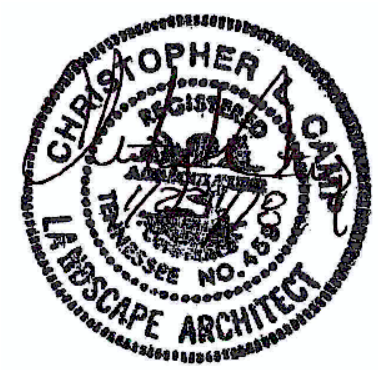
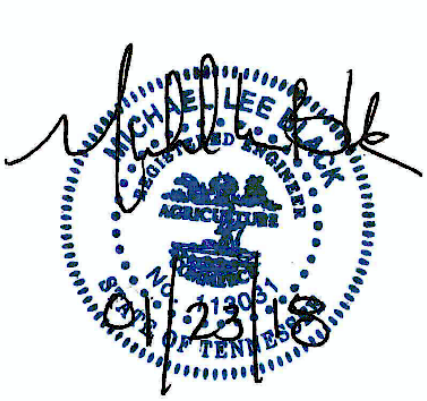
CITY OF ATHENS, TENNESSEE

REQUEST FOR COMPETETIVE SEALED PROPOSALS

ATHENS REGIONAL PARK SPLASH PAD PHASE I

January 26, 2018





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END OF INDEX

General Notes

1. Non-applicable division and section references have been omitted.

2. Recipients of bidding instruments must consult the Index to Bidding Instruments to determine the full scope of work involved and to ensure that all pages of the Project Manual have been included. Recipients must also consult the Construction Drawings Cover to ensure all drawing pages have been included within the drawing set. If any material is deemed absent, the Bidder is responsible for notifying the Contact Person identified on the construction documents to obtain the missing items.

3. This project is funded by a Tennessee Department of Environment and Conservation (TDEC) Local Parks and Recreation (LPRF) grant.

4. The winning bidder certifies, by submission of this proposal or contract, that neither it nor its firm is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such participant shall attach an explanation to this form. Verification through SAM (System for Award Management), www.sam.gov can be used.

5. Bidder or Contractor Signature: _____
6. Print Name and Title: _____
7. Date: _____

Purpose of Request for Proposal

The City of Athens Tennessee is soliciting proposals from qualified contractors/vendors interested in constructing a splash pad in Athens Regional Park.

Scope of Services

The selected team will be required to supply and construct a recirculating system splash pad that is not less than 2,500 square feet in activity area. This project includes all demo, systems, walks and other amenities required for a functioning public splash pad. The budget for this project is $280,000. A fee for the additional items labeled as Phase 2 shall also be supplied as an additions to the project if the City determines it feasible. See attached performance specification and site drawings for detailed scope.

Proposal Requirements

1. Team must include a Tennessee licensed contractor.
2. Insurance Requirement-The Contractor shall provide general liability insurance in the minimum amount of one ($1,000,000) million and name the City of Athens as an Additional Insured. Proof of Workers Compensation insurance will be required as evidenced by a certificate.
3. If selected the splash pad designs must be sealed by an engineer licensed in the state of Tennessee.

Submittal Requirements

The submitting contractor/vendor shall provide a written proposal with a layout plan including a product legend, 3 dimensional renderings, individual feature and mechanical cut sheets, manufacturer's data, warranty information, operating cost analysis, operation training information and a schedule for completion. Submitting companies' proposals can include up to 25 pages and maximum page size shall be 11"x17".

Three (3) printed and one digital copy of proposal shall be submitted to the City of Athens no later than 2:00 p.m. ET, February 21, 2018 for committee review.

City of Athens
Attention: James Gallup, Purchasing
815 North Jackson Street
Athens, TN 37303

RFCSP Evaluations

RFCSP will be evaluated based on the following criteria (not listed in any order of importance):

1. Function, durability and design of proposed splash pad
2. Proven ability with similar projects.
3. History and years of experience.
4. Capacity to perform the required work.
5. Meeting budget restraints.

Proposals Opening

Proposals shall be opened in a manner that avoids disclosure of contents to competing Proposers during the negotiation.

Final Ranking and Selection

A committee will make a recommendation to possibly negotiate with the responder whose proposal is determined to be the most advantageous to the City, considering the evaluation factors set forth in the RFCSP. Recommended contract awarded, if any, resulting from this RFCSP is subject to the approval of the City Council. In all cases, the City will be the sole judge as to whether a Proposer has or has not satisfactorily met the requirements of this RFCSP. The City reserves the right to accept or reject any Proposal or to accept a Proposal containing variations from these specifications if the Proposal so merits.

Negotiations

The City retains the right to make an award based on initial proposals without negotiations. Negotiations may be conducted with all responsible Proposers.

Discussions: Best and Final Proposer

The Committee reserves the right to recommend a Proposer based upon the Proposer's written proposal, without further discussions. Should the Committee determine that further discussions would be in the best interest of the City; the Committee shall establish procedures and schedules for conducting discussions and will notify qualified Proposers'. When in the best interest of the City, the Committee **ma**y permit qualified Proposers to revise their proposals by submitting "best and final" Proposal. The City shall rely on the information submitted by Proposers in reaching its decision and shall have the right to demand the services as described in the proposals.

Schedule

Advertisement publication date……..January 26, 2018
RFCSP Deadline (2:00 p.m. EST)…….February 21, 2018
Submit Recommendation to City Council if applicable…March 5, 2018
City Council Approval……...March 20, 2018

Changes in the RFCSP

Any communication from the City to a Proposer will be transmitted simultaneously to all Proposers along with written questions submitted. Any Proposer who fails to recognize or utilize this process of communication will be notified of its violation of the process and may be disqualified. All addenda will be numbered in sequence, dated as of the date of issue, and sent via fax to all Proposers.

Verbal Agreements

No verbal agreement or conversation with any officer, agent or employee of the City, either before or after execution of the Contract, shall affect or modify any of the terms or obligations contained in the Contract. Any such verbal agreement or conversation shall be considered unofficial information and in no way binding upon the City or the Contractor.

