

PROJECT MANUAL

for Herz-Rose Park - Terre Haute, Indiana



City of Terre Haute
17 Harding Avenue
Terre Haute, Indiana 47807

Brandon Sakbun, Mayor



Terre Haute Parks & Recreation Dept.
1110 Girlscout Lane
Terre Haute, Indiana 47807



Land Stewards
Design Group

Land Stewards Design Group
5022 Rockville Road
Indianapolis, IN 46224
www.landstewardsdg.com

LSDG Project No. 23-005

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The bid packets items A-W, are available at Rapid Reproductions, Inc. 129 S. 11th St. Terre Haute, IN Phone: 812-238-1681 or at Terre Haute Engineering Dept. Office.

ITEMS X-GG are not included. These items are Standard AIA Documents (Most current editions) and may be examined at the Design Consultant's office.

- X. Bid Bond (AIA Document A310)
- Y. Standard form of Agreement Between Owner and Contractor (AIA Document A104)
- Z. Performance Bond and Payment Bond (AIA Document A312)
- AA. Change Order (AIA Document G701)
- BB. Application and Certificate for Payment (AIA Document G702 & G703)
- CC. Certificate of Insurance (AIA Document G715)
- DD. Contractor's Affidavit of Payment of Debts and Claims (AIA Document G706)
- EE. Contractor's Affidavit of Release of Liens (AIA Document G706A)
- FF. Consent of Surety Company to Final Payment (AIA Document G707)
- GG. Proposal Request (AIA Document G709)

INVITATION TO BID

The City of Terre Haute Board of Public Works will receive sealed bids for the Herz-Rose Park Project at the Engineering Department at City Hall in Terre Haute, Indiana until 9:00 AM on the 12th day of August, 2024, at the office of the Board of Public Works, City Hall, 17 Harding Ave., Terre Haute, Indiana at which time and place all bids will be publicly opened and read aloud.

Bids will be received on the basis of a single lump sum and alternates for complete construction as described in the Instructions to Bidders. The work is to include all labor, materials, equipment, tools and appliances, transportation, all applicable taxes, permits and everything required for the entire performance and completion of the work in every detail.

All work shall be in strict accordance with this Invitation to Bid and the bidding Contract Documents as prepared by Land Stewards Design Group, Inc. (Design Consultant) Any bids received after the above specified time and date will be returned to bidders unopened. Bids shall be accompanied by the General Contractor's Proposal Contents as stated in the specifications.

Bidding and Contract Documents may be examined in the Engineering Department Office at City Hall or purchased from Rapid Reproductions.

Plans and specifications will be available for distribution July 8, 2024. The plans and specifications must be purchased directly from Rapid Reproductions, 129 S. 11th St., Terre Haute, IN 47807. No bids shall be withdrawn for a period of sixty-(60) calendar days after the bid opening without written consent of the Design Consultant.

Do not include sales tax in the bid amount. The Owner is exempt from payment of Indiana Sales Tax and Use Tax. The Owner will furnish the Contractor with the necessary exemption number upon request.

A certified check or bank draft, payable to the order of the City of Terre Haute, negotiable U.S. Government Bonds (at par value), or a satisfactory Bid Bond executed by the Bidder and acceptable surety, in an amount equal to five percent (5%) of the total amount of the bid shall be submitted with each bid.

Bid Guaranty will be returned to unsuccessful bidders upon selection of the successful bidder. Bid Guaranty of the successful bidder will be returned upon the signing of contracts. Bids may be held not to exceed sixty-(60) days from the date of Bid Opening for the purpose of reviewing the Bids and investigating the qualifications of the Bidders, prior to the award of a Contract.

The Contractor receiving the award shall furnish at the directive of the Owner, an approved Performance Bond, Labor and Material Payment Bond in an amount at least equal to 100% of the contract amount.

The bidders are requested to meet with the Owner and Design Consultant for a pre-bid conference at the project site at City Hall Board of Public Works Conference Room, Terre Haute, IN on Monday, July 29th at 10:00 AM local time. Contractors shall be aware that this project is covered under the provisions of the Davis- Bacon Prevailing Wages Act. All laborers and mechanics shall be paid at a minimum according to the prevailing wages indicated in the Wage Decision.

The Contractor must ensure that all employees and applicants for employment are not discriminated against because of their race, religion, color, sex, national origin, or individuals with handicaps. Women and Minority Owned Businesses qualified to perform the work contemplated by this solicitation are encouraged to bid.

The time of completion for the project shall be 270 days after the Notice to Proceed. The City of Terre Haute reserves the right to reject any or all bids or waive any informality in the bidding to the extent permitted by law.

Each bid must be enclosed in a sealed envelope marked:

Bid For: City of Terre Haute, Board of Public Works
Herz-Rose Park Project
Bid opening August 12th, 2024 at 9:00
AM "Name and Address of Bidder"

Dated this 8th Day of July

INSTRUCTIONS TO BIDDERS

1. SECURING DOCUMENTS

Copies of the proposed Contract Documents are on file at the following offices:

City of Terre Haute: Engineering Department
City Hall, Room 200
17 Harding Avenue
Terre Haute, IN 47807

Land Stewards Design Group
5022 Rockville Road,
Indianapolis, IN 46224

The bid packets, plans and specifications are available online at Rapid Reproductions, Inc. 129 S. 11th St., Terre Haute, IN (Phone # 812-238-1681), rapid@rapidreproductions.net

Copies of the proposed Contract Documents may be obtained for bidding purposes upon the conditions set forth in the Invitation to Bid.

2. BID FORM

In order to receive consideration, make all bids in strict accordance with the following:

- 1) Make bids upon the forms provided therefore, with bids as shown properly executed and with all items filled out. Do not change the wording of the Bid Form, and do not add words to the wording of the Bid Form. Unauthorized conditions, limitations or provisions attached to the proposal shall be cause for rejection of the proposal. Alterations by erasure or interlineation must be explained or noted in the bid over the signature of the bidder.
- 2) No telegraphic bid or telegraphic modification of bid will be considered. No bids received after the time fixed for receiving them will be considered. Late bids will be returned to the sender unopened.
- 3) Each bid shall be addressed to the Owner and shall be delivered to the Owner at the address given on or before the day and hour set for opening of the bids. Each bid shall be enclosed in a sealed envelope bearing the title of the work, the name of the bidder, and the date and hour of the bid opening. It is the sole responsibility of the bidder to see that his bid is received on time.

3. EXAMINATION OF DRAWINGS, SPECIFICATIONS, AND SITE OF WORK

Before submitting a bid, each bidder shall carefully examine the Drawings, READ the Specifications and all other proposed Contract Documents, and visit the site of the Work.

Each bidder shall fully inform himself prior to bidding as to all existing conditions and limitations under which the Work is to be performed, and he shall include in his bid a sum to cover all costs of all items necessary to perform the work as set forth in the proposed Contract Documents. No allowances will be made to any bidder because of lack of such examination or knowledge. The submission of a bid will be construed as conclusive evidence that the bidder has made such an examination.

4. WITHDRAWAL OF BIDS

Any bidder may withdraw his bid, either personally or by written request, at any time prior to the scheduled time for opening bids. No bidder may withdraw his bid for a period of 60 days after the date set for opening thereof, and all bids shall be subject to acceptance by the Owner during this period.

5. AWARD OR REJECTION OF BIDS

The Contract will be awarded based on the low bid. The Owner also reserves the right to reject the Bid of any bidder who has previously failed to perform properly, or in a timely manner, or to complete an item, contracts of similar nature, who is not in a position to perform the Contract, or who has habitually and without just cause neglected the payment of bills or otherwise disregarded his obligations to subcontractors, materialmen, or employees. The Contract is intended to be awarded to the apparent and best low bidder. In the case of the acceptance of any alternates, it will be the lowest net or aggregate including the alternates that the Owner accepts. The Owner reserves the right to accept any bid and to waive any formalities.

