CONTRACTORS WILL NOTE THAT A PROPOSAL MUST BE MADE ON THIS FORM. OTHER PROPOSALS WILL NOT BE ACCEPTED. COMPLETE ALL BLANKS. ALL BID PRICES SHALL BE IN BOTH FIGURES AND IN WRITING. PROPOSALS SHALL BE ENCLOSED IN A SEALED ENVELOPE, MARKED ON THE OUTSIDE “SEALED BID: CONCRETE PAVING UNIT COST AS NEEDED & STORM DRAINAGE AT TPS MAINTENANCE. ALSO INCLUDE COMPANY NAME, ADDRESS & PHONE NUMBER

Selection of the successful bidder will be based on the lowest responsible bid taking into consideration the number of calendar days bid to reach substantial completion of the Work. The Owner reserves the right to reject any or all bids and to waive informalities and minor irregularities in any bid.
Dear School Board Members:

The undersigned Contractor, in compliance with your Solicitation and Notice for Bids and Instructions to Bidders contained in the Bid documents for CONCRETE PAVING UNIT COST AS NEEDED & STORM DRAINAGE AT TPS MAINTENANCE in Tulsa, County, Oklahoma, having examined the Specifications, Drawings, details, and Scope of Work, and areas where the work is proposed, and being familiar with all of the work required at the Project site(s), hereby proposes to furnish all labor, materials, tools, equipment, supplies and services to complete the Project(s) within the time set forth in this Proposal for the price as herein stated. The price(s) indicated is to cover all expenses incurred in performing all of the work required under the Contract Documents of which this Proposal is a part. The Concrete Paving Unit Cost As Needed contract is good for the period of time beginning July 1, 2018 and ending June 30, 2019. The scope of work is estimated at $850,000.00. At the end of the first year, the district has the option to extend the contract for an additional year with a 2% maximum increase per unit. Contractor will be required to provide a Bid Security in the amount of 10% of contract or a Notarized Letter from a Bonding Company in the amount of $10% of contract.

If awarded a contract for the Projects the undersigned agrees as follows:

1. To furnish a Contractor’s Written Warranty which will warranty the Project(s) for a period of one (1) year after substantial completion and acceptance by Owner against all defects in materials and workmanship.

2. To furnish all other insurance and Bonds required as indicated in the “Solicitation and Notice for Bids” in the amount equal to the Total Contract Price.

3. To furnish a monthly Application and Certificate for Payment (AIA Documents G702) and Certificate of Substantial Completion (AIA Document G704) for the project(s) based on the contract bid price indicated on this proposal.

The bidder acknowledges the following Addendum: ______, ______, ______, ______.

OUR BID FOR COMPLETING THE REQUIRED WORK DEFINED ABOVE AND DESCRIBED IN THESE BID DOCUMENTS IS AS FOLLOWS:
**BID FORM**

**Base Bid:**
Base bid to furnish all labor and materials in accordance with the Plans and Specifications for construction of the above-described Project.

** ASPHALT PAVING **

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>2&quot; type &quot;A&quot; (after rolling)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>3&quot; type &quot;A&quot; (after rolling)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>3&quot; type &quot;B&quot; (after rolling)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>4&quot; Type &quot;B&quot; (after rolling)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>2&quot; Type &quot;C&quot; (after rolling)</td>
<td>$</td>
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<td>3&quot; Type &quot;C&quot; (after rolling)</td>
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<tr>
<td>6&quot; Washed Rock</td>
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<tr>
<td>6&quot; Crushed Limestone</td>
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<tr>
<td>Seal Coating</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Crack Fuller</td>
<td>$</td>
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** MISCELLANEOUS **

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<tr>
<th>Item Description</th>
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<tbody>
<tr>
<td>Parking Lot Marking</td>
<td>$</td>
<td>Lineal Foot</td>
</tr>
<tr>
<td>6&quot; Curb &amp; Guttering Including all Forms &amp; Excavation</td>
<td>$</td>
<td>Lineal Foot</td>
</tr>
<tr>
<td>Parking Bumpers</td>
<td>$</td>
<td>Each</td>
</tr>
<tr>
<td>Tack Coating</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Dirt Work/Excavation (4&quot; Lifts)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Top Soil</td>
<td>$</td>
<td>Per Load</td>
</tr>
<tr>
<td>Sandy Loam</td>
<td>$</td>
<td>Per Load</td>
</tr>
<tr>
<td>Sod - Installed</td>
<td>$</td>
<td>Square Foot</td>
</tr>
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</table>

** CONCRETE WORK **

<table>
<thead>
<tr>
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<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; Concrete (per TPS specification)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>6&quot; Concrete (per TPS specification)</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>4' Sidewalk - 4&quot; thick - Include All Forms &amp; Excavation</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>6' Sidewalk - 4&quot; thick - Include All Forms &amp; Excavation</td>
<td>$</td>
<td>Square Foot</td>
</tr>
<tr>
<td>Saw Cut</td>
<td>$</td>
<td>Lineal foot</td>
</tr>
<tr>
<td>Rebar #4 per 20' stick</td>
<td>$</td>
<td>Per Stick</td>
</tr>
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</table>

** TRASH PAD **

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<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>12&quot; X 35' X 8&quot; Thick - Include #3 Bars @ 16&quot; O.C. and 6&quot; base and 4000# concrete (include all forms)</td>
<td>$</td>
<td>Each</td>
</tr>
</tbody>
</table>

0130-3
FORM WORK
2" x 4" Installed $ _______ Lineal Foot
2" x 6" Installed $ _______ Lineal Foot

LABOR
General Labor $ _______ Per Hour

TRIP CHARGE (if job is less than $2,500) $ _______ Total Fee
DUMP TRUCK $ _______ Per Hour
MATERIAL MARK-UP FEE ON EXTRAS $ _______ Percentage
BACK HOE $ _______ Per Hour
SKID LOADER $ _______ Per Hour
% Markup for permit cost $ _______

Storm Drainage @ TPS Maintenance
Base Bid

Time of Completion:

If awarded the contract, the undersigned agrees to complete the Work on the Project described in the Base Bid, to substantial completion, within the following number of calendar days from the date specified in the Notice to Proceed: _______ CALENDAR DAYS

We have included the following sworn and notarized bid affidavits and bid security. They are attached to this proposal:

1. Bid Bond, Certified Cashier's Check or other approved security as listed in the "Solicitation and Notice for Bids" and "Instructions to Bidders," in the amount of five (5%) of the bid.
2. Non-Collusion Affidavits
3. Business Relationship Affidavit
4. Non-Discrimination Affidavit
5. Felony Statement
6. No Kick Back Statement
7. Contractor's Qualification Statement (completed and submitted seven days prior to bid)

In submitting this Bid, the undersigned agrees that the Bid will not be withdrawn for a period of thirty (30) calendar days from the date hereof and it is understood that the right is reserved by the Owner to reject any and all Bids and to waive informalities and irregularities.

Respectfully submitted

Seal if Bid is by Corporation

Company

0130-4
By

Title

Address

City, State, Zip

Area Code & Telephone Number

Company ID

Note: When submitting your bid, all blanks on this form must be filled in.
Bid Bond

THIS DOCUMENT HAS IMPRACTICAL LEGAL CONSEQUENCES: CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT A121.