Reservation of Rights

The City reserves and holds at its discretion the following rights and options:

a. Issue addenda to the Request for Competitive Sealed Proposal, including extending or otherwise revising the timeline for submittals;
b. Withdraw the Request for Competitive Sealed Proposals;
c. Request clarification and/or additional information from the Proposer at any point in the procurement process;
d. Execute a Contract with Proposer, on the sole basis of the original proposal or any additions to the proposal submission;
e. Reject any or all Proposals, waive irregularities in any Proposal, accept or reject all or any part of any Proposal, waive any requirements of the Request, as may be deemed to be in the best interest of the City; and
f. Reissue or modify the Request for Competitive Sealed Proposals.

In order to be considered for selection, responses must be received on or before the date and time specified. Firms mailing responses should allow normal mail delivery time to ensure timely receipt by the City. Proposals received after the stated time shall not be considered. No fax transmittals will be accepted.

Disposition of Proposals

All materials submitted in response to this Proposal will become the property of the City of Athens. One (1) copy of each proposal shall be retained for official files. It is understood that the proposal will become part of the official file on this matter without obligation on the part of the City of Athens. All Proposals become the property of the City upon submission and will not be returned to the applicant.

Disclosure

Any trade secrets or proprietary information submitted by a vendor in connection with this procurement shall not be subject to public disclosure. However, the vendor must invoke the protection of this section prior to or upon submission of the data or other materials by identifying the specific area or scope of data or other materials to be protected and state the reasons protection is necessary. An all-inclusive statement that the entire proposal is proprietary is not acceptable. A statement that cost proposals are to be protected is not acceptable. There is no expressed or implied obligation for the City of Athens to reimburse responding firms for any expenses incurred in preparing proposals in response to this request.

CITY OF ATHENS
NONDISCRIMINATION POLICY

It is the policy of the City of Athens not to discriminate on the basis of race, color, national origin, age, sex, or disability in its hiring and employment practices, or in admission to, access to, or operation of its programs, services, and activities. In addition, the City of Athens does not discriminate based on race, color, or national origin in federal or state sponsored programs, pursuant to Title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d). With regard to all aspects of this contract, the contractor certifies and warrants it will comply with this policy.

_____ _____

COMPANY NAME DATE

_____ _____

REPRESENTATIVE TITLE

CITY OF ATHENS
815 North Jackson Street
Athens, TN 37303
423.744.2702

STATE OF TENNESSEE/CITY OF ATHENS
COUNTY OF MCMINN

DRUG-FREE WORKPLACE AFFIDAVIT OF PRIME BIDDER

NOW COMES AFFIANT, who being duly sworn, deposes and says:

1. He/She is the principal officer for;

   _____
   Company Name

   _____
   Address

2. That the bidding entity has submitted a bid to the City of Athens for;

   _____
   Project

3. That the bidding entity employs no less than five (5) employees;

4. That Affiant certifies that the bidding entity has in effect, at the time of submission of its bid to perform the construction referred to above, a drug-free workplace program that complies with 50-9-113, Tennessee Code Annotated.

5. That this affidavit is made on personal knowledge.

Further Affiant saith not.

_____
Affiant

SUBSCRIBED AND SWORN TO before me this _____ day of _____.

_____
Notary Public
My commission expires:_____

CITY OF ATHENS
815 North Jackson Street
Athens, TN 37303
423.744.2702

DRUG AND ALCOHOL TESTING PROGRAM

Bidders must have a testing program for employees in place that is at least as stringent as the drug and alcohol-testing program of the City of Athens, which is attached. Bidders must provide a copy of their drug and alcohol-testing program at the time the bid is made.

CITY OF ATHENS - TERMS AND CONDITIONS

1. Prices shall be quoted FOB Athens, TN. Delivery to City of Athens locations shall be without additional charge unless otherwise requested by the City of Athens.

2. Failure to examine any drawings, specifications, and instructions will be at bidder's risk. If bidder is in doubt as to the true meaning of any part of the drawings, specifications, and instructions or other documents, he should submit a written request for an interpretation to the Director of Finance. An interpretation of the document will be made only by addendum issued by the Director of Finance to each firm to whom an invitation was forwarded. The City will not be responsible for explanations or interpretations of bid documents except as issued in accordance herewith.

3. Where a brand or trade name appears in the specifications, it is understood that the brand or trade name referred to, or its approved equivalent, shall be furnished. If no mention is made of any exceptions, it is assumed that he is bidding on the article mentioned and not an approved equivalent. If a brand name is listed in the bid package and a vendor intends to bid another name it is the responsibility of the bidder to notify the Director of Finance of his intent to do so by seven (7) days prior to bid opening. This is to allow time to evaluate equipment or product. Failure to do so disqualifies you as a bidder. An approved equivalent is defined as a bid item that meets or exceeds every specification provided in the bid specifications and is approved by the City of Athens. However, the City of Athens reserves the right to choose a specific name brand if standardizing to accommodate parts supply, knowledge of maintenance, and to prevent the purchase of specialty tools.

4. The bidder is requested to attach brochure-type information and written specifications on the supplies furnished. All guarantees and warranties should be clearly stated.

5. Prices quoted for all machinery, equipment, and vehicles shall include complete parts manual(s), maintenance manual(s), service manual(s), and operator's manual(s) without additional charge and are to be delivered with the unit.

6. Bids and modifications or corrections thereof received after the closing time specified will not be considered. The City is not responsible for delays in delivery by mail, courier, etc.

7. Any exceptions to these terms or conditions or deviations from written specifications will be shown in writing and attached to the bid form.

8. Any alteration, erasure, additions to or omission of requested information, change of the specifications or bidding schedule, is made at the risk of the bidder and shall result in the rejection of the bid unless such changes are authorized by the specifications.

9. In the event cash discounts are offered by the bidder, the discount date shall begin with the date of the invoice or the date of receipt of all material covered by the order/contract, whichever is the later date.

10. Charges for boxing or cartage will not be allowed unless previously agreed upon.

11. Default in promised delivery and failure to comply with specifications authorizes the City to purchase supplies elsewhere and charge the difference to defaulting Vendor.

12. Bidder agrees to defend and save the City of Athens from and against all demands, claims, suits, costs, expenses, damages, and judgments based upon infringement of any patents relating to goods specified in this order or the ordinary use or operation of such goods by the City or use or operation of such goods in accordance with bidder's direction.