6. EXECUTION OF AGREEMENT

The form of Agreement which the successful bidder, as Contractor, will be required to execute, is included in the Project Manual:

- 1) The bidder to whom the contract is awarded by the Owner shall, within 7 days after Notice of Award and receipt of the Agreement form from the Owner, sign and deliver to the Design Consultant all required copies.
- 2) At or prior to delivery of the signed Agreement, the Contractor shall deliver to the Design Consultant the policies of insurance certificates as required by the Contract Documents. All bonds and policies of insurance shall be approved by the Owner before the successful bidder may proceed with the work.
- 3) Failure or refusal to furnish bonds or insurance policies or certificates in a form satisfactory to the Owner shall subject the bidder to loss of time from the allowable construction period equal to the time delay in furnishing the required material.

7. INTERPRETATION OF CONTRACT DOCUMENTS PRIOR TO BIDDING

If any person contemplating submitting a bid for construction of the Work is in doubt as to the true meaning of any part of the proposed Contract Documents or finds discrepancies in or omissions from any part of the proposed Contract Documents, he may submit to the Design Consultant a written request for interpretation thereof not later than five days before bids will be opened.

- 1) The person submitting the request shall be responsible for its prompt delivery.
- 2) Interpretation or correction of proposed Contract Documents will be made only by Addendum and will be mailed or delivered to each bidder of record. All Addenda will be a part of the Contract.
- 3) The Owner will not be responsible for any other explanations or interpretations of the proposed Documents.

8. CONSTRUCTION TIME AND LIQUIDATED DAMAGES

The Agreement will include a stipulation that work be completed in 270 days. The Agreement will also include a stipulation that liquidated damages will be established in the amount of \$100.00 per calendar day after the completion date that the work is not fully completed, and Certificate of Occupancy issued.

9. PERFORMANCE BOND

A performance and payment bond in a penal sum of 100 percent of the contract price; or as may be required or permitted by State law, or an irrevocable line of credit listing the City of Terre Haute as the sole beneficiary for 25% of the total construction contract. The line of credit must be issued for the entire construction period plus one (1) year following construction completion.

10. COMPLETION OF SPECIFICATIONS AND PLANS

Upon issue to prospective bidders the physical make-up and content of the plans, specifications and extra proposal forms are intended to be complete for preparing and submitting of proposals. However, the bidder will verify to his own satisfaction that all material issued to him is complete. Should he discover that a page, sheet, etc., is missing, he shall notify the Design Consultant in writing, and it will be forwarded to him. After bids have been submitted, no claim of ignorance of the requirements of bidding or of construction due to such missing material will be recognized.

11. PROPOSAL CONTENTS

All bids shall include properly executed forms as follows:

- 1) Bid Security
- 2) Bid Form 96
- 3) Bid Form Attachment
- 4) Wage Scale Affidavit
- 5) E-Verify Affidavit
- 6) Non-Collusion Affidavits*
- 7) EEO Certificates*
- 8) Drug Free Work Place Certification*
- 9) Anti-Lobbying Certificates*
- 10) Non-Segregated Facilities*
- 11) Proposed List of Subcontractors (Including Addresses and Phone Numbers)

The general contractor shall submit all the above items with their proposals.

* All subcontractors shall submit these forms before the Notice to Proceed is issued.

12. WAGES

Attention of bidders is called to the fact that no less than minimum salaries and wages must be paid on this project.

13. PRE-BID MEETING

A Pre-Bid meeting will be at City Hall Board of Public Works Conference Room,
Terre Haute, IN on Monday, July 29th at 10:00 AM

BID FORM ATTACHMENT

TO: CITY OF TERRE HAUTE BOARD OF PUBLIC WORKS
17 HARDING AVENUE, TERRE HAUTE, IN 47807
HERZ-ROSE PARK PROJECT

Bidding Contractors:

1. Pursuant to and in compliance with the invitation to bid and the proposed Contract Documents relating to Project, including any addenda, the undersigned, having become thoroughly familiar with the terms and conditions of the proposed Contract Documents and with the local conditions affecting the performance and costs of the work at the places where the work is to be completed, and having inspected the sites in all particulars, hereby purposes and agrees to fully perform the work within the time stated and in strict accordance with the proposed Contract Documents, including furnishing any and all labor and materials, and to do all of the work required to construct and complete said work in accordance with the Contract Documents, for the following sum of money:
2. I understand that the Owner reserves the right to reject this bid, but that this bid shall remain open and not be withdrawn for a period of sixty days from the date prescribed for its opening.
3. If written notice of the acceptance of this bid is mailed or delivered to the undersigned within thirty days after the date set for the opening of this bid, or at any other time thereafter before it is withdrawn, the undersigned will execute and deliver the Contract Documents to the Design Consultant in accordance with this bid as accepted, and will also furnish and deliver to the Design Consultant, Proof of Insurance Coverage within seven days after personal delivery or after deposit in the mails of the notification of acceptance of this bid.
4. If awarded a contract under this proposal, the undersigned agrees to start work within seven (7) days of the contract signing, Notice of Acceptance, or request for additional information, may be addressed to the undersigned at the address set forth below:

ADDENDA CONFIRMATION

Bidder acknowledges receipt and has incorporated the provisions of the following addenda in this bid.

<u>Addendum Number</u>	<u>Date</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

BID FORM

PROJECT: Herz-Rose Park Project

COMPLETE CONSTRUCTION BID (IN WRITING)

(IN FIGURES)

Date_____, 2024

(Firm Name)

Official Address:

By: _____

Title: _____

Phone: _____



CONTRACTOR'S BID FOR PUBLIC WORK - FORM 96

State Form 52414 (R / 9-10) / Form 96 (Revised 2010)
Prescribed by State Board of Accounts

PART I

(To be completed for all bids. Please type or print)

Date (month, day, year): _____

1. Governmental Unit (Owner): _____

2. County : _____

3. Bidder (Firm): _____

Address: _____

City/State/ZIPcode: _____

4. Telephone Number: _____

5. Agent of Bidder (if applicable): _____

Pursuant to notices given, the undersigned offers to furnish labor and/or material necessary to complete the public works project of _____
(Governmental Unit) in accordance with plans and specifications prepared by _____
_____ and dated _____ for the sum of
_____ \$ _____

The undersigned further agrees to furnish a bond or certified check with this bid for an amount specified in the notice of the letting. If alternative bids apply, the undersigned submits a proposal for each in accordance with the notice. Any addendums attached will be specifically referenced at the applicable page.

If additional units of material included in the contract are needed, the cost of units must be the same as that shown in the original contract if accepted by the governmental unit. If the bid is to be awarded on a unit basis, the itemization of the units shall be shown on a separate attachment.

The contractor and his subcontractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin or ancestry. Breach of this covenant may be regarded as a material breach of the contract.

CERTIFICATION OF USE OF UNITED STATES STEEL PRODUCTS (If applicable)

I, the undersigned bidder or agent as a contractor on a public works project, understand my statutory obligation to use steel products made in the United States (I.C. 5-16-8-2). I hereby certify that I and all subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

ACCEPTANCE

The above bid is accepted this _____ day of _____, _____, subject to the following conditions: _____

Contracting Authority Members:

_____	_____
_____	_____
_____	_____

PART II

(For projects of \$100,000 or more – IC 36-1-12-4)

Governmental Unit: _____

Bidder (Firm) _____

Date (*month, day, year*): _____

These statements to be submitted under oath by each bidder with and as a part of his bid.
Attach additional pages for each section as needed.

SECTION I EXPERIENCE QUESTIONNAIRE

1. What public works projects has your organization completed for the period of one (1) year prior to the date of the current bid?