KNOW ALL MEN BY THESE PRESENTS, that we (Here insert full name and address or legal title of Contractor) as principal, hereinafter called the Principal, and (Here insert full name and address or legal title of Surety) as Surety, hereinafter called the Surety, are held and firmly bound unto (Here insert full name and address or legal title of Owner) as Obligee, hereinafter called the Obligee, in the sum of Dollars ($), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for (Here insert full name, address, and description of project)

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this day of 20

(Principal) (Seal)

(Witness)

(Title)

(Surety) (Seal)

(Witness)

(Title)

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STATE OF OKLAHOMA
COUNTY OF TULSA

__________________________, of lawful age, being first duly sworn, on oath says that
(she)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder has
not been a party to any collusion among bidders in restraint of freedom of competition by agreement to bid at a
fixed price or to refrain from bidding; or with any state official or employee as to quantity, quality, or price in any
discussions between bidders and any state official concerning exchange of money or other thing of value for
special consideration in the letting of a contract.

Subscribed and sworn to before me this __________ day of ________________, 2010.

Company Representative

Notary Public

My Commission Expires:
SECTION 00160 – BUSINESS RELATIONSHIP AFFIDAVIT

STATE OF OKLAHOMA )
COUNTY OF TULSA ) ss.

__________________________ of lawful age, being first duly sworn, on oath says that
(she) he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the nature of
any partnership, joint venture, or other business relationship presently in effect or which existed within one (1) year
prior to the date of this statement with the Architect, Engineer, or other party to the project is as follows:

Affiant further states that any such business relationship presently in effect or which existed within one (1) year
prior to the date of this statement between any officer or director of the bidding company, any officer or director of
the architectural or engineering firm or other party to the project is as follows:

Affiant further states that the names of all persons having any such business relationships and the positions they
hold with their respective companies or firms are as follows:

(If none of the business relationships herein above mentioned exist, affiant should so state.)

Company Representative

Subscribed and sworn to before me this __________ day of ___________________, 2010.

__________________________
Notary Public:

My Commission Expires:

__________________________
SECTION 00170 – NON-DISCRIMINATION AFFIDAVIT

The Contractor affirms and states that he/she complies with the following:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or age. The Contractor will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to their race, color, sex, religion, national origin or age. 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 setting forth the requirements of these nondiscrimination provisions.

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

Company Representative

Subscribed and sworn to before me this __________ day of _________________, 2014.

Notary Public

My Commission Expires:
SECTION 00180 - FELONY FREE AFFIDAVIT

STATE OF OKLAHOMA       )
COUNTY OF TULSA          )
                        ) ss.

The undersigned, under the penalties of perjury, certifies to the Tulsa Public Schools ("School District") as follows:

1. The undersigned:
   — has a contract with the School District; OR
   — is the duly authorized representative of a business ("entity") having a contract with the School District,

   to perform work on School District premises on a full-time or part-time basis.

2. The undersigned hereby certifies that neither the undersigned nor any employee of the undersigned or of the entity, or of any subcontractor of the undersigned or the entity, will perform work on School District premises on a full-time or part-time basis that would otherwise be performed by School District employees if such employee has been convicted in this State, the United States or any other state of any felony offense unless ten (10) years have elapsed since the date of the criminal conviction or the employee has received a pardon for the offense.

3. Neither the undersigned nor any employee of the undersigned, or the entity, or of any subcontractor of the undersigned or the entity, who performs any work on School District property is currently registered under the Oklahoma Sex Offenders Registration Act or the Mary Rippy Violent Crime Offenders Registration Act.

4. The undersigned, or the entity, has conducted a felony record search of all employees who will be assigned to work on a full-time or part-time basis on School District property.
5. This Affidavit is made and delivered pursuant to the requirements of Okla. Stat. tit. 70, § 6-101.48 (Supp. 2000) and Okla. Stat. tit. 57, § 589 (Supp. 2004) (the "Acts"). The undersigned further certifies to the School District that the undersigned and/or the entity are in full compliance with the requirements of the Acts.

EXECUTED AND DELIVERED this ___ day of ____________,

AFFIANT'S SIGNATURE

(Print Name and Title)

Representing:

(Name of Entity)

Subscribed and sworn to before me this ___ day of ____________,

Notary Public

(SEAL)

Notary Commission Number: __________

My Commission Expires: __________

Updated: March 2010
SECTION 000190 – ASBESTOS COMPLIANCE FORM

CERTIFICATION OF COMPLIANCE
WITH ASBESTOS RESTRICTIONS

STATE OF _______________________________ } SS.
COUNTY OF ________________________________

The undersigned Contractor, of lawful age, being first duly sworn, on oath says that:

A. Building materials or products incorporated or installed in the construction of
   ________________________________, School addition and/or remodel will be
   free of asbestos containing materials or products of any kind.

B. Certification of Compliance with Asbestos Restrictions will be included in any sub-
   contract connected with the performance of work for this project.

C. Submit copy in O&M Manuals.

ARCHITECT

By ________________________________

(Title)

SUBSCRIBED AND SWORN to before me this ______day of ______________________ 20___

__________________________
Notary Public

My Commission Expires:

__________________________

Updated: December 2005 00190-1
SECTION 00191

CONTRACTORS QUALIFICATIONS STATEMENT

This form must be submitted seven (7) days prior to the bid date. All questions must be answered, the data must be clear and comprehensive, and must be signed and notarized. If not previously on file.

1. Name of Bidder: ______________________________

2. Permanent Main Office Address: ______________________________

3. When organized: ______________________________

4. If incorporated, when and where: ______________________________

5. How many years have you been engaged in the contracting business under your present firm or trading name?: ______________________________

6. List 5 projects of similar size work, references with telephone numbers, cost of project and year completed:

   (1) Project: ______________________________, Year: ______________________________
   Cost: $ ______________________________
   Reference: ______________________________, Phone: ______________________________

   (2) Project: ______________________________, Year: ______________________________
   Cost: $ ______________________________
   Reference: ______________________________, Phone: ______________________________

   (3) Project: ______________________________, Year: ______________________________
   Cost: $ ______________________________
   Reference: ______________________________, Phone: ______________________________

   (4) Project: ______________________________, Year: ______________________________
   Cost: $ ______________________________
   Reference: ______________________________, Phone: ______________________________

   (5) Project: ______________________________, Year: ______________________________
   Cost: $ ______________________________
   Reference: ______________________________, Phone: ______________________________
7. Have you ever failed to complete any work awarded to you? Please explain.

8. Please state the size of your business:
   # of employee's (total): _________________

9. Are any of your job captains bilingual?

10. Financial Information:
    a. State the name of the bank with whom you do your principal business:

<table>
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<th>Name of Bank</th>
<th>Address</th>
<th>City, State</th>
<th>Phone Number</th>
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b. State 5 trade references with whom you do business:

   1. __________________________________________
   2. __________________________________________
   3. __________________________________________
   4. __________________________________________

President of Company

(Notary Public) (Date)

Affix Notary Seal
SECTION 00260 – NO KICK-BACK STATEMENT

SECTION 00260

NO KICK-BACK STATEMENT

A duplicate of the following statement is required to be signed, notarized, and submitted with each and every copy of the AIA Document G702, “Application and Certificate for Payment”, that is presented to the Owner for payment.