13. In case of error or discrepancy in the mathematics of the bid price, the unit prices shall prevail.

14. By submission of a signed bid, the bidder certifies total compliance with Title VI and Title VII of the Civil Rights Act of 1964, as amended and all regulations promulgated thereunder, as the City of Athens does not discriminate based on race, color, or national origin in federal or state sponsored programs, pursuant to Title VI of the Civil Rights Act of 1964 (42 USC 2000d).

15. Contracts and purchases will be made or entered into with the lowest, responsible, compliant bidder meeting specifications for the particular grade or class of material, work or service desired in the best interest and advantage to the City of Athens. Responsible bidder is defined as a bidder whose reputation, past performance, and business and financial capabilities are such that he would be judged by the appropriate City authority to be capable of satisfying the City's needs for a specific contract or purchase order.

16. The City reserves the right to determine the low bidder either on the basis of the individual items or on the basis of all items included in its INVITATION TO BID, unless otherwise expressly provided in the INVITATION TO BID. The City reserves the right to accept any item or group of items of any kind and to modify or cancel in whole or in part, its INVITATION TO BID.

17. The City reserves the right to determine the low bidder by durability and maintenance cost over the life of the vehicle or equipment. This may be done by means of past experience or research. Initial cost may not determine low bid.

18. All contracts or purchase orders issued for this award will be governed by the laws of the State of Tennessee.

19. **IRAN DIVESTMENT ACT**

"By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to TENNESSEE CODE ANNOTATED §12-12-106."

Bidder's company name, signature, and date indicate that these terms and conditions have been read, understood, and accepted.

DATE:_____

BIDDER'S COMPANY NAME _____

COMPANY REPRESENTATIVE:

_____ _____

(Printed Name) (Written Signature)

TELEPHONE _____ FAX _____

EMAIL _____

M E M O R A N D U M

TO: **Daily Post Athenian**

FROM: **City of Athens**

DATE: **January 23, 2018**

SUBJECT: **LEGAL NOTICE**

Please publish the following Legal Notice on Friday, January 26, 2018, and provide an Affidavit of Publication as soon as possible.

LEGAL NOTICE

The City of Athens will receive sealed proposals until 2:00 p.m., Wednesday, February 21, 2018 for the following:

ATHENS REGIONAL PARK SPLASH PAD PHASE I

The City of Athens reserves the right to reject any and all responses or waive any informalities and to accept any proposal deemed to be in the best interest of the City.

The City of Athens, Tennessee does not discriminate based on race, color or national origin in federal or state sponsored programs, pursuant to Title VI of the Civil Rights Act of 1964 (42 USC 2000d).

Further, no person shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal or state financial assistance.

For further information, please contact the City of Athens Purchasing Department, telephone number (423) 744-2780.

_____

C. Seth Sumner, City Manager

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
RECREATION EDUCATIONAL SERVICES
WR Snodgrass TN Tower, 312 Rosa L. Parks Avenue, 2nd Floor, Nashville, TN 37243
PH: 615-532-0748 FAX: 615-532-0732

CERTIFICATION OF CONTRACTOR REGARDING CONFLICTS OF INTEREST, LOBBYING, NONDISCRIMINATION, PUBLIC ACCOUNTABILITY, AND PUBLIC NOTICE

This certification is required by the agency that has funded, in part, by: **(check one)**

☒ **Local Park & Recreation Fund (LPRF)** ☐ **Land & Water Conservation Fund (LWCF)**

☐ **Recreation Trail Program (RTP)** ☐ **Other** _____

The Contractor, _____, by signing and submitting this Certification, acknowledges the following: This Certification will be incorporated into the Agreement executed between: _____ (*the Grantee)* and the Contractor.

By signing and submitting this Certification, the Contractor certifies that neither it, its principals nor affiliates has violated the following:

1. Conflicts of Interest: The Grantee warrants that no part of the total Grant Contract Amount shall be paid directly or indirectly to an employee or official of the State of Tennessee as wages, compensation, or gifts in exchange for acting as an officer, agent, employee, subcontractor, or consultant to the Grantee in connection with any work contemplated or performed relative to this Grant Contract.

2. Lobbying: The Grantee certifies to the best of its knowledge and belief that:

   a. No federally appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

   b. If any funds other than federally appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this contract, grant, loan, or cooperative agreement, the Grantee shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

   c. The Grantee shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

   This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into and is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352.

3. Nondiscrimination: The Grantee hereby agrees, warrants, and assures that no person shall be excluded from participation in, be denied benefits of, or be otherwise subjected to discrimination in the performance of this Grant Contract or in the employment practices of the Grantee on the grounds of handicap or disability, age, race, color,

religion, sex, national origin, or any other classification protected by federal, Tennessee state constitutional, or statutory law. The Grantee shall, upon request, show proof of nondiscrimination and shall post in conspicuous places, available to all employees and applicants, notices of nondiscrimination.

4. Public Accountability: If the Grantee is subject to Tenn. Code Ann. § 8-4-401 *et seq.*, or if this Grant Contract involves the provision of services to citizens by the Grantee on behalf of the State, the Grantee agrees to establish a system through which recipients of services may present grievances about the operation of the service program. The Grantee shall also display in a prominent place, located near the passageway through which the public enters in order to receive Grant supported services, a sign at least eleven inches (11") in height and seventeen inches (17") in width stating:

   NOTICE: THIS AGENCY IS A RECIPIENT OF TAXPAYER FUNDING. IF YOU OBSERVE AN AGENCY DIRECTOR OR EMPLOYEE ENGAGING IN ANY ACTIVITY WHICH YOU CONSIDER TO BE ILLEGAL, IMPROPER, OR WASTEFUL, PLEASE CALL THE STATE COMPTROLLER'S TOLL-FREE HOTLINE: 1-800-232-5454.

   The sign shall be on the form prescribed by the Comptroller of the Treasury. The Grantor State Agency shall obtain copies of the sign from the Comptroller of the Treasury, and upon request from the Grantee, provide Grantee with any necessary signs.

5. Public Notice: All notices, informational pamphlets, press releases, research reports, signs, and similar public notices prepared and released by the Grantee in relation to this Grant Contract shall include the statement, "This project is funded under a grant contract with the State of Tennessee." All notices by the Grantee in relation to this Grant Contract shall be approved by the State.