Contract Amount	Class of Work	Completion Date	Name and Address of Owner

2. What public works projects are now in process of construction by your organization?

Contract Amount	Class of Work	Expected Completion Date	Name and Address of Owner

3. Have you ever failed to complete any work awarded to you? _____ If so, where and why?

4. List references from private firms for which you have performed work.

SECTION II PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed work. *(Examples could include a narrative of when you could begin work, complete the project, number of workers, etc. and any other information which you believe would enable the governmental unit to consider your bid.)*

2. Please list the names and addresses of all subcontractors *(i.e. persons or firms outside your own firm who have performed part of the work)* that you have used on public works projects during the past five (5) years along with a brief description of the work done by each subcontractor.

3. If you intend to sublet any portion of the work, state the name and address of each subcontractor, equipment to be used by the subcontractor, and whether you will require a bond. However, if you are unable to currently provide a listing, please understand a listing must be provided prior to contract approval. Until the completion of the proposed project, you are under a continuing obligation to immediately notify the governmental unit in the event that you subsequently determine that you will use a subcontractor on the proposed project.

4. What equipment do you have available to use for the proposed project? Any equipment to be used by subcontractors may also be required to be listed by the governmental unit.

5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your proposal? If not, please explain the rationale used which would corroborate the prices listed.

SECTION III CONTRACTOR'S FINANCIAL STATEMENT

Attachment of bidder's financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidder's capability for completing the project if awarded.

SECTION IV CONTRACTOR'S NON – COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

SECTION V OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated at _____ this _____ day of _____, _____

(Name of Organization)

By _____

(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF _____)
COUNTY OF _____) ss

Before me, a Notary Public, personally appeared the above-named _____ and
swore that the statements contained in the foregoing document are true and correct.

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

Notary Public

My Commission Expires: _____

County of Residence: _____

BID OF

(Contractor)

(Address)

FOR
PUBLIC WORKS PROJECTS
OF

Filed _____, _____

Action taken _____

SUPPLEMENTAL GENERAL CONDITIONS

1. COPIES OF DOCUMENTS,

2. INSURANCE AND BONDS, ARTICLE 17, ADD THE FOLLOWING PARAGRAPHS:

- A. The Contractor shall not commence work under this contract until he has obtained all insurance required by these specifications and until such insurance has been approved by the Owner, nor shall the Contractor allow any Subcontractor to commence work on his subcontract until all similar insurance required of the Subcontractor has been obtained and approved. Policies expiring on a fixed date before final acceptance of the project must be renewed and evidence of such renewal submitted to the Owner before such date.
- B. The Contractor shall furnish the Owner with satisfactory evidence of the insurance required.
- C. All policies and/or policy certificates shall contain the following clauses:
 - 1. Worker's Compensation Insurance: The Contractor shall maintain during the life of this contract Worker's Compensation Insurance for all employees employed at the site of the project, and, in case any work is sublet, the Contractor must require the Subcontractor similarly to provide Worker's Compensation Insurance for all of his employees engaged in work under this contract at the site of the project. The Contractor shall provide insurance coverage equal to that provided under the Worker's Compensation Act, for the protection of his employees not otherwise protected. Employer's liability coverage must be maintained in amount not less than \$100,000/\$500,000/\$100,000.
 - 2. Public Liability Property Damage: The Contractor shall maintain during the life of this contract Commercial General Liability Insurance. Such coverage shall protect him and any Subcontractor performing work covered by this contract, from claims for damages for personal injury, including accidental death, as well as from claims for property damages, which may arise from operations under this contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them and the amounts of such insurance shall be as follows:

Commercial General Liability Insurance in an amount not less than \$1,000,000 per occurrence for Bodily Injury, Property Damage, Personal and Advertising Injury with a \$1,000,000 General Aggregate and a \$1,000,000 Products and Completed Operations Aggregate.

The Contractor shall require all of its Subcontractors, if not protected under Contractor's insurance policies, to effect and maintain, at their own expense during the entire period of performance and until completion of the subcontract, Commercial General Liability Insurance with a company or companies to the satisfaction of the Owner as follows:

- a. Commercial General Liability Insurance in an amount not less than \$1,000,000 per occurrences for Bodily Injury, Property Damage, or accidental death with a \$1,000,000 general aggregate and a \$1,000,000 Products and Completed Operations aggregate.
 - b. Special hazards not covered under the Commercial General Liability Insurance must be covered on a policy within the amounts as required above.
3. Business Auto Insurance: The Contractor and all Subcontractors shall at all times during the life of this contract, and any other subcontracts, maintain at their own expense, respectively, business auto insurance covering all liability and claims arising from the use and operation, anywhere in the United States, in connection with the performance of the Contract of Subcontracts of automobiles, whether such are owner, hired, or non-owned by the Contractor or Subcontractors. Such auto insurance shall be written with a limit of not less than \$1,000,000 per occurrence as a combined single limit for Bodily Injury and Property Damage coverage.
4. Umbrella Liability: The Contractor and all Subcontractors shall maintain during the life of this contract, Umbrella Liability Insurance providing excess coverage over the above specified primary insurance in an amount not less than:
 - a. \$1,000,000 for contracts UNDER \$100,000
 - b. \$2,000,000 for contracts OVER \$100,000
5. Additional Insurance Requirements: The Contractor and all Subcontractors in connection with the above mentioned Worker's Compensation Insurance shall furnish to the Owner a Compensation Board showing that such insurance is in full force and effect.

With regard to the above mentioned General Liability Insurance, if in the event of any major change or cancellation of such policy, the Contractor and all Subcontractors shall give a 30 day advance notice to the Owner.

Also, the Contractor and all Subcontractors shall make the Owner, as stated in the "Instruction to Bidders", additional insured on their Business Auto and General Liability policies with regard to this Contract.

The Contractor and all Subcontractors shall be required to furnish to the Owner duly executed certificates of insurance showing that all insurance policies required under this contract have been issued and are in full force and effect at all times during the life of this contract and have named the Owner, as stated in the "Instruction to Bidders", additional Insured. These certificates are to include General Liability, including contractual coverage, Business Auto, and Umbrella Liability.

The "Contractor will name the Owner, and any other parties specified, as an "Additional Insured" under the Commercial General Liability Policy. This "Additional Insured" coverage shall be on Form CG2010, or its equivalent, including "completed operations" coverage. The "Additional Insured" coverage provided to the Owner shall be primary coverage, and non contributory as respects the Owners Liability policy.

6. Loss or Damage: The Owner will obtain all Builders Risk Insurance Policies for this project.
7. Indemnification: To the fullest extent permitted by law, the Subcontractor expressly agrees to defend (at Subcontractor's expense and with counsel acceptable to the Contractor), indemnify, and hold harmless Owner, Contractor, Architect, Architect's Consultants, Engineer, Construction Manager, Lender, and any other parties which Contractor has agreed to indemnify as named or referenced in the project contract documents as attached to and made a part of this Subcontract, and their respective Officers, Directors, Shareholders, Employees, Agents, Successors, Affiliates, and assigns from and against any and all claims, suits, losses, causes of action, damages, liabilities, fines, penalties and expenses of any kind whatsoever, including without limitation arbitration or court costs and attorney's fees, arising on account of or in connection with injuries to or the death of any person, or any and all damages to property including loss of use, from or in any manner connected with the work performed by or for the Subcontractor under this Subcontract, caused in whole or in part by the presence of the person or property or the negligent acts or omissions of a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this paragraph. The defense and indemnification obligations under this Subcontract agreement shall not be restricted in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Subcontractor under workers' compensation acts, disability benefits acts, or other employee benefits acts, and shall extend to and include any actions brought by or in the name of any employee of the Subcontractor or any third party to whom Subcontractor may subcontract a part or all of the work.