STATE OF OKLAHOMA  )
COUNTY OF TULSA  ) ss.

The undersigned Contractor, of lawful age, being first duly sworn, an oath says that this invoice is true and correct. Affiant further states that the services as shown by the invoice have been completed in accordance with the contract. Affiant further states that he has made no payment directly or indirectly to any elected official, officer or employee of the State of Oklahoma, any county or local subdivision of the state, of money or any other things of value to obtain payment.

Contractor

________________________________________
(Title)

By_______________________________________

Subscribed and sworn to before me this _________ day of __________________, 20_____.

________________________________________
Notary Public

My Commission Expires:

________________________________________

[SEAL]

END OF SECTION
INTRODUCTION TO THE SCOPE OF WORK

The cost of the work will not exceed $850,000 from July 1, 2018 thru June 30, 2019.
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Cold milling of existing asphalt pavement.
   2. Hot-mix asphalt patching.
   3. Hot-mix asphalt paving.
   4. Hot-mix asphalt overlay.
   5. Asphalt curbs.
   6. Asphalt traffic-calming devices.
   7. Asphalt surface treatments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include technical data and tested physical and performance properties.
   2. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

B. Sustainable Design Submittals:

C. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
   1. Paving Fabric: 12 by 12 inches (300 by 300 mm) minimum.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For [manufacturer] [and] [testing agency].

B. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.
1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: [A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located].

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
   2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
   4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
   5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692/D 692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: [ASTM D 1073] [or] [AASHTO M 29], sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: [ASTM D 242/D 242M] [or] [AASHTO M 17], rock or slag dust, hydraulic cement, or other inert material.
2.2 ASPHALT MATERIALS

A. Asphalt Binder: [ASTM D 6373] [or] [AASHTO M 320] binder designation [PG 64-22] [PG 58-28] [PG 70-22] Asphalt Cement: [ASTM D 3381/D 3381M for viscosity-graded material] [ASTM D 946/D 946M for penetration-graded material].

B. Cutback Prime Coat: ASTM D 2027/D 2027M, medium-curing cutback asphalt, [MC-30 or MC-70] [MC-250].

C. Emulsified Asphalt Prime Coat: [ASTM D 977] [or] [AASHTO M 140] emulsified asphalt, or [ASTM D 2397/D 2397M] [or] [AASHTO M 208] cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Tack Coat: [ASTM D 977] [or] [AASHTO M 140] emulsified asphalt, or [ASTM D 2397/D 2397M] [or] [AASHTO M 208] cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Fog Seal: [ASTM D 977] [or] [AASHTO M 140] emulsified asphalt, or [ASTM D 2397/D 2397M] [or] [AASHTO M 208] cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.

F. Water: Potable.

G. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires [asphalt shingles] [or] [glass] from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Herbicide: Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

C. Sand: [ASTM D 1073] [or] [AASHTO M 29], Grade No. 2 or No. 3.

D. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.


2.4 MIXES

1. Surface Course Limit: Recycled content no more than [10] percent by weight.
B. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes [approved by authorities having jurisdiction] [designated according to procedures in A I MS-2, "Asphalt Mix Design Methods"*] and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: <>. 
3. Surface Course: <>

C. Emulsified-Asphalt Slurry: ASTM D 3910, [Type I]

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

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

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, [repeating proof-rolling in direction perpendicular to first direction]. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of [1-1/2 inches (38 mm)] [2 inches (50 mm)] [3 inches (75 mm)].
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Handle milled asphalt material according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."
8. Keep milled pavement surface free of loose material and dust.
9. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Patch Material: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of [1/4 inch (6 mm)]
1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

D. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.3 to 1.40 L/sq. m per 2.5 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.
   1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
   2. Protect primed substrate from damage until ready to receive paving.

E. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
   1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 PAVING GEOTEXTILE INSTALLATION

A. Apply [tack coat | asphalt binder | asphalt cement] uniformly to existing pavement surfaces at a rate of 0.20 to 0.30 gal./sq. yd. (0.8 to 1.2 L/sq. m).
B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches (100 mm) and transverse joints 6 inches (150 mm).

C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.8 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.9 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
   3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bullhead" or "papered" method according to AIMS-22, for both "Ending a Lane" and "Resumption of Paving Operations." [as shown on Drawings] <Insert joint requirement.>
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.10 COMPACTING

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edges. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydowns and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to [ASTM D 6927] or [AASHTO T 245], but not less than 94 percent or greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041/D 2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.11 ASPHALT TRAFFIC-CALMING DEVICES

A. Construct hot-mix asphalt speed [bumps] [bumps] [cushions] and [tables] over compacted pavement surfaces. Apply a tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 deg F (121 deg C).

1. Tack Coat Application: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal/sq. yd. (0.2 to 0.7 L/sq. m.).
2. Asphalt Mix: Same as pavement surface-course mix.
3. Before installation, mill pavement that will be in contact with bottom of traffic-calming device. Mill to a depth of 1 inch (25 mm) from top of pavement to a clean, rough profile.

B. Place and compact hot-mix asphalt to cross section indicated, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

3.12 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch (13 mm).
   2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: [1/4 inch (6 mm)] <Insert dimension>.
   2. Surface Course: [1/8 inch (3 mm)] <Insert dimension>.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. Asphalt Traffic-Calming Devices: Compact and form asphalt to produce the contour indicated and within a tolerance of plus or minus 1/8 inch (3 mm) of height indicated above pavement surface.

3.13 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal/sq. yd. (0.45 to 0.7 L/sq. m) to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.
   1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.14 FIELD QUALITY CONTROL

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

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549/D 3549M.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
D. Asphalt Traffic-Calming Devices: Finished height of traffic-calming devices above pavement will be measured for compliance with tolerances.

E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to [ASTM D 979/D 979M] [or] [AASHTO T 168].

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041/D 2041M, and compacted according to job-mix specifications.

2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726/D 2726M.
   a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
   b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726/D 2726M.

F. Replace and compact hot-mix asphalt where core tests were taken.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.15 WASTE HANDLING

A. General: Handle asphalt-paving waste according to approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216
SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes Concrete Paving

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curb and gutters.
5. Walks.

1.3 DEFINITIONS

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

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

C. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:

1. Exposed Aggregate: 10-lb (Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For the following, from manufacturer:
1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

B. Material Test Reports: For each of the following:
1. Aggregates.
2. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Stamped Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

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

1. Manufacturer certified according to NRMCA’s "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.8 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray form[s, steel reinforcement,] and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

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


D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A 1064/A 1064M, [as drawn] [galvanized].

I. Deformed-Steel Wire: ASTM A 1064/A 1064M.

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

K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating; Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

N. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Zinc Repair Material: ASTM A 780/A 780M.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150/C 150M, [gray] [white] portland cement [Type I] [Type II] [Type III] [Type V].
2. Fly Ash: ASTM C 618, [Class C] [or] [Class F].
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, [Class 4S] Insert requirement for recycled content of coarse aggregate if required. Verify availability before specifying.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:

1. Aggregate Sizes: 3/4 to 1 inch 1/2 to 3/4 inch (13 to 19 mm) [3/8 to 5/8 inch (10 to 16 mm)] > nominal.
2. Aggregate Source, Shape, and Color: <Insert requirements>.