6. Records: The Grantee and any approved subcontractor shall maintain documentation for all charges under this Grant Contract. The books, records, and documents of the Grantee and any approved subcontractor, insofar as they relate to work performed or money received under this Grant Contract, shall be maintained in accordance with applicable Tennessee law. In no case shall the records be maintained for a period of less than five (5) full years from the date of the final payment. The Grantee's records shall be subject to audit at any reasonable time and upon reasonable notice by the Grantor State Agency, the Comptroller of the Treasury, or their duly appointed representatives.

   The records shall be maintained in accordance with Governmental Accounting Standards Board (GASB) Accounting Standards or the Financial Accounting Standards Board (FASB) Accounting Standards Codification, as applicable, and any related AICPA Industry Audit and Accounting guides.

   In addition, documentation of grant applications, budgets, reports, awards, and expenditures will be maintained in accordance with U.S. Office of Management and Budget's Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards.

   Grant expenditures shall be made in accordance with local government purchasing policies and procedures and purchasing procedures for local governments authorized under state law.

   The Grantee shall also comply with any recordkeeping and reporting requirements prescribed by the Tennessee Comptroller of the Treasury.

   The Grantee shall establish a system of internal controls that utilize the COSO Internal Control - Integrated Framework model as the basic foundation for the internal control system. The Grantee shall incorporate any additional Comptroller of the Treasury directives into its internal control system.

   Any other required records or reports which are not contemplated in the above standards shall follow the format designated by the head of the Grantor State Agency, the Central Procurement Office, or the Commissioner of Finance and Administration of the State of Tennessee.

Grantee's Authorized Representative:
(USUALLY MAYOR)

Signature

Print Name

Title

8/16/2017

Date

CONTRACTOR: _____

Signature

Print Name

Title

8/16/2017

Date

PART 1- GENERAL

1.01 SUMMARY

A. General: The below specification describes the components of a complete splash pad equipment system. The system includes but is not limited to those components necessary to make up a completely operational system. The splash pad system is designed to operate as a "Re-circulated water treatment" system.

1. The system will be located at the Athens Regional Park in Athens, Tennessee.
   The intent is to operate the splash pad during the summer months.
2. All embed spray features and above grade spray features must be interchangeable to allow reconfiguration of the splash pad.
3. The perimeter of the spraygound will have a six foot buffer beyond the feature area of influence.
4. The spraygound system will be served by a recirculated water system. The system control will be comprised of a CPU with a touch screen interface that will be located in a covered enclosure. The enclosure will include all suction and discharge headers, piping, interconnecting wiring, concrete, connections, finishes, and safeguards for a full and complete splash pad to be performed under one contract. All construction must be in compliance with all applicable codes and ordinances and in compliance with the plans and specifications. Work shall be performed in accordance with the best practices of the respective trade and all other applicable requirements.
5. The splash pad equipment (spray features, embed sprays, drains, pumps, filtration, controls, manifold, sensors, filter & chemical system, equipment enclosure, filters, pumps, collection tank) will be furnished and installed under this contract.

B. The splash pad system shall consist of:

1. Multi-station interactive features;
2. Splash pad display system including pump(s), valves, piping, and specialties.
3. Splash pad equipment vault and enclosure for the related accessories.
4. Splash pad plumbing services including water and sewer, to designated points of connection with site utilities.
5. All electrical equipment, wiring, and conduit necessary for full operation of the splash pad.
6. Any other necessary specialties required for proper installation of the splash pad and related equipment resulting in a complete and useable splash pad.
7. Collection tank.
8. Filter and chemical system including valves, pipes, fittings, filter, filter pump, and chlorine injection system.
9. Concrete Pad with light broom finish.

1.02 SUBMITTALS

A. Product Data: For each of the products indicated. Include construction details, material descriptions, dimensions of individual components. Include rated capacities, operating characteristics, electrical characteristics, and furnish

specialties and accessories.

B. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements and attachments to other work.

C. Wiring Diagram: For power, signal, and control wiring. Provide both power and control signal line drawings and ladder diagrams. Provide interconnecting control wiring diagrams with lags and labels for each wire and termination. Wiring diagrams will be provided no later than 30 days from signed contract.

D. Coordination Drawings: Indicate locations of Aquatic Playground and connections to utilities. Include plans and elevations; clearance requirements for equipment access and maintenance; details of support for equipment; and utility service characteristics.

E. Operation and Maintenance Data: Provide all operation and maintenance manuals for all individual components and complete system. The operation and maintenance manuals shall include all seasonal requirements of start-up and shutdown, and any other information unique to this system. At minimum the manufacturer will provide the following:
   1. Sequence of operation
   2. Controls functions; internal and external
   3. Control equipment requirements
   4. Seasonal start-up and shutdown requirements
   5. Filter & chemical system requirements
   6. Parts lists
   7. Warranty information

F. Splash pad equipment manufacturer assumes sole responsibility for the delivery and successful integration of all equipment to meet the performance requirements of the contract documents and specifications.

G. Product Schedule: For each Aquatic Playground item, include the following:
   1. Designation indicated on drawings.
   2. Manufacturer's name and model number.
   3. List of factory-authorized service agencies including their address and telephone numbers.

1.03 QUALITY ASSURANCE

A. All materials shall be new and shall conform to applicable standards as specified herein.

B. All work shall be executed by workmen skilled in the craft that they are assigned.

C. The Contractor must currently be in the business of supplying and installing Aquatic Playground equipment, similar in size and complexity. The Contractor shall provide written documentation of supplying and installing Aquatic Playground equipment, for a minimum ten (10) year experience and shall have previously supplied Aquatic Playground system design, drawing and equipment, similar in size and complexity to this project.

D. The Manufacturer shall provide engineering design as it pertains to the Aquatic Playground system and the equipment supplied, referring specifically to complete hydraulic and electrical design. This shall include, but not limited to: spray effects, Aquatic Playground system, filtration system, water level control system, pump selection, piping system sizing and layout.

E. The engineering design information shall be delineated on the final schematic, installation, and detail shop drawings showing the proper installation of the Manufacturer's equipment. The drawings shall be furnished as an integral part of

their Aquatic Playground equipment package. Preliminary drawings shall not be used for installation.