SUBCONTRACTORS:

- A. Prior to the awarding of the Contract, the contractor shall submit to the Owner, in writing, the names of the proposed Subcontractors and major material vendors, the Contractor shall furnish the Owner with full information concerning the proposed Subcontractor's ability and qualifications at the time such Subcontractor is submitted for approval.
- B. The Contractor shall be responsible for the acts and omissions of his Subcontractors and of persons wither directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

- C. Nothing contained in the Contract shall create any contractual relationship between any Subcontractor and the Owner, and no Subcontractor will be recognized as a party to the Contract.

3. TAXES, ARTICLE 9.5 ADD THE FOLLOWING PARAGRAPH:

The Contractor shall pay all unemployment, social security, and other such taxes imposed by local, state, or federal government. The Owner is NOT subject to Indiana Retail Sales Tax and Federal Excise Tax, these taxes should Not be included in the Contractor's bid.

4. PROTECTION AND SAFETY, ARTICLE 16.1, 16.2, 16.2.1, 16.2.2, 16.2.3

OCCUPATIONAL SAFETY AND HEALTH ACTS:

These construction documents, and the joint and several phases of construction hereby contemplated are to be governed at all times by the applicable provisions of the state and federal laws included, but not limited to, the latest amendments of the following:

1. Indiana Occupational Safety and Health Act.
2. Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 81-596; Part 1910-Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations; Part 1518-Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

The Contractor shall assume full responsibility for health and safety at the construction site, including, but not limited to, the above mentioned laws and regulations.

5. PAYMENTS TO CONTRACTOR AND COMPLETION, ARTICLE 15.3. ADD THE FOLLOWING PARAGRAPH:

Progress payments will be made monthly based on an approved Application for Payment, and will include work completed, as well as payment on material and equipment delivered and suitably stored at the site, less retainer of 10% of the amount of each, less the aggregate of previous payments in each case. Contractor must include with application, proof of purchase and delivery of material and equipment stored.

6. SHOP DRAWINGS AND SAMPLES, ARTICLE 9.9, ADD THE FOLLOWING PARAGRAPHS:

See Section 01300 Submittals and Section 01340 Shop Drawings, Product Data, & Samples for information on these items. No material shall be delivered to the project until final approved shop drawings are in the hands of the Owner and Design Consultant and no shop drawings shall be used on the project that do not bear the Design Consultant's stamp of approval.

7. *EQUAL EMPLOYMENT OPPORTUNITY:*

Attention of Bidders is particularly called to the requirement for ensuring that employees and applicants for employment are not discriminated against because of their race, creed, color, sex or national origin.

CONTRACTOR'S NON-COLLUSION AFFIDAVIT

The Bidder, by its officers and _____ agents or representatives present at the time of filling this bid, being duly sworn, on their oaths, say that neither they nor any of them have in any way, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any public officer of the State of Indiana whereby such affiant or affiants or either of them, has paid or is to pay such other bidder or public officer any sum of money, or has given or is to give such other bidder or public officer anything of value whatever, or such affiant or affiants or either of them has not, directly, or indirectly, entered into any arrangement or agreement with any other bidder or bidders, which tends to or does lessen or destroy free competition in the letting of the contract sought for by the attached bids; that no inducement of any form or character other than that which appears up on the face of the bid will be suggested, offered, paid or delivered to any person whomsoever to influence the acceptance of the said bid or awarding of the contract, nor has this bidder any agreement or understanding of any kind whatsoever, with any person whomsoever to pay, deliver to, or share with any other person, in any way or manner, any of the proceeds of the contract sought by this bid.

FIRM NAME

*OWNER-PRESIDENT-PARTNER

PARTNER-VICE PRESIDENT AND/OR
SECRETARY/TREASURER

PARTNER

Subscribed and sworn to before me this ____ Day of _____ 20__

Public Notary (signature)

(print)

Commission expires: _____

Country of Residence: _____

This form **must be signed by the same person(s) who sign(s) the bid.*

SUBCONTRACTOR'S NON-COLLUSION AFFIDAVIT

State of _____
County of _____

_____, being first duly shown, deposes and says that:

- 1) He/She is _____ of _____.
Hereinafter referred to as the "Subcontractor";
- 2) He/She is fully informed respecting the preparation and contents of the subcontractor's Proposal submitted to the subcontractor to _____, the Contractor for certain work in connection with the _____ Contract pertaining to the Project in _____;
- 3) Such subcontractor's Proposal is genuine and is not a collusive or sham proposal;
- 4) Neither the subcontractor nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived, or agreed, directly or indirectly, with any other Bidder, firm or person to submit a collusive or sham Proposal in connection with such contractor or to refrain from submitting a Proposal in connection with such contract, or has in any manner, directly or indirectly, sought by unlawful agreement or connivance with any other Bidder, firm or person to fix the price or prices in said subcontractor's Proposal, or to secure through collusion, conspiracy, connivance or unlawful agreement any advantage against the _____ and _____
- 5) The price or prices quoted in the subcontractor's Proposal are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owner, employees, or parties in interest, including this affiant.

SIGNATURE

Subscribed and sworn to before me this _____ Day of _____ 20____

Public Notary (signature) _____

(print) _____

Commission expires: _____ Country of Residence: _____

**REQUIRMENT FOR AFFIRMATIVE ACTION TO ENSURE
EQUAL EMPLOYMENT OPPORTUNITY**

Executive Order 11246

1. The Offeror's or Bidders' attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, and as follows:

Timetable	Goals for minority participation in each trade	Goals for female participation in each trade
Until Further Notice	3.1	6.9

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR part 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within ten (10) working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting for this solicitation. The notification shall list the name, address, and telephone number of the subcontractor, employer identification number of the subcontractor, estimated dollar amount of the subcontract, estimated starting and completion dates of the subcontract, and the geographical area in which the subcontract is to be performed.
4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is coextensive with the political jurisdiction of the City of Terre Haute, Indiana.

CONTRACTOR
EQUAL EMPLOYMENT OPPORTUNITY

Executive Order 11246
(30 F.R. 12319-25)

Sec. 202. Except in contracts exempted in accordance with Section 204 of this order, all Government contracting agencies shall include in every Government contract hereafter entered into the following provisions:

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

- 1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment advertising; layoff or termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in a conspicuous place, available to employees and applicants for employment, notices to be provided by the contracting offer setting forth the provision of this nondiscrimination clause.
- 2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- 3) The contractor will send to each labor union or representative of workers with which he/she has collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union of workers’ representative of the contractors’ commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 4) The contractor will comply with all provisions of Executive Order No. 1124 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 5) The contract will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor for purposes of investigation to ascertain compliance with each rule, regulation and order.
- 6) In the event of the contractor’s non-compliance with the nondiscrimination clauses of the contract or with any such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or part, the contractor may be declared ineligible for Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

- 7) The contract will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor pursuant to Section 202 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions including sanctions for non-compliance; Provided however, that in the event the contractor becomes involved in, or is threatened with, litigation with a sub-contractor or vendor as a result of such direction by the Department, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

THIS COMPANY WILL COMPLY WITH THE PROVISIONS OF SECTIONS 202 OF
EXECUTIVE ORDER 11246

Name of Firm: _____

Address: _____

Signature: _____

Printed: _____

Date: _____

SUBCONTRACTOR
EQUAL EMPLOYMENT OPPORTUNITY

Executive Order 11246
(30 F.R. 12319-25)

Sec. 202. Except in contracts exempted in accordance with Section 204 of this order, all Government contracting agencies shall include in every Government contract hereafter entered into the following provisions:

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

- 1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment advertising; layoff or termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in a conspicuous place, available to employees and applicants for employment, notices to be provided by the contracting offer setting forth the provision of this nondiscrimination clause.
- 2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- 3) The contractor will send to each labor union or representative of workers with which he/she has collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union of workers’ representative of the contractors’ commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 4) The contractor will comply with all provisions of Executive Order No. 1124 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 5) The contract will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor for purposes of investigation to ascertain compliance with each rule, regulation and order.
- 6) In the event of the contractor’s non-compliance with the nondiscrimination clauses of the contract or with any such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or part, the contractor may be declared ineligible for Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