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

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

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

F. Water: Potable and complying with ASTM C 94/C 94M.
2.5 FIBER REINFORCEMENT
   A. Synthetic Fiber: Monofilament polypropylene fibers engineered and
designed for use in decorative concrete paving, complying with
ASTM C 1116/C 1116M, Type III, [1/2 to 1-1/2 inches (13 to 30
mm)] long.

2.6 CURING MATERIALS
   A. Absorptive Cover: AASHTO M 182, [Class 3, burlap cloth made
from jute or kenaf, weighing approximately 9 oz./sq. yd.) dry] [or]
cotton mats.
   B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white
burlap-polyethylene sheet.
   C. Water: Potable.
   D. Evaporation Retarder: Waterborne, monomolecular, film forming,
manufactured for application to fresh concrete.
   E. Clear, Waterborne, Membrane-Forming Curing Compound:
   ASTM C 309, Type 1, Class B, dissipating.
   F. White, Waterborne, Membrane-Forming Curing Compound:
   ASTM C 309, Type 2, Class B, dissipating.

2.7 RELATED MATERIALS
   A. Joint Fillers: [ASTM D 1751, asphalt-saturated cellulosic fiber] [or]
[ASTM D 1752, cork or self-expanding cork] in preformed strips.
   B. Slip-Resistant Aggregate Finish: Factory-graded, packaged, rustproof,
nonglazing, abrasive aggregate of fused aluminum-oxide granules or
crushed emery aggregate containing not less than 50 percent aluminum
oxide and not less than 20 percent ferric oxide; unaffected by freezing,
moisture, and cleaning materials.
   C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible,
acrylic emulsion or styrene butadiene.
   D. Epoxy-Bonding Adhesive: ASTM C 881/C 881M, two-component
epoxy resin capable of humid curing and bonding to damp surfaces; of
class suitable for application temperature, of grade complying with
requirements, and of the following types:
   1. [Types I and II, nonload bearing] [Types IV and V, load bearing], for bonding
hardened or freshly mixed concrete to hardened concrete.
E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

2.8 CONCRETE MIXTURES

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

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Pozzolan: 25 percent.
2. Slag Cement: 50 percent.
3. Combined Fly Ash or Pozzolan, and Slag Cement: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

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

1. Air Content: [5-1/2] [4-1/2] [2-1/2] percent plus or minus 1-1/2 percent for 1-1/2-inch nominal maximum aggregate size.
2. Air Content: [6] [4-1/2] [3] percent plus or minus 1-1/2 percent for 1-inch nominal maximum aggregate size.
3. Air Content: [6] [5] [3-1/2] percent plus or minus 1-1/2 percent for 3/4-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to [0.15] [0.30] percent by weight of cement.

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

1. Use [water-reducing admixture] [high-range, water-reducing admixture] [high-range, water-reducing and retarding admixture] [plasticizing and retarding admixture] in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than [1.0 lb/cu. yd.] [1.5 lb/cu. yd.].

G. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

H. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): [4500 psi] [4000 psi] [3500 psi] [3000 psi] Generally retain first option in "Maximum W/C Ratio at Point of Placement" Subparagraph below if concrete paving will be exposed to deicers or subject to freezing and thawing while moist; retain second option for concrete required to have low water permeability; insert another ratio to suit Project.

2. Maximum W/C Ratio at Point of Placement: [0.45] [0.50].

3. Slump Limit: [4 inches] [5 inches] [8 inches] expansion, plus or minus 1 inch.

2.9 CONCRETE MIXING

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

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

2. For concrete batches larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
B. Proof-roll prepared subbase surface below [concrete paving] to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction [and repeat in perpendicular direction]. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of [1/2 inch (13 mm)] -<Insert dimension>- according to requirements in Section 312000 "Earth Moving."

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

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSFs "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.

2. Provide tie bars at sides of paving strips where indicated.

3. Butt Joints: Use [bonding agent] [epoxy-bonding adhesive] at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1/2 inches (38 mm) into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of [50 feet (15.25 m)] unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.

6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a [1/4-inch (6-mm)] [3/8-inch (10-mm)] radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.
a. Tolerance: Ensure that grooved joints are within [3 inches (75 mm)] either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch (3-mm) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

a. Tolerance: Ensure that sawed joints are within [3 inches (75 mm)] either way from centers of dowels.

3. Dowelled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a [1/4-inch (6-mm)] [3/8-inch (10-mm)] radius. Repeat tooling of edges after applying surface finishes. [Eliminate edging-tool marks on concrete surfaces.]

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation[,] steel reinforcement[,] and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface[,] and steel reinforcement[,] before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

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

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies[,] reinforcement[,] or side...
forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating [reinforcement] [dowels] [and] joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.


3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striking float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:

1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.

3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.

4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).

1. Spray-apply chemical surface retarder to paving according to manufacturer’s written instructions.

2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.

3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.

4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistant aggregate finish on paving surface according to manufacturer’s written instructions and as follows:

1. Uniformly spread [25 lb/100 sq. ft. (12 kg/10 sq. m)] [40 lb/100 sq. ft. (19.5 kg/10 sq. m)] [60 lb/100 sq. ft. (29 kg/10 sq. m)] of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.

2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.

3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.

4. After curing, lightly work surface with a steel-wire brush or abrasive stone and water to expose nonslip aggregate.

D. Rock-Salt Finish: After initial [floating] [troweling] [brooming], uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft. (0.2 kg/10 sq. m).

1. Embed rock salt into plastic concrete with [roller] [or] [magnesium float] <Insert tool>.

2. Cover paving surface with 1-mil (0.025-mm-) thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
3. After seven-day curing period, saturate concrete with water and broom-sweep surface to
dissolve remaining rock salt, thereby leaving pits and holes.

E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating,
apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread dry-shake hardener at a rate of [100 lb/100 sq. ft. (49 kg/10 sq. m)]
   <Insert rate of application> unless greater amount is recommended by manufacturer to
   match paving color required.
2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete
   surface with mechanical spreader; allow hardener to absorb moisture and embed it by
   power floating. Follow power floating with a second application of pigmented mineral
   dry-shake hardener, uniformly distributing remainder of material at right angles to first
   application to ensure uniform color, and embed hardener by final power floating.
3. After final power floating, apply a hand-troweled finish followed by a broom finish.
4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer.
   Apply curing compound immediately after final finishing.

3.9 DETECTABLE WARNING INSTALLATION

A. Blockouts: Form blockouts in concrete for installation of detectable
   paving units specified in Section 321726 "Tactile Warning Surfacing."

1. Tolerance for Opening Size: [Plus 1/4 inch (6 mm), no minus].

B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete
   for installation of tiles specified in Section 321726 "Tactile Warning Surfacing."
   Screed surface of concrete where tiles are to be installed to
elevation, so that edges of installed tiles will be flush with surrounding
   concrete paving. Embed tiles in fresh concrete to comply with
   Section 321726 "Tactile Warning Surfacing" immediately after
   screeding concrete surface.

C. Stamped Detectable Warnings: Install stamped detectable warnings as
   part of a continuous concrete paving placement and according to
   stamp-mat manufacturer's written instructions.