F. Pre-installation Conference: Conduct conference at Project site prior to commencement of construction of Aquatic Playground system and equipment.

1.04 DELIVERY, STORAGE & HANDLING

A. All equipment delivered and placed in storage shall be stored with protection from weather, humidity and temperature variations, dirt and dust or other contaminants, and theft or vandalism. Contractor shall handle all equipment so as to prevent damage or marring, paying particular attention to any handling instructions on the equipment of packaging.

1.05 COORDINATION

A. Coordinate Aquatic Playground layout and installation with other work, including potable water distribution, electrical power, sanitary system, storm drain system, etc.

B. Coordinate location and requirements of utility service connections.

C. Coordinate size, location, and requirements of the following:
   1. Overhead equipment supports.
   2. Equipment bases.
   3. Floor depressions.
   4. Slab areas with positive slopes to drains.

1.06 WARRANTY

A. Splash pad Equipment Warranty: manufacturer's standard form in which manufacturer agrees to repair or replace components or equipment that fail in a materials or workmanship within specified warranty period.

1. Warranty Period: A minimum of 15 years from date of substantial completion against corrosion, material and workmanship will be warranted for not less than 5 years, and electrical components will be warranted for not less than 1 year.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. This section covers splash pad equipment, devices, filter & chemical system, controls, piping, and other components of the complete system. All components are to be supplied by a single manufacturer. All spray nozzles, water features, and complete system will be designed and manufactured by the selected manufacturer.

B. Splash pad System: Selected manufacturer to provide all equipment and features equal to product at submitted and selected. These items must meet the minimum standards specified herein.

2.02 GENERAL

A. Provide all special tools and winterization plates or inserts for proper operation and maintenance of the equipment.

2.03 SPLASH PAD FOUNTAIN SUMMARY

A. Features at splash pad shall at a minimum include:
1. The splash pad shall include features for all ages.
2. A minimum of 10 play features.
3. A minimum of 2 play features must have flow rates of 50 gpm or greater.
4. No slides or climbing features can be used.

B. Deck Drains
1. Deck Drains shall be factory assembled
2. Drains shall have non-skid surface with slot openings no wider than 5/16”.
3. A waste/rain water bypass valve box shall be included in drain system.

C. Activation Devices

Activation device shall not have any moving parts, and shall operate on low voltage. The activation device shall serve as a direct interface between the users and the splash pad features.

D. Universal Mounting Fixture
1. The universal mounting fixture (UMF) for installation of water feature apparatus comprising: a housing designed to be positioned within a water park surface, the housing having a sealing surface, and an inlet adapted to be coupled to a water supply for providing water to a water feature mounted in association with the housing, the sealing surface defining an opening, the opening dimensioned to accept an inlet of a water feature fixture in sealing relationship, such that water supplied to the receptacle housing will flow to the water feature mounted therewith, wherein the housing and mounting surface accommodate both inlets from above ground and below ground water feature fixtures.
2. Supply Piping: All piping connections shall be made from heavy-duty high tensile strength PVC.
3. Connections: A female socket shall be supplied to connect the water supply line supplied by others.
4. Shall be packaged to protect against damage in transit.
5. Drawings and installation instructions shall be supplied by manufacturer.

E. Flush Mounted Components
1. Flush mounted features shall be suitable for installation in splash pads. Pumps and valves to regulate the flow shall be supplied.
2. Construction: The body shall be manufactured from heavy duty, high tensile strength materials, and shall be impervious to rust and corrosion. Nozzles shall be adjustable high strength and corrosion resistant.
3. Supply Piping: All piping and connections shall be made from heavy-duty high tensile strength schedule 40 PVC.
4. Shall be packaged to protect against damage in transit.
5. Drawings and instructions shall be supplied by the manufacturer for ease of installation.
6. A universal mounting fixture (UMF), for splash pad shall be provided for installation ease at a later date, or removal for winterization, or for moving to another location.
7. A tamper resistant cover shall be provided to winterize the feature. It shall be made from high strength material.

F. Above Ground Features
   1. Features shall be suitable for installation in splash pads.
   2. Pumps and valves to regulate flow shall be supplied. Installation shall be supplied.
   3. Construction: The body/shell shall be manufactured with nonconductive, MACT compliant materials inert to pool chemicals.
   4. Supply Piping: All piping connection shall be made from heavy-duty high tensile strength schedule 40PVC.
   5. Colors will be chosen by owner from manufactures color charts. Colors shall be ultraviolet stabilized to inhibit fading.
   6. Shall be packaged to protect against damage in transit.
   7. Drawings and instructions shall be supplied by manufacturer for ease of installation.

2.04 CENTRAL PROCESSING UNIT (CPU)

A. The CPU shall be responsible for controlling actuated jandy valves for sequential, on demand, or random distribution of water to the water features while monitoring system water pressure and flow. It shall control and receive signals from photo electric sensors, push buttons, pressure transducers, proximity sensors, and depth sensors. It shall control makeup water and reservoir tank water level.

B. The CPU shall be capable of onsite programming, monitoring, and actuation. It shall data log chemical levels in the system. It shall include all the necessary software to provide a complete splash pad operation controlling the timing and frequency of water distribution automatically to the specific water features in the system. It shall be equipped with a 24-hour clocking system for automatic daily activation and shut down of programming. It shall be capable of daily programming for each day of the week.

C. Construction: The CPU shall be housed in a NEMA 4 enclosure designed for wall mount installation in an indoor application.

D. Run to bypass the activator and run continuously, or Test/Manual Run as chosen by the system operator.

2.05 HOLDING TANK

A. System shall contain a minimum 2,000-gallon, below-grade tank.

B. All fittings shall be flanged or solvent weld and compatible with overall mechanical system.

C. Tank shall have an access ladder and lockable hatch.

D. Tank shall include coupling for 2” overflow line and 1” fresh water fill line.

E. Coupling for feature return to tank shall be sized to handle required feature flow rate not to exceed 10 fps flow velocity per NSF Guidelines.

F. Coupling for feature suction line sized to handle required feature flow rate not to exceed 6 fps flow velocity per NSF Guidelines.