- 7) The contract will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor pursuant to Section 202 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions including sanctions for non-compliance; Provided however, that in the event the contractor becomes involved in, or is threatened with, litigation with a sub-contractor or vendor as a result of such direction by the Department, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

THIS COMPANY WILL COMPLY WITH THE PROVISIONS OF SECTIONS 202 OF
EXECUTIVE ORDER 11246

Name of Firm: _____

Address: _____

Signature: _____

Printed: _____

Date: _____

CONTRACTOR'S CERTIFICATE REGARDING
DRUG-FREE WORK PLACE

The Contractor certifies that it will provide a drug-free workplace by:

1. Publishing a Statement notifying employees that the unlawful manufacture, distribution, dispensing, possession; or use of a controlled substance is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violation of such prohibition.
2. Establishing an ongoing drug-free awareness program to inform employee about:
 - a. The dangers of drug abuse in the workplace
 - b. The Contractor's policy of maintaining a drug-free workplace
 - c. Any available drug counseling, rehabilitation, and employee assistance programs
 - d. The penalties that may be imposed upon employees for drug abuse violation occurring in the workplace
3. Giving each employee to be engaged in the performance of work on this contract a copy of the above required statement.
4. Notifying the employee in the required Statement that, as a condition of employment on this Contract, the employee will:
 - a. Abide by the terms of the Statement; and
 - b. Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction.
5. Notifying the Contracting Officer in writing, within ten calendar days after receiving notice under subparagraph 4 (b) from an employee of otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every Contracting Officer or other designee on whose Contract activity the convicted employee was working. Notice shall include the identification number (s) of the Contract of funding Grant.
6. Taking one of the following actions, within 30 calendar days of receiving notice under paragraph 4 (b), with respect to any employee who is so convicted –
 - a. Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended, or
 - b. Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purpose by a Federal, State, or local health, law enforcement, or other appropriate agency.

DATE: _____

COMPANY: _____

SIGNATURE: _____

PRINTED: _____

SUBCONTRACTOR'S CERTIFICATE REGARDING
DRUG-FREE WORK PLACE

The subcontractor certifies that it will provide a drug-free workplace by:

1. Publishing a Statement notifying employees that the unlawful manufacture, distribution, dispensing, possession; or use of a controlled substance is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violation of such prohibition.
2. Establishing an ongoing drug-free awareness program to inform employee about:
 - a. The dangers of drug abuse in the workplace
 - b. The Contractor's policy of maintaining a drug-free workplace
 - c. Any available drug counseling, rehabilitation, and employee assistance programs
 - d. The penalties that may be imposed upon employees for drug abuse violation occurring in the workplace
3. Giving each employee to be engaged in the performance of work on this contract a copy of the above required statement.
4. Notifying the employee in the required Statement that, as a condition of employment on this Contract, the employee will:
 - a. Abide by the terms of the Statement; and
 - b. Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction.
5. Notifying the Contracting Officer in writing, within ten calendar days after receiving notice under subparagraph 4 (b) from an employee of otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every Contracting Officer or other designee on whose Contract activity the convicted employee was working. Notice shall include the identification number (s) of the Contract of funding Grant.
6. Taking one of the following actions, within 30 calendar days of receiving notice under paragraph 4 (b), with respect to any employee who is so convicted –
 - a. Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended, or
 - b. Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purpose by a Federal, State, or local health, law enforcement, or other appropriate agency.

DATE: _____

SIGNATURE: _____

SIGNATURE: _____

CONTRACTOR'S CERTIFICATE OF
ANTI-LOBBYING

The Contractor certifies that to the best of his/her knowledge and belief that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the contractor, 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 the awarding of any Federal contract, 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.
2. If any funds other than Federal 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 Federal contract, grant, loan, or cooperative agreement, the contractor shall complete and submit Standard Form LLL, 'Disclosure Form to Report Lobbying,' in accordance with its instructions.
3. The contractor shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all surecipients shall certify and disclose accordingly.

Date: _____

Name of Contractor

Official Address (Including Zip)

By: _____

Subscribed and sworn to before me this ____ Day of _____, 20__

Public Notary (signature)

(print)

Commission expires: _____

Country of Residence: _____

SUBCONTRACTOR'S CERTIFICATE OF
ANTI-LOBBYING

The subcontractor certifies that to the best of his/her knowledge and belief that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the contractor, 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 the awarding of any Federal contract, 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.
2. If any funds other than Federal 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 Federal contract, grant, loan, or cooperative agreement, the contractor shall complete and submit Standard Form LLL, 'Disclosure Form to Report Lobbying,' in accordance with its instructions.
3. The subcontractor shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all surecipients shall certify and disclose accordingly.

Date: _____

Name of Subcontractor

Official Address (Including Zip)

By: _____

Subscribed and sworn to before me this ____ Day of _____, 20__

Public Notary (signature)

(print)

Commission expires: _____

Country of Residence: _____

CONTRACTOR'S CERTIFICATION OF NONSEGREGATED FACILITIES

The Bidder certifies that he/she does not maintain nor provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location, under his/her control, where segregated facilities are maintained. The Bidder certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The Bidder agrees that a breach of the certificate will be in violation of the Equal Opportunity clause in any contract resulting from acceptance of his/her bid. As used in this certification, the term "segregated Facilities" mean any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The Bidder agrees that he/she will obtain identical certification from proposed subcontractors prior to the award of subcontracts.

Date: _____

Name of Contractor

Official Address (Including Zip)

By: _____

Subscribed and sworn to before me this ____ Day of _____ 20__

Public Notary (signature)

(print)

Commission expires: _____

Country of Residence: _____

SUBCONTRACTOR'S CERTIFICATION OF NONSEGREGATED FACILITIES

The subcontractor certifies that he/she does not maintain nor provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she does not permit his/her employees to perform their services at any location, under his/her control, where segregated facilities are maintained. The subcontractor certifies further that he/she will not maintain or provide for his/her employees any segregated facilities at any of his/her establishments, and that he/she will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The subcontractor agrees that a breach of the certificate will be in violation of the Equal Opportunity clause in any contract resulting from acceptance of his/her bid. As used in this certification, the term "segregated Facilities" mean any waiting rooms, work areas, restrooms, and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directives or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise. The subcontractor agrees that he/she will obtain identical certification from proposed subcontractors prior to the award of subcontracts.

Date: _____

Name of Contractor

Official Address (Including Zip)

By: _____

Subscribed and sworn to before me this ____ Day of _____ 20__

Public Notary (signature)

(print)

Commission expires: _____

Country of Residence: _____

WAGE SCALE AFFIDAVIT

We _____

Do hereby certify that the wage rates, fringe benefits, classifications, and ratios submitted are inclusive of all contracts, memorandums of understanding (mou's), addendums, supplemental contracts, agreements or other understanding presently in effect. We also agree to notify the Indiana Department of Labor of any changes in contract, mou's, addendums or supplemental agreements that affect the wage rates, fringe benefits, classifications or ratios in anyway during the term of the contract within 14 days of said change.

FIRM NAME

*OWNER-PRESIDENT-PARTNER

PARTNER-VICE PRESIDENT AND/OR
SECRETARY/TREASURER

PARTNER

Subscribed and sworn to before me this ____ Day of _____ 20__

Public Notary (signature)

(print)

Commission expires: _____

Country of Residence: _____

This form **must be signed by the same person(s) who sign(s) the bid.*

E-Verify Affidavit

Pursuant to Indiana Code 22-5-1.7-11, the Contractor entering into a contract with the City is required to enroll in and verify the work eligibility status of all its newly hired employees through the E-Verify program. The Contractor is not required to verify the work eligibility status of all its newly hired employees through the E-Verify program if the E-Verify program no longer exists.