1. Before using stamp mats, verify that the vent holes are unobstructed.
2. Apply liquid release agent to the concrete surface and the stamp mat.
3. Stamping: [While initially finished concrete is plastic] [After application and final
   floating of pigmented mineral dry-shake hardener], accurately align and place stamp
   mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce
   imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the
   stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar
   begins to come through all of the vent holes. Gently remove stamp mats.
4.Trimming: After [24] <Insert number> hours, cut off the tips of mortar formed by the
   vent holes.
5. Remove residual release agent according to manufacturer's written instructions, but no
   fewer than three days after stamping concrete. High-pressure-wash surface and joint
patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

3.10 CONCRETE PROTECTION AND CURING

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

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

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

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

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

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recom areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.11 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-feet- (3-m-) long; un leveled straight edge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.12 FIELD QUALITY CONTROL

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

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

1. Testing Frequency: Obtain at least one composite sample for each [100 cu. yd. (76 cu. m)] [5000 sq. ft. (465 sq. m)] or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

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

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

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.

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

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

   C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

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

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

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

I. Prepare test and inspection reports.

3.13 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

CONCRETE PAVING
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Non-pressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Drains.
8. Encasement for piping.
10. Channel drainage systems.
11. Catch basins.
13. Stormwater detention structures.
15. Dry wells.
16. Stormwater disposal systems.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. [Catch basins] [stormwater inlets] [and] [dry wells]: Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.
1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

D. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle [catch basins] and [stormwater inlets] according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify [Architect] [Construction Manager] [Owner] no fewer than [two] <Insert number> days in advance of proposed interruption of service.

2. Do not proceed with interruption of service without [Architect's] [Construction Manager's] [Owner's] written permission.

PART 2 - PRODUCTS

2.1 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, [Service class] [Service and Extra-Heavy classes] [Extra-Heavy class].

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

STORM UTILITY DRAINAGE PIPING
2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISP 301.

B. CISP1-Trademarked, Shielded Couplings:
   1. Description: ASTM C 1277 and CISP1 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Shielded Couplings:
   1. Description: ASTM C 1277 and ASTM C 1540, with stainless-steel shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Shielded Couplings:
   1. Description: ASTM C 1277 and ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

A. Pipe: ASTM A 716, for push-on joints.

B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, for push-on joints.

D. Gaskets: AWWA C111, rubber.

2.4 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

A. Push-on-Joint Piping:
   1. Pipe: AWWA C151, for push-on joints.
   2. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
   3. Compact Fittings: AWWA C153, for push-on joints.

B. Mechanical-Joint Piping:
   1. Pipe: AWWA C151, with bolt holes in bell.
   2. Standard Fittings: AWWA C110, ductile or gray iron, with bolt holes in bell.
   4. Glands: Cast or ductile iron, with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.
   5. Gaskets: AWWA C111, rubber, of shape matching pipe, fittings, and glands.
2.5 STEEL PIPE AND FITTINGS
   A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.
      1. Special-Joint Bands: Corrugated steel with O-ring seals.
      3. Coating: [Aluminum] [Zinc].

2.6 ALUMINUM PIPE AND FITTINGS
   A. Corrugated Aluminum Pipe and Fittings: ASTM B 745/B 745M, Type I with fittings of similar form and construction as pipe.
      1. Special-Joint Bands: Corrugated steel with O-ring seals.

2.7 ABS PIPE AND FITTINGS
   A. , with bell-and-spigot ends for gasketed joints.
      1. NPS 3 to NPS 6 (DN 80 to DN 150): SDR 35.
      2. NPS 8 to NPS 12 (DN 200 to DN 300): SDR 42.
   B. Gaskets: ASTM F 477, elastomeric seals.

2.8 PE PIPE AND FITTINGS
   A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252M, Type S, with smooth waterway for coupling joints.
      1. Siltight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
   B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294M, Type S, with smooth waterway for coupling joints.
      1. Siltight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

2.9 PVC PIPE AND FITTINGS
   A. PVC Cellular-Core Piping:
      1. PVC Cellular-Core Pipe and Fittings: ASTM F 891, Sewer and Drain Series, PS 50 minimum stiffness, PVC cellular-core pipe with plain ends for solvent-cemented joints.
2. Fittings: ASTM D 3034, [SDR 35], PVC socket-type fittings.

B. PVC Corrugated Sewer Piping:
   2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.

C. PVC Profile Sewer Piping:
   2. Fittings: ASTM D 3034, PVC with bell ends.

D. PVC Type PSM Sewer Piping:
   2. Fittings: ASTM D 3034, PVC with bell ends.

E. PVC Gravity Sewer Piping:

F. PVC Pressure Piping:
   1. Pipe: AWWA C900, [Class 100] [Class 150] [and] [Class 200] PVC pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: AWWA C900, [Class 100] [Class 150] [and] [Class 200] PVC pipe with bell ends

G. PVC Water-Service Piping:
   1. Pipe: ASTM D 1785, [Schedule 40] [and] [Schedule 80] PVC, with plain ends for solvent-cemented joints.
   2. Fittings: [ASTM D 2466, Schedule 40] [and] [ASTM D 2467, Schedule 80] PVC, socket type.

2.10 FIBERGLASS PIPE AND FITTINGS

A. Fiberglass Sewer Pipe: ASTM D 3262, RTRP for gasketed joints fabricated with [Type 2, polyester] [Type 2, polyester or Type 4, epoxy] [Type 4, epoxy] resin.
   1. Liner: [Reinforced thermoset] [Nonreinforced thermoset] [Thermoplastic] [No liner]
   2. Grade: [Reinforced, surface layer matching pipe resin] [Nonreinforced, surface layer matching pipe resin] [No surface layer]
3. Stiffness: [9 psig (62 kPa)] [18 psig (124 kPa)] [36 psig (248 kPa)] [72 psig (496 kPa)].

   1. Laminating Resin: [Type 1, polyester] [Type 1, polyester or Type 2, epoxy] [Type 2, epoxy] resin.
   2. Reinforcement: Grade with finish compatible with resin.

C. Gaskets: ASTM F 477, elastomeric seals.

2.11 CONCRETE PIPE AND FITTINGS

A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14 (ASTM C 14M), [Class 1] [Class 2], with [bell-and-spigot] [or] [tongue-and-groove] ends and [gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets] [sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant].

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M).
   1. [Bell-and-spigot] [or] [tongue-and-groove] ends and [gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets] [sealant joints with ASTM C 990 (ASTM C 990M), bitumen or butyl-rubber sealant].
   2. Class I, [Wall A] [Wall B].
   3. Class II, [Wall A] [Wall B] [Wall C].
   4. Class III, [Wall A] [Wall B] [Wall C].
   5. Class IV, [Wall A] [Wall B] [Wall C].
   6. Class V, [Wall B] [Wall C].

2.12 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Concrete Pipes: ASTM C 443 (ASTM C 443M), rubber.
   3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
   5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:
   1. Description: Elastomeric sleeve with [stainless-steel shear ring and] corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:
   1. <Double click here to find, evaluate, and insert list of manufacturers and products>
2. Description: ASTM C1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:
   1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.13 PRESSURE PIPE COUPLINGS

A. Description: AWWA C219, tubular-sleeve coupling, with center sleeve, gaskets, end rings, and bolt fasteners.

B. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include [150-psig (1035-kPa)] [200-psig (1380-kPa)] > minimum pressure rating and ends sized to fit adjoining pipes.