G. Coupling for tank drain line shall be sized to handle filter pump flow rate.

H. Coupling for main drain line shall be sized to handle required feature flow rate not to exceed 3 fps flow velocity from splash pad drains.

I. Coupling for recirculating suction line shall be sized to handle required filter flow rate not to exceed 6 fps flow velocity per NSF Guidelines.

J. Tank automatic water fill device with adjustable float sensor and control valve.

2.06 WATER QUALITY MANAGEMENT SYSTEM

A. The contractor shall provide and install the Water Quality Management System per manufacturers specifications.

B. The Water Quality Management System shall be factory assembled and water pressure tested before delivery.
C. The Water Quality Management System shall be fully serviceable and accessible for ease of maintenance and use.
D. All electrical equipment, including circulation pumps, filtration pumps, chemical controllers, chemical feed pumps, electrical solenoid valves, and flow switches, shall be pre-wired and tested before delivery.
E. All specified flow rates shall be tested and verified before delivery.
F. All equipment shall housed in an enclosure with lockable access. Equipment must be accessible to facilitate maintenance.
G. The Water Quality Management System shall use NSF certified self-priming pump(s), with a strainer, to operate the play features.
H. The pump(s) shall be capable of providing the required flow to operate all play features simultaneously in a pre-programmed sequence.
I. The sand filter(s) shall be NSF-listed for swimming pool filters. It shall be capable of maintaining a filtration rate of less than 30 minutes, at the required filtration rate.
J. A flow control valve and flow meter shall be present to maintain the required filter flow rates. Influent and effluent pressure gauges shall be present on all pumps.
K. A backwash valve kit shall be provided, including a sight glass, flow control valve, and flow meter to control the backwash rate.
L. An automated chemical controller shall be present on the system, capable of monitoring and adjusting pH and ORP levels.
M. The chemical controller shall have an alarm system that shall close all valves to the aquatic play features in case of a loss of proper water chemistry.
N. The chemical controller shall not be capable of injecting chemicals into the system whenever the filter pump is off.
O. The chemical controller shall be pre-wired to the Splash pad System Controller and feed systems prior to delivery.
P. Both 50 gallon chemical reservoirs shall be double-walled polyethylene with a polyethylene lid and vent to atmosphere.
Q. A flow switch shall be present on the circulation pump and filter pump to monitor flow and shut down the pump system in the event of no flow. It shall be pre-wired to the Splash pad System Controller prior to delivery.
R. The water distribution system shall be fabricated out of Stainless Steel 304/304L and be pre-assembled, factory tested, and come complete with all the necessary plumbing.

2.07 AQUATIC PLAYGROUND SURFACE AREA

A. Provide brushed concrete surface at the entire Aquatic Playground area with slopes to drains and control joints. The pad shall be a minimum of 2500 square feet in size.

PART 3 EXECUTION

3.01 GENERAL

A. Install all equipment specified herein and/or shown on the drawings in strict accordance with the manufacturer’s instructions and recommendations and in compliance applicable codes.
B. Splash pad feature manufacturer shall provide drawings and instructions of splash pad play features for ease in installation.
C. Mounting shall be manufacturer’s standard methods for each feature.

3.02 PREPARATION

A. Prior to submitting a design, the Contractor shall visit the site and compare with the drawings and specifications covering this work. Contractor satisfy himself with the conditions existing at the site and/or shown on the drawings which affect or are affected by the work and all other matters incidental to the work. Contractor shall assume all responsibility relating to his requirement in submitting his bid.

3.03 INSTALLATION

A. Pipe
1. Provide flanges or unions as indicated and/or as necessary to allow removal and reinstallation of any item of equipment or accessory without cutting, welding or soldering.
2. Cut pipe into measurements established at the site. Work into place thout springing or forcing.
3. Protect all openings in piping during construction to prevent entrance of foreign matter.
4. Cut pipe and tubing ends square. Remove rough edges and burrs so that a smooth and unobstructed flow will be obtained.
5. Close or short nipples should be used only where shown on the drawings, or absolutely necessary to satisfy dimensional constraints.
6. Make changes in pipe size using reducing fittings. Use bushings only if shown on the drawings.
7. Connections to equipment or accessories shall be screwed for sizes 2" or smaller, and flanged for sizes 2½" and larger.
8. Arrange exposed piping straight, parallel and perpendicular to the walls of the structures unless, otherwise shown on the Drawings.
9. Whenever two or more pipes are installed in parallel, allow sufficient space for required connections labeling and/or the application of insulation.

B. Pipe Joints
1. Cut all threads accurately, axis of thread coinciding with axis of pipe.
2. No more than two threads shall show beyond fittings.
3. Make up joints with Teflon tape or pipe dope compound.
4. Remake leaky joints with new materials.

C. Copper and brass pipe and tubing:
1. Clean surfaces to be jointed of oil, grease, rust, and oxides before assembly or heating.
2. Apply an appropriated flux to each joint surface and spread evenly. Apply heat with an oxyacetylene torch.
3. Make up all joints using non-corrosive flux and 95-5 solder, ASTM B32 Grade A.

D. PVC pipe
1. Bevel all pipe ends with a coarse file or beveling tool.
2. Clean surfaces to be joined of all loose dirt and moisture from the I.D. and O.D. of the pipe end and the I.D. of the fitting socket.
3. Apply a coating of appropriate primer to the entire I.D. surface of the fitting socket and to an equal area on the O.D. of the pipe end.

4. Apply solvent cement using an appropriate natural bristle brush. Apply a liberal coating of cement around the entire depth of the socket surface, avoiding excessive cement application. Apply a second liberal coating onto the pipe end.
5. Immediately after cementing, insert the pipe into the fitting to the full socket depth while rotating the pipe or fitting one quarter turn. Hold joint together for at least 15 seconds after joining to make sure pipe does not back out of socket.
6. Do not solvent weld pipe if atmospheric temperature is below 40 degrees F or above 90 degrees F, or if it is raining.
7. Discard cement when an appreciable change in viscosity takes place or if cement is lumpy or stringy. Do not thin. Cement must be used before the expiration date shown on container.
8. All systems shall be left in good operating condition. If defects of materials or workmanship in piping systems or equipment are disclosed as a result of tests and operation, repairs shall be made by the Contractor at his expense, using new materials, and all defective materials shall be retested until a satisfactory test has been made.
9. No caulking or screwed joints, cracks, or holes will be acceptable. Replacing shall be the full length of defective sections of pipe. Defective apparatus shall be removed from the site and replaced by apparatus conforming to the requirements of these requirements. The entire cost of repairs and replacements shall be borne by the Contractor.