The undersigned, on behalf of the Contractor, being first duly sworn, deposes and states that the Contractor does not knowingly employ an unauthorized alien. The undersigned further affirms that, prior to entering into its contract with the City, the undersigned Contractor will enroll in and agrees to verify the work eligibility status of all its newly hired employees through the E-Verify program.

(Contractor): _____

By (Written Signature): _____

(Printed Name): _____

(Title): _____

Important - Notary Signature and Seal Required in the Space Below

STATE OF _____

SS:

COUNTY OF _____

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

My commission expires: _____ (Signed) _____

a. Residing in _____ County, State of _____

LIST OF SUBCONTRACTORS

Each bidder shall submit their Subcontractors List with their Bid.

After submission of this Schedule and after approval by the Owner and the Design Consultant, it shall not be changed without prior approval by the Owner and the Design Consultant.

SUBCONTRACTOR:

<hr/> Name	<hr/> Trade
<hr/> Address	<hr/> President, Owner, Partner, Etc.
<hr/> City/State/Zip Code	<hr/> Email
<hr/> Telephone/Fax	
<hr/> Name	<hr/> Trade
<hr/> Address	<hr/> President, Owner, Partner, Etc.
<hr/> City/State/Zip Code	<hr/> Email
<hr/> Telephone/Fax	
<hr/> Name	<hr/> Trade
<hr/> Address	<hr/> President, Owner, Partner, Etc.
<hr/> City/State/Zip Code	<hr/> Email
<hr/> Telephone/Fax	
<hr/> Name	<hr/> Trade
<hr/> Address	<hr/> President, Owner, Partner, Etc.
<hr/> City/State/Zip Code	<hr/> Email
<hr/> Telephone/Fax	

Name

Address

City/State/Zip Code

Telephone/Fax

Name

Address

City/State/Zip Code

Telephone/Fax

Name

Address

City/State/Zip Code

Telephone/Fax

Name

Address

City/State/Zip Code

Telephone/Fax

Name

Address

City/State/Zip Code

Telephone/Fax

Trade

President, Owner, Partner, Etc.

Email

Trade

President, Owner, Partner, Etc.

Email

Trade

President, Owner, Partner, Etc.

Email

Trade

President, Owner, Partner, Etc.

Email

Trade

President, Owner, Partner, Etc.

Email

CONTRACT PROVISIONS

All contracts, awarded by a recipient including small purchases shall contain the following provisions as applicable:

1. **Equal Employment Opportunity** – All contracts shall contain a provision requiring compliance with E.O. 11246, “Equal Employment Opportunity,” as amended by E.O. 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and as supplemented by regulations at 41 CFR Part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”
2. **Copeland “Anti-Kickback” Act (18 U.S.C. 874 and 40 U.S.C. 27c)** – All contracts and subgrants in excess of \$2,000 for construction or repair awarded by recipients and subrecipients shall include a provision for compliance with the Copeland “Anti-Kickback” Act (18 U.S.C. 874), as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each contractor or subrecipient shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled. The recipient shall report all suspected or reported violations to the Federal awarding agency.
3. **Davis-Bacon Act**, as amended (40 U.S.C. 276a to a-7) – When required by Federal program legislation, all construction contracts awarded by the recipients and subrecipients of more than \$2,000 shall include a provision for compliance with the Davis-Bacon Act (40 U.S. C. 276a to a-7) and as supplemented by Department of Labor regulations (29 CFR Part 5, “Labor Standards Provisions Applicable to Contracts Governing Federally Financed and Assisted Construction”). Under this Act, contracts shall be required to pay wages to laborers and mechanics at a rate not less than the minimum wages specified in a wage determination made by the Secretary of Labor. In addition, contractors shall be required to pay wages not less than once a week. The recipient shall place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation and the award of a contract shall be conditioned upon the acceptance of the wage determination. The recipient shall report suspected or reported violations to the Federal awarding agency.
4. **Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333)** – Where applicable, all contracts awarded by recipients in excess of \$2,000 for construction contracts and in excess of \$2,500 for other contracts that involved the employment of mechanics or laborers shall include a provision for compliance with Section 102 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-333), as supplemented by Department of Labor regulations (29 CFR Part 5). Under Section 102 of the Act, each contractor shall be required to compute the wages every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1 ½ times the basic rate of pay for all hours worked in excess of 40 hours in the

work week. Section 107 of the Act is applicable to construction work and provides that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

5. **Rights to Inventions Made Under a Contract or Agreement** – Contracts or agreements for the performance of experimental, developmental, or research work shall provide for the rights of the Federal Government and the recipient in any resulting invention in accordance with 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.
6. **Clean Air Act (42 U.S.C. 7401 et seq.) and the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.)**, as amended – Contracts and subgrants of amounts in excess of \$100,000 shall contain a provision that requires the recipient to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401 et seq.) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).
7. **Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)** – Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.
8. **Debarment and Suspension (E.O.s 12549 and 12689)** – No contract shall be made to parties listed on the General Services Administration’s List of Parties Excluded from Federal Procurement or Nonprocurement Programs in accordance with E.O.s 12549 and 12689, “Debarment and Suspension.” This list contains the names of parties debarred, suspended, or otherwise excluded by agencies, and the contractors declared ineligible under statutory or regulatory authority other than E.O. 12549. Contractors with awards that exceed the small purchase threshold shall provide the required certification regarding its exclusion status and that of its principal employees.

Technical Specifications

Herz-Rose Park
Terre Haute, Indiana

July 2024

SECTION 03 33 01 - ARCHITECTURAL CONCRETE

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 cast-in-place architectural concrete surfaces for Building Slabs, Seat Walls, Piers, and Miscellaneous Site Retaining Walls and patching of existing concrete surfaces: including board form facings, smooth form facings, reinforcement accessories, concrete materials, color pigments, floor hardeners and treatments, concrete mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 033000 "Cast-In-Place Concrete" for formwork, material, water repellants, fabrication and installation requirement, for steel reinforcement and field quality control.
 - 2. Section 071900 "Water Repellents" for film-forming coatings on exposed concrete surfaces.
 - 3. Section 079200 "Joint Sealants" for elastomeric joint sealants in contraction and other joints in cast-in-place architectural concrete.

1.3 DEFINITIONS

- A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
- B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
- C. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples: For each of the following materials:

1. Form ties.
2. Chamfers and rustications.

D. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches, of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Material Certificates: For each of the following:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Repair materials.

1.6 QUALITY ASSURANCE

- A. 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 "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- C. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 6, "Architectural Concrete."
 2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."

- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- F. Mockups: Before casting architectural concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Build mockups of typical exterior wall of cast-in-place architectural concrete as shown on Drawings.
 - 3. Construct mock-up of integrally colored concrete to demonstrate color.
 - 4. Construct mock-up of patching techniques for use on existing concrete walls and slabs, demonstrating proposed finishes, colors, and textures.
 - 5. Build mockups of building slab of cast-in-place architectural concrete as shown on Drawings. Cast horizontal panels approximately 36 by 36 inches, demonstrating proposed finishes, colors, and textures.
 - 6. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
 - 7. Obtain Landscape Architect's approval of mockups before casting architectural concrete.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for formwork and other form-facing material requirements.
- B. Smooth Form-Facing Panels for As-Cast Finishes: Steel, glass-fiber-reinforced plastic or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. See architectural drawings for finish location.
- C. Furnish in largest practicable sizes to minimize number of joints. Stagger vertical joints.
- D. Miter inside corners of boards.
- E. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.
- F. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch thick.
- G. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS, that adheres to form joint substrates.

- H. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood. See Section 071900 for more details.
- I. Form-Release Agent: Commercially formulated, colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- J. Form Ties: Factory-fabricated, glass-fiber-reinforced plastic ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.2 STEEL REINFORCEMENT AND ACCESSORIES

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice." Supports should not contact formwork.