C. Center-Sleeve Material: [Manufacturer's standard] [Carbon steel] [Stainless steel] [Ductile iron] [Malleable iron].

D. Gasket Material: Natural or synthetic rubber.

E. Metal Component Finish: Corrosion-resistant coating or material.

2.14 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron Flexible Expansion Joints:
   1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:
   1. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron or steel with protective coating, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:
   1. Description: Compound-coupling fitting, with ball joint, flexing section, gaskets, and restrained-joint ends, complying with AWWA C110 or AWWA C153. Include rating for 250-psig (1725-kPa) minimum working pressure and for up to 15 degrees of deflection.

2.15 BACKWATER VALVES

A. Cast-Iron Backwater Valves:
   1. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
   2. Horizontal type; with swing check valve and hub-and-spigot ends.

STORM UTILITY DRAINAGE PIPING
3. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
4. Terminal type; with bronze seat, swing check valve, and hub inlet.

B. Plastic Backwater Valves:
1. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

2.16 CLEANOUTS

A. Cast-Iron Cleanouts:
1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scrotated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): [Light Duty] [Medium Duty] [Heavy Duty] [and] [Extra-Heavy Duty].
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:
1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.17 DRAINS

A. Cast-Iron Area Drains:
1. Description: ASME A112.6.3 gray-iron round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
2. Top-Loading Classification(s): [Medium Duty] [Medium and Heavy Duty] [Heavy Duty].

B. Cast-Iron Trench Drains:
1. Description: ASME A112.6.3, 6-inch- (150-mm) wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and quantity of bottom outlets with inside calk or spigot connections, of sizes indicated.
2. Top-Loading Classification(s): [Medium Duty] [Heavy Duty] [Extra-Heavy Duty] [Medium and Heavy Duty] [Medium and Extra-Heavy Duty] [Heavy and Extra-Heavy Duty] [Medium, Heavy, and Extra-Heavy Duty].

C. Steel Trench Drains:
1. Description: Factory fabricated from ASTM A 242/A 242M, welded steel plate, to form rectangular body with uniform bottom downward slope of 2 percent toward outlet, anchor flange, and grate. Include units of total length indicated, bottom outlet of size indicated, outlet strainer, acid-resistant enamel coating on inside and outside surfaces, and grate with openings of total free area at least two times cross-sectional area of outlet.
2. Plate Thicknesses: [1/8 inch (3.2 mm)] [1/8 inch (3.2 mm) and 1/4 inch (6.4 mm)] [1/4 inch (6.4 mm)].
3. Overall Widths: [7-1/2 inches (190 mm)][7-1/2 inches (190 mm) and 12-1/3 inches (313 mm)][12-1/3 inches (313 mm)].
   a. Grate Openings: [1/4 inch (6.4 mm) circular] [3/8 inch (9.5 mm) circular] [3/8 inch (9.5 mm) circular or 3/8-by-3-inch (9.5-by-76-mm) slots] [3/8-by-3-inch (9.5-by-76-mm) slots].

2.18 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.
B. Material: [Linear low-density polyethylene film of 0.005-inch (0.13-mm)] or [high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm)] minimum thickness.
C. Form: [Sheet] [or] [tube].
D. Color: [Black] [or] [natural].

2.19 MANHOLES

A. Standard Precast Concrete Manholes:
   1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
   2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
   3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
   4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
   5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
   6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
   8. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
   9. Steps: [Individual FRP steps or FRP ladder] [Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [Insert material]; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalks at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than [60 inches (1500 mm)] [Insert dimension].
   10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
4. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
5. Steps: [Individual FRP steps or FRP ladder] [Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [Insert material], wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than [60 inches (1500 mm)] [Insert dimension].
6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Fiberglass Manholes:

1. [Double click here to find, evaluate, and insert list of manufacturers and products.]
2. Description: ASTM D 3753.
3. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
4. Ballast: Increase thickness of concrete base as required to prevent flotation.
5. Base Section: Concrete, 6-inch (150-mm) minimum thickness.
6. Resilient Pipe Connectors: ASTM C 923 (ASTM C 923M), cast or fitted into manhole walls, for each pipe connection.
7. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than [60 inches (1500 mm)] [Insert dimension].
8. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
9. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.
D. Manhole Frames and Covers:

1. Description: Ferrous, 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange and 26-inch (660-mm) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to “STORM SEWER.”


2.20 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R (ACI 350M/350RM), and the following:

1. Cement: ASTM C 150, Type II.

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.

2. Benches: Concrete, sloped to drain into channel.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.21 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

A. General Requirements for Polymer-Concrete, Channel Drainage Systems: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit
into channel recesses without rocking or rattling. Include quantity of units required to form total lengths indicated.

B. Sloped-Invert, Polymer-Concrete Systems:

1. Channel Sections:
   a. Interlocking-joint, precast, modular units with end caps.
   b. 4-inch (102-mm) inside width and deep, rounded bottom, with built-in invert slope of 0.6 percent and with outlets in quantities, sizes, and locations indicated.
   c. Extension sections necessary for required depth.
   d. Frame: Include gray-iron or steel frame for grate.

2. Grates:
   a. Manufacturer's designation "[Heavy] [Medium] Duty," with slots or perforations that fit recesses in channels.
   b. Material: [Fiberglass] [Galvanized steel] [Gray iron] [Stainless steel].

3. Covers: Solid gray iron if indicated.
   4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

C. Narrow-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:
   a. Interlocking-joint, precast, modular units with end caps.
   b. 5-inch (127-mm) inside width and 9-3/4-inch- (248-mm-) deep, rounded bottom, with level invert and with NPS 4 (DN 100) outlets in quantities, sizes, and locations indicated.

2. Grates:
   a. Slots or perforations that fit recesses in channels.
   b. Material: [Fiberglass] [Galvanized steel] [Gray iron] [Stainless steel].

3. Covers: Solid gray iron if indicated.
   4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

D. Wide-Width, Level-Invert, Polymer-Concrete Systems:

1. Channel Sections:
   a. Interlocking-joint, precast, modular units with end caps.
   b. 8-inch (203-mm) inside width and 13-3/4-inch- (350-mm-) deep, rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.

2. Grates:
   a. Slots or other openings that fit recesses in channels.
b. Material: [Fiberglass] [Gray iron].

3. Covers: Solid gray iron if indicated.
4. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

E. Drainage Specialties: Precast, polymer-concrete units.

1. Large Catch Basins:
   a. 24-by-12-inch (610-by-305-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
   b. Gray-iron slotted grate.
   c. Frame: Include gray-iron or steel frame for grate.

2. Small Catch Basins:
   a. 19- to 24-inch by approximately 6-inch (483- to 610-mm by approximately 150-mm) polymer-concrete body, with outlets in quantities and sizes indicated.
   b. Gray-iron slotted grate.
   c. Frame: Include gray-iron or steel frame for grate.

3. Oil Interceptors:
   a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch (6.4-mm) thick, steel-plate covers.
   b. Steel-plate covers.
   c. Capacity: [140 gal. (530 L)] [200 gal. (757 L)] [260 gal. (984 L)].
   d. Inlet and Outlet: [NPS 4 (DN 100)] [NPS 6 (DN 150)].

4. Sediment Interceptors:
   a. 27-inch (686-mm) square, polymer-concrete body, with outlets in quantities and sizes indicated.
   b. 24-inch (610-mm) square, gray-iron frame and slotted grate.

F. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

G. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.22 PLASTIC, CHANNEL DRAINAGE SYSTEMS

A. General Requirements for Plastic, Channel Drainage Systems:

1. Modular system of plastic channel sections, grates, and appurtenances.
2. Designed so grates fit into frames without rocking or rattling.
3. Number of units required to form total lengths indicated.

B. Fiberglass Systems:

1. Channel Sections:
a. Interlocking-joint, fiberglass modular units, with built-in invert slope of approximately 1 percent and with end caps.
b. Rounded or inclined inside bottom surface, with outlets in quantities, sizes, and locations indicated.
c. Width: [6 inches (150 mm)] [6 or 8 inches (150 or 203 mm)] [8 inches (203 mm)].

2. Factory- or field-attached frames that fit channel sections and grates.
   a. Material: [Galvanized steel] [Stainless steel] [Manufacturer’s standard metal].

3. Grates with slots or perforations that fit frames.
   a. Material: [Fiberglass] [Galvanized steel] [Gray iron] [Stainless steel].

4. Covers: Solid gray iron if indicated.

5. Drainage Specialties:
   a. Large Catch Basins: 24-inch- (610-mm-) square plastic body, with outlets in quantities and sizes indicated. Include gray-iron frame and slotted grate.
   b. Small Catch Basins: 12-by-24-inch (305-by-610-mm) plastic body, with outlets in quantities and sizes indicated. Include gray-iron frame and slotted grate.

C. PE Systems:

1. Channel Sections: Interlocking-joint, PE modular units, 4 inches (102 mm) wide, with end caps. Include rounded bottom, with level invert and with outlets in quantities, sizes, and locations indicated.

2. Grates: PE, ladder shaped; with stainless-steel screws.

3. Color: Gray unless otherwise indicated.

4. Drainage Specialties: Include the following PE components:
   a. Drains: 4-inch- (102-mm-) diameter, round, slotted top; with NPS 4 (DN 100) bottom outlet.
   b. Drains: 8-inch- (203-mm-) diameter, round, slotted top; with NPS 6 (DN 150) bottom outlet.
   c. Drains: 4-inch- (102-mm-) square, slotted top; with NPS 3 (DN 80) bottom outlet.
   d. Drains: 8-inch- (203-mm-) square, slotted top; with NPS 6 (DN 150) bottom outlet.
   e. Catch Basins: 12-inch- (305-mm-) square plastic body, with outlets in quantities and sizes indicated. Include PE slotted grate 11-3/4 inches (298 mm) square by 1-1/8 inches (28.6 mm) thick.

D. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.

E. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.23 CATCH BASINS

A. Standard Precast Concrete Catch Basins:
1. Description: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.

4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.


6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.

7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch (610-mm) diameter frame and grate.

8. Steps: [Individual FRP steps or FRP ladder] Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [Insert material], wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalks at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than [60 inches (1500-mm)] [Insert dimension].

9. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (AASHTO HSS20-44), heavy traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.


2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.

3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch (610-mm) diameter frame and grate.

4. Steps: [Individual FRP steps or FRP ladder] Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [Insert material], wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalks at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than [60 inches (1500-mm)] [Insert dimension].

5. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-sloped drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.24 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty, according to utility standards.

2.25 STORMWATER DETENTION STRUCTURES

A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO H120-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete as required to prevent flotation.

2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and cover.

3. Steps: [Individual FRP steps or FRP ladder] [Individual FRP steps; FRP ladder; or ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [ASTM A 615/A 615M, deformed, 1/2-inch (13-mm) steel reinforcing rods encased in ASTM D 4101, PP] [Insert material], wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of structure to finished grade is less than [60 inches (1500 mm)] [Insert dimension].

B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch (102-mm) minimum width flange, and 26-inch- (660-mm-) diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.26 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-3, screen opening 2 inches (51 mm).
2. Average Size: NSSGA No. R-4, screen opening 3 inches (76 mm).
3. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).


D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

2.27 DRY WELLS

A. Description: ASTM C 913, precast, reinforced, perforated concrete rings. Include the following:

1. Floor: Cast-in-place concrete.
2. Cover: Liftoff-type concrete cover with cast-in lift rings.
3. Wall Thickness: 4 inches (102 mm) minimum with 1-inch (25-mm) diameter or 1-by-3-inch (25-by-76-mm-) maximum slotted perforations arranged in rows parallel to axis of ring.
   a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
   b. Ring Construction: Designed to be self-aligning.
4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.

B. Description: Manufactured PE side panels and top cover that assemble into 50-gal. (190-L) storage capacity units.

2. Top Cover: With knockout port for drian.
3. Filter Fabric: As recommended by unit manufacturer.
4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.

C. Description: Constructed-in-place aggregate type. Include the following:

1. Lining: Clay or concrete bricks.
2. Lining: Concrete blocks or precast concrete rings with notches or weep holes.
3. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
4. Cover: Precast, reinforced-concrete slab, designed for structural loading according to ASTM C 890 and made according to ASTM C 913. Include slab dimensions that will extend 12 inches (300 mm) minimum beyond edge of excavation, with bituminous coating over entire surface. Cast cover with opening for manhole in center.
5. Manhole: 24-inch- (610-mm-) diameter, reinforced-concrete access lid with steel lift rings. Include bituminous coating over entire surface.
2.28 STORMWATER DISPOSAL SYSTEMS

A. Chamber Systems:
1. Storage and Leaching Chambers: Molded PE with perforated sides and open bottom. Include number of chambers, distribution piping, end plates, and other standard components as required for system total capacity.
2. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch (19- to 63-mm) washed, crushed stone or gravel.
3. Filter Mat: Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4 oz./sq. yd. (135 g/sq. m).

B. Pipe Systems: Perforated manifold, header, and lateral piping complying with AASHTO M 252M for NPS 10 (DN 250) and smaller, AASHTO M 294M for NPS 12 to NPS 60 (DN 300 to DN 1500). Include proprietary fittings, couplings, seals, and filter fabric.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install piping [NPS 6 (DN 150)] Typical value and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with [36-inch (915-mm)] [48-inch (1220-mm)] [60-inch (1520-mm)] [72-inch (1830-mm)] "Insert dimension:" minimum cover.
5. Install hubless cast-iron soil piping according to CISPPI 310 and CISPPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
7. Install corrugated steel piping according to ASTM A 798/A 798M.
8. Install corrugated aluminum piping according to ASTM B 788/B 788M.
9. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
10. Install PE corrugated sewer piping according to ASTM D 2321.
11. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
12. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
13. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
14. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.
15. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.
16. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
17. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

G. Install force-main pressure piping according to the following:
   1. Install piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
   2. Install piping with [36-inch (915-mm)] [48-inch (1220-mm)] [60-inch (1520-mm)] [72-inch (1830-mm)] "Insert dimension:" minimum cover.
   3. Install ductile-iron pressure piping according to AWWA C600 or AWWA M41.
   4. Install ductile-iron special fittings according to AWWA C600.
   5. Install PVC pressure piping according to AWWA M23, or ASTM D 2774 and ASTM F 1668.
   6. Install PVC water-service piping according to ASTM D 2774 and ASTM F 1668.

H. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
   2. Hubless cast-iron soil pipe and fittings.
   3. Ductile-iron pipe and fittings.
   4. Expansion joints and deflection fittings.

3.3 PIPE JOINT CONSTRUCTION
A. Join gravity-flow, nonpressure drainage piping according to the following:
4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
7. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
8. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
9. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
10. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
11. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
12. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
13. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
14. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
15. Join nonreinforced-concrete sewer piping according to ASTM C 14 (ASTM C 14M) and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
17. Join dissimilar pipe materials with nonpressure-type flexible couplings.

B. Join force-main pressure piping according to the following:
1. Join ductile-iron pressure piping according to AWWA C600 or AWWA M41 for push-on joints.
2. Join ductile-iron special fittings according to AWWA C600 or AWWA M41 for push-on joints.
3. Join PVC pressure piping according to AWWA M23 for gasketed joints.
4. Join PVC water-service piping according to ASTM D 2855 for solvent-cemented joints.
5. Join dissimilar pipe materials with pressure-type couplings.

3.4 BACKWATER VALVE INSTALLATION

A. Install horizontal-type backwater valves in piping where indicated.

B. Install combination horizontal and manual gate-valve type in piping and in manholes where indicated.

C. Install terminal-type backwater valves on end of piping and in manholes where indicated.
3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Light-Duty, top-loading classification cleanouts in [earth or unpaved foot-traffic] <Insert other> areas.
2. Use Medium-Duty, top-loading classification cleanouts in [paved foot-traffic] <Insert other> areas.
3. Use Heavy-Duty, top-loading classification cleanouts in [vehicle-traffic service] <Insert other> areas.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, [18 by 18 by 12 inches (450 by 450 by 300 mm)] <Insert dimensions> deep. Set with tops [1 inch (25 mm)] <Insert dimension> above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in [earth or unpaved foot-traffic] <Insert other> areas.
2. Use Medium-Duty, top-loading classification drains in [paved foot-traffic] <Insert other> areas.
3. Use Heavy-Duty, top-loading classification drains in [vehicle-traffic service] <Insert other> areas.

B. Embed drains in 4-inch (102-mm) minimum concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

F. Embed trench sections in [4-inch (102-mm)] <Insert dimension> minimum concrete around bottom and sides.

3.7 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.
C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops [3 inches (76 mm)] above finished surface elsewhere unless otherwise indicated.

3.8 CATCH BASIN INSTALLATION
A. Construct catch basins to sizes and shapes indicated.
B. Set frames and grates to elevations indicated.

3.9 STORMWATER INLET[ AND OUTLET] INSTALLATION
A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
B. Construct riprap of broken stone, as indicated.
C. Install outlets that spill onto grade, anchored with concrete, where indicated.
D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
E. Construct energy dissipaters at outlets, as indicated.

3.10 DRY WELL INSTALLATION
A. Excavate hole to diameter of at least 6 inches (150 mm) greater than outside of dry well. Do not extend excavation into ground-water table.
B. Install precast, concrete-ring dry wells according to the following:
   1. Assemble rings to depth indicated.
   2. Extend rings to height where top of cover will be approximately 8 inches (203 mm) below finished grade.
   3. Backfill bottom of inside of rings with filtering material to level at least 12 inches (300 mm) above bottom.
   4. Extend effluent inlet pipe 12 inches (300 mm) into rings and terminate into side of tee fitting.
   5. Backfill around outside of rings with filtering material to top level of rings.
   6. Install cover over top of rings.
C. Install manufactured, PE dry wells according to manufacturer's written instructions and the following:
   1. Assemble and install panels and cover.
   2. Backfill bottom of inside of unit with filtering material to level at least [12 inches (300 mm)] above bottom.
3. Extend effluent pipe [12 inches (300 mm)] <Insert dimension> into unit and terminate into side of tee fitting.
4. Install filter fabric around outside of unit.
5. Install filtering material around outside of unit.

D. Install constructed-in-place dry wells according to the following:

1. Install brick lining material dry and laid flat, with staggered joints for seepage. Build to diameter and depth indicated.
2. Install block lining material dry, with staggered joints and 20 percent minimum of blocks on side for seepage. Install precast concrete rings with notches or weep holes for seepage. Build to diameter and depth indicated.
3. Extend lining material to height where top of manhole will be approximately [8 inches (203 mm)] <Insert dimension> below finished grade.
4. Backfill bottom of inside of lining with filtering material to level at least [12 inches (300 mm)] <Insert dimension> above bottom.
5. Extend effluent pipe [12 inches (300 mm)] <Insert dimension> into lining and terminate into side of tee fitting.
6. Backfill around outside of lining with filtering material to top level of lining.
7. Install manhole over top of dry well. Support cover on undisturbed soil. Do not support cover on lining.

3.11 CONCRETE PLACEMENT
A. Place cast-in-place concrete according to ACI 318.

3.12 CHANNEL DRAINAGE SYSTEM INSTALLATION
A. Install with top surfaces of components, except piping, flush with finished surface.
B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
C. Embed channel sections and drainage specialties in [4-inch (102-mm)] <Insert dimension> minimum concrete around bottom and sides.
D. Fasten grates to channel sections if indicated.
E. Assemble channel sections with flanged or interlocking joints.
F. Embed channel sections in [4-inch (102-mm)] <Insert dimension> minimum concrete around bottom and sides.

3.13 STORMWATER DISPOSAL SYSTEM INSTALLATION
A. Chamber Systems: Excavate trenches of width and depth, and install system and backfill according to chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.
B. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, according to piping manufacturer's written instructions.

3.14 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.

C. Make connections to existing piping and underground manholes.

1. Use commercially manufactured yoke fittings for piping branch connections. Remove section of existing pipe; install yoke fitting into existing piping, and encase entire yoke fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install yoke fitting into existing piping, and encase entire yoke fitting with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

   a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.

   b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."

E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

   a. [Unshielded] [Shielded] flexible couplings for same or minor difference OD pipes.
b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.

c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

2. Use pressure-type pipe couplings for force-main joints.

3.15 CLOSING ABANDONED STORM DRAINAGE SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least [8-inch (203-mm)] <Insert dimension> thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:

1. Remove manhole or structure and close open ends of remaining piping.
2. Remove top of manhole or structure down to at least [36 inches (915 mm)] <Insert dimension> below final grade. Fill to within [12 inches (300 mm)] <Insert dimension> of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Section 312000 "Earth Moving."

3.16 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use [warning tape or] detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.17 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Exception: Piping with scilitight joints unless required by authorities having jurisdiction.
   b. Option: Test plastic piping according to ASTM F 1417.
   c. Option: Test concrete piping according to ASTM C 924 (ASTM C 924M).
6. Force-Main Storm Drainage Piping: Perform hydrostatic test after thrust blocks, supports, and anchors have hardened. Test at pressure not less than 1-1/2 times the maximum system operating pressure, but not less than [150 psig (1035 kPa)] <Insert value>.
   a. Ductile-Iron Piping: Test according to AWWA C600, "Hydraulic Testing" Section.
   b. PVC Piping: Test according to AWWA M23, "Testing and Maintenance" Chapter.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.18 CLEANING

A. Clean interior of piping of dirt and superfluous materials. [Flush with potable water.] [Flush with water.]

END OF SECTION 334100