E. Wiring Materials

1. Electrical conductors connected to equipment having a tendency to cause noise or vibration, shall be installed in flexible conduit not to exceed four feet in length. All flexible conduit subject to moisture shall be covered with watertight plastic and all connections shall made with watertight fittings.
2. All other electrical conductors shall be installed in rigid conduit unless otherwise specified or indicated on the drawings. All connections shall be made with approved fittings.
3. All conduit and stub-ups located within areas under water shall be red brass pipe, type K copper tubing of full hard temper, or Everdur.
4. All interconnecting conduits shall be steel, P.V.C. or other material approved for application.
5. All connections between dissimilar metals shall be made with dielectric fittings.
6. Minimum conduit size shall be ¾” unless otherwise specified or indicated on the drawings.
7. All wire, flexible cord, cable and/or conductors shall be selected as to size, type, current carrying capacity, voltage and insulation based on intended service, and shall conform to the latest ASTM and IPECA specifications and standards.
8. All connecting and terminating devices used for making connections, taps and/or splices shall be as approved for application.
9. All junction and/or pull boxes located outside the water containment areas shall conform to applicable codes and shall be of sufficient size, suitable design and approved construction to meet the conditions and requirements involved.

F. Installation of Conduit

1. All wiring shall be in conduit installed and sealed in accordance with the best modern practice as specified.
2. All conduit located in finished areas shall be concealed unless otherwise specified or indicated on the drawings.
3. The ends of all conduits shall be cut square and shall be carefully reamed to remove rough edges.
4. Open ends of conduit shall be kept closed with approved conduit seals during construction.
5. Where conduit enters a box or other fitting, a bushing shall be provided to protect conductors from abrasion.
6. Where junctions, bends, or offsets are required, for exposed runs of conduit, fittings shall be provided. Fitting covers shall be accessible. Bends will not be permitted around corners of beams, walls, or equipment.
7. Threadless couplings and/or connectors used with conduit shall be made tight. Where installed in wet locations or where buried in concrete or other fill, threadless couplings and connectors shall be suitable for preventing water from entering the conduit. Running threads will not be permitted.
8. Sliding expansion joints with bonding straps shall be furnished where conduits cross building expansion joints or as otherwise required.
9. Bends in conduit shall be made so that the conduit is not damaged and such that the inside diameter of the conduit will not be effectively reduced. No more than the equivalent of four 90-degree bends shall be used on any single run of conduit between outlets and/or other fittings.
10. All concealed and/or exposed conduit shall be supported in an approved manner.

G. Installation of Conductors

1. All conductors shall be installed in conduit after all conduits, except exposed conduit with removable conduit seals, has been installed as a complete raceway system.
2. All debris and moisture shall be removed from all conduit, boxes, and other fittings before installing conductors. Cleaning agents or materials used as lubricants that might have a deteriorating effect on conductor coverings shall not be used.
3. The connection of conductors to terminals shall be made using approved connectors. Wires in panel cabinets, pull boxes, and wiring gutters shall be neatly grouped and fanned out to the terminals.
4. Care shall be taken to protect conductors from damage caused by further mechanical work completed after conductors have been installed. Damaged conductors shall be replaced.
5. All circuits fed by ground fault interrupters shall have their own separate neutral wire. No common neutrals will be acceptable.

I. Conductor Color Coding

1. All conductors (600 volts and under) shall be color-coded and numbered. Color continuity being maintained throughout the project.
2. Color-coding shall be as follows: Phase “A” shall be “Black”, Phase “B” shall be “Red”, Phase “C” shall be “Blue”, “Neutral” shall be “White”, and “Grounding Conductors” shall be “Green”.

J. Excavating, Trenching and Backfilling

1. The Contractor shall perform all excavating, trenching and backfilling specified, as indicated on the plans and/or as required for the installation of the work under this section.
2. Trenches shall be excavated and underground conduit shall be laid and supported in accordance with the best modern practice as specified.
3. Prior to lowering into the trenches, all conduit fittings and accessories shall be inspected for defects and all defective, damaged or unsound conduit shall be replaced.

3.04 TEST AND ADJUSTMENTS

A. This Contractor shall test all equipment as necessary to show that it complies with all requirements specified. Testing shall be done in a manner approved by the Owner's Representative.

B. All water piping systems shall be flushed free of debris and pressure tested at 150% of operating pressure or 75psi minimum for discharge lines, 30p.s.i. minimum for suction lines, and 15p.s.i. minimum for drain lines, for a period of not less than 4 hours, and proven free of leaks or other defects, prior to and after backfilling and concrete pours. Repair leaks and repeat test as necessary until satisfactory results are obtained.
   1. Splash pad flow manifold assemblies shall be pressure tested to150 PSI for 30 minutes with zero leakage. Repair any leaks and retest until acceptable results are obtained.
   2. All open ended pipes and equipment, such as drain bodies, shall be left long for testing, and then cut to length before final installation of equipment

C. All electrical circuits, feeders, and equipment shall be tested and proven free of improper grounds, open circuits or shorts, as required by the authorities having jurisdiction, to demonstrate compliance with codes and laws.

D. The Contractor shall place the installation in operation and make tests, adjustments, and corrections, until it is shown to be in proper operating condition.

3.05 GUARANTEE

A. In entering into a contract covering this work, each contractor accepts the specifications and drawings and guarantees that the work will be performed in accordance with the requirements of the specifications and drawings, or such modifications to said specifications and drawings, as may be made in the contract documents and applicable codes and laws.

B. Each Contractor further guarantees that the workmanship and material will be of best quality procurable, and that none but experienced workmen, familiar with each particular class of work, will be employed.

C. Each Contractor further agrees to hold himself responsible for any defects which may develop in any part of the entire system, including equipment as provided for under this specification, due to faulty workmanship, design or material and to replace and make good, without cost to the Owner, any such faulty parts or construction that may develop at any time within one year from the date of the final acceptance or longer where dictated by manufacturer's warranty periods. Any repairs or replacements required because of defects, as outlined in this clause, are to be made promptly and approved in writing by the Owner's Representative prior to replacement/repair of defective work.