2.3 CONCRETE MATERIALS

- A. General: Comply with Division 03 Section "Cast-in-Place Concrete" for materials and admixtures.
- B. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I,
- C. Normal-Weight Aggregates: ASTM C 33, Class 5M coarse aggregate or better, graded. Provide aggregates from single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1/2 inch.
 - 2. Gradation: Uniformly graded.
- D. Normal-Weight Fine Aggregate: ASTM C 33, manufactured or natural sand, from same source for entire Project.
- E. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.

- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
- C. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
 - 1. Color: Grace Hydrotint “Palomino”.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 - 1. For integrally colored concrete, curing compound shall be pigmented type approved by color pigment manufacturer.
 - 2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

2.6 REPAIR MATERIALS

- A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Comply with Division 03 Section “Cast-In-Place Concrete” for concrete mixes.
- B. Cementitious Materials: For cast-in-place architectural concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.

- D. 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.

2.8 CONCRETE MIXING

- A. Ready-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
 - 1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
 - 2. 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.

PART 3 - EXECUTION

3.1 FORMWORK

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.
- B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- C. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
 - 1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
- E. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- F. Do not chamfer exterior corners and edges of cast-in-place architectural concrete.
- G. Coat contact surfaces of wood boards and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- L. Erect board forms accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent boards from sagging and stretching in hot weather. Seal joints of forms and accessories to prevent mortar leaks. Coat forms with form-release agent.

3.2 REINFORCEMENT AND INSERTS

- A. General: Comply with Section 033000 "Cast-in-Place Concrete" for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.
- B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.3 REMOVING FORMS

- A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete if concrete is hard enough to not be damaged by form- removal operations and curing and protection operations are maintained.
 - 1. Schedule form removal to maintain surface appearance that matches approved mockups.
 - 2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete. Do not damage finished surface.

3.4 JOINTS

- A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
 - 2. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 4. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms.
- D. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
 - 4. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.
- E. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.6 FINISHES, GENERAL

- A. Architectural Concrete Finish: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.

1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- C. Maintain uniformity of special finishes over construction joints unless otherwise indicated.

3.7 AS-CAST FORMED FINISHES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.

3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Begin curing cast-in-place architectural concrete immediately after removing forms from concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:
1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for no fewer than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for no fewer than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.
 3. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

- A. General: Comply with field quality-control requirements in Section 033000 "Cast-in-Place Concrete."

3.10 REPAIRS, PROTECTION, AND CLEANING

- A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
 - 1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.
- B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.
- C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.
- D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- E. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.
 - 1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

END OF SECTION 033300

SECTION 08 36 00 - OVERHEAD DOORS

VertiStack Clear

PART 1 GENERAL

1.1 SUMMARY

- A. **Section Includes:**
 - 1. Aluminum full view overhead stacking door (Model VS904)
 - 2. Electric door operators

1.2 RELATED SECTIONS:

- A. Section 05500 - Metal Fabrications: Steel frame and supports.
- B. Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.
- C. Section 07900 - Joint Seals: Perimeter sealant and backup materials.
- D. Section 08710 - Door Hardware: Cylinder locks.
- E. Section 09900 - Paints and Coatings: Field painting.
- F. Section 16130 - Raceway and Boxes: Empty conduit from control station to door operator.
- G. Section 16150 - Wiring Connections: Electrical service to door operator.

1.3 SYSTEM DESCRIPTION

- A. **Performance Requirements:**
 - 1. **Air Infiltration:**
 - a. Meets ASHRAE® 90.1 and IECC® (International Energy Conservation Code) 2021 Section C406.9 Air Infiltration requirements with an independently tested value of 0.2 cfm/ft².
 - b. Design includes a gasket between sections and a specialized header seal factory-installed on top section to reduce air infiltration.
- B. **Design Requirements:**
 - 1. **Cycle Life:**
 - a. Life expectancy of up to 25,000 cycles.
 - b. Standard construction for normal use of up to 20 cycles per day maximum.

1.4 SUBMITTALS

- A. Reference Section 01 33 00—Submittal Procedures; submit the following items:
 - 1. **Product Data:** Manufacturer's data sheets on each product to be used.
 - 2. **Shop Drawings:** Include special conditions not detailed in Product Data. Show interface with adjacent work. Include opening dimensions, connection details, anchorage spacing, hardware locations, and installation details.
 - 3. **Manufacturer's installation instructions**
 - 4. **Closeout Submittals:**
 - a. Operation and Maintenance Manual.
 - b. Certificate stating that installed materials comply with this specification.

1.5 QUALITY ASSURANCE

- A. **Qualifications:**
 - 1. **Manufacturer Qualifications:** ISO 9001:2015 registered and a minimum of five years' of documented experience.
 - 2. **Installer Qualifications:** Manufacturer's approval.

1.6 DELIVERY STORAGE AND HANDLING

- A. Reference Section 01 66 00—Product Storage and Handling Requirements.

PART 2: PRODUCTS

2.1 MANUFACTURER

- A. **Manufacturer:**
1. **Cornell:** 24 Elmwood Avenue, Mountain Top, PA 18707.
 2. **Cookson:** 1901 South Litchfield Road Goodyear, AZ 85338.
 3. **Clopay Building Products:** 8585 Duke Blvd. Mason, OH 45040.

2.2 PRODUCT INFO

- A. **Model:**
1. Model VS904

2.3 MATERIALS

- A. **Stacking overhead door:** Glazed aluminum vertically stacking overhead door with no floor or ceiling tracks. Sections stack together above opening without the need for hinges or other visible hardware connecting sections together.
1. Approved Product: VertiStack Clear.
 2. Model VS904
- B. **Sections:**
1. **Section construction:**
 - a. Sections are 2-1/8 inches (54 mm) thick extruded 6053-T5 aluminum, consisting of center stiles, end stile, intermediate rails, and top and bottom rails with solid or glazing panels. Panel widths are equally spaced.
 - b. Full-vision sections include glass held in place with snap-in glazing bead and hot melt adhesive.
 - c. Sections to stack above opening when door is in open position
 2. **Panels/Glazing:**
 - a. 1/4" Tempered Clear
 3. **Aluminum Finish:**
 - a. **Anodized finish:** Black Anodized
- C. **Wall angles:**
1. **Fabrication:** steel wall angles, powder coated to match guide covers and bracket plates.
- D. **Track:**
1. Vertical continuous angle mounted, 2" galvanized full tapered steel track, which must not require ceiling mount.
 2. Track and rollers must be concealed by guide covers when door is fully installed.
- E. **Guide Covers:**
1. **Fabrication:** steel guide covers.
 2. Guide covers are to be installed without the need for visible fasteners.
 3. **Finish:**
 - a. **Powder Coat:** Zirconium pre-treatment followed by baked-on polyester powder coat. Minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better. Color: Standard Black RAL9005
- F. **Locking:**
1. **Section locking devices:** Manually operated locking mechanism mounted on both sides of the door, positioned between wall angle and guide cover. Locks impede opening of door and/or separating of sections while door is in the closed position. Lock handles have the ability to be padlocked in place if desired.
 2. **Interlock:** Includes interlock for use with motor to prevent operation while locked.
- G. **Weatherstripping:**
1. Vinyl top weather seal and reverse angle jamb weather seal.
 2. Top weather seal must be affixed to top section and not at the header.

H. **Spring Counterbalance:**

1. **Spring Balance:** torsion spring counterbalance mechanism sized to weight of the door.
2. Include 25,000-cycle torsion springs.
3. **Strap assembly:** high-strength strap assembly.
4. Provide tension wheel for applying and adjusting spring torque.