3.06 CLEAN-UP

A. Upon completion of the work of this section, the Contractor shall remove from the sites all rubbish, trash, and debris resulting from the operations; remove all used equipment and implements of service; and leave the entire area involved in a neat, clean, and acceptable condition as approved by the Owner's Representative.

B. All soiled, abraded or discolored surfaces of splash pad and stream feature work shall be cleaned, polished and left free from blemishes or defects.

END OF SECTION 116850

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

C. Related Requirements:

1. Section 01500 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably

free of subsoil, clay lumps, gravel, and other objects larger than 1 inch in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 MATERIAL OWNERSHIP

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

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

E. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.7 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.8 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises. Coordinate with Owner for location.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

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

F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead-and chromate-free, self-curing, universal modified-alkyd primer complying with SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating. If known, consider inserting manufacturer's name and product name for antirust coating.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

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

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

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

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

1. Arrange with utility companies to shut off indicated utilities.

2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than ten 10 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 1 inch in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 STOCKPILING ROCK

A. Remove from construction area naturally formed rocks that measure more than 1 foot in least dimension. Do not include excavated or crushed rock.

1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

1. Limit height of rock stockpiles to 36 inches.
2. Do not stockpile rock within protection zones.
3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus rock to allow later use by the Owner.

3.8 SITE IMPROVEMENTS

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

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.

C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

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. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements and turf and grasses.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.
9. Excavating well hole to accommodate elevator-cylinder assembly.

B. Related Requirements:
1. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
2. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
3. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
4. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.3 UNIT PRICES

A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following. Unit prices for rock excavation include replacement with approved materials.

1. 24 inches outside of concrete forms other than at footings.
2. 12 inches outside of concrete forms at footings.
3. 6 inches outside of minimum required dimensions of concrete cast against grade.
4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches beneath bottom of concrete slabs-on-grade.
6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

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

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

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

L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

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

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

    a. Personnel and equipment needed to make progress and avoid delays.
    b. Coordination of Work with utility locator service.
    c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
    d. Extent of trenching by hand or with air spade.
    e. Field quality control.
    f. Disposal of excavated materials.
    g. Excavating for drainage installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches.
2. Warning Tape: 12 inches long; of each color.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

C. Blasting plan approved by authorities having jurisdiction.

D. Seismic survey report from seismic survey agency.

E. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.8 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

C. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.9 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

E. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

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

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33/C 33M; fine aggregate.

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

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 157 lbf; ASTM D 4632.
    b. Sewn Seam Strength: 142 lbf; ASTM D 4632.
    c. Tear Strength: 56 lbf; ASTM D 4533.
    d. Puncture Strength: 56 lbf; ASTM D 4833.

3. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.5 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 247 lbf; ASTM D 4632.
    b. Sewn Seam Strength: 222 lbf; ASTM D 4632.
    c. Tear Strength: 90 lbf; ASTM D 4533.
    d. Puncture Strength: 90 lbf; ASTM D 4833.

3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
4. Permittivity: 0.02 per second, minimum; ASTM D 4491.
5. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150/C 150M, Type I, Type II or Type III.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/4-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869/C 869M.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260/C 260M.

B. Produce low-density, controlled low-strength material with the following physical properties:

1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
2. Compressive Strength: 140 psi , when tested according to ASTM C 495/C 495M.

C. Produce conventional-weight, controlled low-strength material with 140-psi compressive strength when tested according to ASTM C 495/C 495M.

2.4 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

B. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.

1. Perform blasting without damaging adjacent structures, property, or site improvements.
2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit

prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

    a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.

6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
2. Place and compact impervious fill over drainage backfill in 6-inch thick compacted layers to final subgrade.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.

6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

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

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes Concrete Paving.
   1. Curbs and gutters.
   2. 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 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

   1. Review methods and procedures related to concrete paving, including but not limited to, the following:

      a. Concrete mixture design.
      b. Quality control of concrete materials and concrete paving construction practices.

   2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete paving Subcontractor.
      e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

1.5 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. 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.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer of stamped detectable warnings, ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Material Test Reports: For each of the following:

1. Aggregates: Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

D. Field quality-control reports.

1.7 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.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches. Include full-size detectable warning.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

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

1.9 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, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

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

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated 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 forms, 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 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. Do not use notched and bent forms.

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 galvanized-steel wire into flat sheets.

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

C. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

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

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

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

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

H. Plain-Steel Wire: ASTM A 1064/A 1064M, 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 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 plain-steel bars.

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

N. Hook Bolts: ASTM A 307, Grade A, 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. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. 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 portland cement Type I.
2. Fly Ash: ASTM C 618, Class C or Class F.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
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: 3/8 to 5/8 inch nominal.

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.

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 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.

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 in preformed strips.

B. Slip-Resistive 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. 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.

E. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, 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: 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: 4-1/2percent plus or minus 1-1/2 percent for 1-1/2-inch nominal maximum aggregate size.
2. Air Content: 4-1/2 percent plus or minus 1-1/2 percent for 1-inch nominal maximum aggregate size.
3. Air Content: 5 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 percent by weight of cement.

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

1. Use water-reducing 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.

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): 3500 psi.
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 5 inches, 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, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

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. 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., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, 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.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch 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 CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

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

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

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

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool 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 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 1-1/2 inches 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 unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.

5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. 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:

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 radius. Repeat grooving of contraction joints after applying surface finishes.

    a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Doweled 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 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 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 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.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch 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. 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-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. 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 brooming, uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft.

1. Embed rock salt into plastic concrete with roller.
2. Cover paving surface with 1-mil-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. 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 CONCRETE PROTECTION AND CURING

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

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

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

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

E. Curing Methods: Cure concrete by moisture curing as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

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

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

3.10 PAVING TOLERANCES

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

1. Elevation: 3/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch .
3. Surface: Gap below 10-feet- long; unleveled straightedge not to exceed 1/2 inch.
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch.
6. Vertical Alignment of Dowels: 1/4 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: 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. 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 and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 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.

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.

3.12 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