I. **Brackets:** Fabricate from minimum 7 gauge steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.

1. **Finish:**

- a. **Powder Coat:** Zirconium pre-treatment followed by baked-on polyester powder coat.
Minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
Color: Standard Black RAL9005

J. **Hood:** three-sided hood fabricated from 24-gauge steel with reinforced top and bottom edges.

1. **Finish:**

- a. **Powder Coat:** Zirconium pre-treatment followed by baked-on polyester powder coat.
Minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
Color: Standard Black RAL9005

2.4 OPERATION

A. **Motor Operation:**

1. **VSH Standard Series Operator – ½ horsepower UL listed gear head motor**

- a. The operator is to include a totally enclosed non ventilated (TENV) gear head motor, reversing magnetic controller in NEMA 1 enclosure, spur gearbox for drive reduction, and an electric brake.
- b. The controller shall include UL listed thermal overload protection, rotary limit switches, safety edge circuit and transformer with 24 volt control secondary, and delay on reverse.
- c. All components of the motor controller are to be pre-wired to a terminal block using color coding of the wires to facilitate troubleshooting.
- d. The operator must not extend above or below the door coil when mounted front-of-coil.
- e. Rated for a maximum of 20 cycles per hour
- f. Supply motor with the following configuration: ____ Volts, ____ Phase, ____ Hertz
 - i. Standard configurations:
 1. 120 Volts, 1-phase, 60 Hertz
 1. 208 Volts, 3-phase, 60 Hertz
 1. 230 Volts, 3-phase, 60 Hertz
 1. 460 Volts, 3-phase, 60 Hertz
 - ii. Custom configurations:
 1. 230 Volts, 1-phase, 60 Hertz
 1. 575 Volts, 3-phase, 60 Hertz
 1. 230 Volts, 1-phase, 50 Hertz
 1. 380 Volts, 3-phase, 50 Hertz
 1. 400 Volts, 3-phase, 50 Hertz
 1. 415 Volts, 3-phase, 50 Hertz
- g. Operator shall be equipped with an emergency manual chain hoist assembly that safely cuts operator power when engaged. A disconnect chain shall not be required to engage or release the manual chain hoist.
- h. Operator to be supplied with 72" minimum of #50 roller chain.
- i. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the motor operator wiring instructions.

B. **Control Stations:**

1. NEMA 1 Interior Flush Mounted Key Control with Best Cylinder

C. **Safety Devices:**

1. **NEMA 4X photo eye sensors** consisting of a transmitter and receiver that are to be mounted within 6" (152.4 mm) of the floor, projecting an IR beam across the entire width of the door. Interruption of beam before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Electrical contractor to provide low voltage wiring from the transmitter and receiver to the door operator.

2.5 ACCESSORIES

A. **Strap brake safety system:** engages guide mounted engagement teeth to effectively stop the door in the event of strap failure.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
- C. Commencement of work by installer is acceptance of substrate.

3.2 INSTALLATION

- A. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.

3.3 ADJUSTING

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

3.4 FIELD QUALITY CONTROL

- A. Site Test: Test doors for normal operation and automatic closing.

3.5 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.6 DEMONSTRATION

- A. Demonstrate proper operation, testing and reset procedures to Owner's Representative.
- B. Instruct Owner's Representative in maintenance procedures.

END OF SECTION

SECTION 12 93 00 - SITE FURNISHINGS

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. Benches
 - 2. Bike Rack
 - 3. Trash Receptacle
 - 4. Basketball Goal
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts cast in concrete footings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For units with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish, not less than 6-inch- long linear components and 4-inch- square sheet components.
- E. Product Schedule: For site furnishings. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Waste Receptacle Inner Containers: Four full-size units for each size indicated.
 - 2. Anchors: One extra anchor assembly for each product type specified.

PART 2 - PRODUCTS

2.1 BENCH TYPE 1

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Infinity 2'x6' Linear Thermory Flat Bench, Powder Coat Frame Finish from the Infinity Collection benches or approved equal.
1. Manufacturer Contact: Anova Furnishings, 1424 Talmage Ave. St. Louis, MO 63110
Tel: (800) 325-3047
E-mail: sales@anovafurnishings.com
Web site: <https://www.anovafurnishings.com>
- B. Materials
1. The linear bench is composed of 1.50" x 3.50" actual recycled plastic planks and steel frame and supports. The bench is 72" long and 24.00" wide. A configured bench supports 200 lbs. per linear foot. Low-maintenance Thermory is made from thermally-modified North American White Ash—a sustainably harvested and renewable temperate hardwood.
- C. Finishes
1. Fade-resistant, powder coated steel frame and supports feature a state-of-the-art primer proven to prevent rusting.
 - 1) Color: Black
 2. Thermory is a lustrous chocolate brown color when new and will naturally age to uniform silver/gray over time. The color-changing process begins immediately and varies with the amount of UV exposure.
- D. Dimensions
1. Standard length to be used: 6ft.
- E. Mounting
1. The bench is designed to be surface mounted using pre-drilled 0.50" diameter holes in the supports to prevent movement.
 2. Mounting hardware is not included, provide stainless steel hardware.
- F. Maintenance
1. Clean with mild soap and water. Let dry thoroughly. To maintain original color, regularly apply standard deck oil, such as Cutek® Extreme Wood Protection Oil.

2.2 BENCH TYPE 2

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Vibe 5 ½' Thermory Contour Bench with Armrests from the Vibe Collection or approved equal.
1. Manufacturer Contact: Anova Furnishings, 1424 Talmage Ave. St. Louis, MO 63110
Tel: (800) 325-3047
E-mail: sales@anovafurnishings.com
Web site: <https://www.anovafurnishings.com>
- B. Materials
1. The 5 ½' contour bench is composed of 5.0" x .75" low-maintenance Thermory planks made from thermally-modified North American White Ash—a sustainably harvested and renewable temperate hardwood. Frame is 2" wide, 10-gauge steel with 0.375" steel legs and armrests. Back supports are

0.25" steel. Seat will support 200 lbs. per linear foot.

C. Finishes

1. Fade-resistant, powder coated steel features a state-of-the-art primer proven to prevent rusting.
 - 1) Color: Yellow
2. Thermory is a lustrous chocolate brown color when new and will naturally age to a uniform silver/gray overtime.

D. Dimensions

1. Standard length to be used: 5 ½ ft.

E. Mounting

1. The bench is designed to be surface mounted using two predrilled countersunk holes at the base at either end of the bench. The bench also comes with factory installed plastic glides on each leg base to avoid damage to mounting surface or powder coating on the product.

F. Maintenance

1. Clean with mild soap and water. Let dry thoroughly. To maintain original color, regularly apply standard deck oil, such as Cutek® Extreme Wood Protection Oil.

2.3 BENCH TYPE 3

A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Extra Heavy-Duty Bench without Back or approved equal.

1. Manufacturer Contact: WillyGoat, LLC PO Box 59278 Birmingham, AL 35259
Tel: (888) 920-4628
E-mail: fun@willygoat.com
Web site: <https://willygoat.com>

B. Materials

1. All MIG welded frame
2. Diamond or Perforated Pattern, Regular or Rolled
3. Stainless steel hardware

C. Finishes

1. MIG welded metal
 - 1) Color: Black

D. Dimensions

1. Standard lengths to be used: 8 ft.

E. Mounting

1. Surface mount. Stainless steel hardware provided.

2.4 ARC BENCH TYPE 1

A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Infinity 2' Curved 1290 Thermory Bench, Powder Coat Frame Finish from the Infinity Series benches or approved equal.

1. Manufacturer Contact: Anova Furnishings, 1424 Talmage Ave. St. Louis, MO 63110
Tel: (800) 325-3047
E-mail: sales@anovafurnishings.com
Web site: <https://www.anovafurnishings.com>

B. Materials

1. The curved section is composed of 1.50" x 3.50" actual recycled plastic planks and steel frame and supports. The bench is 225.60" arc length and 24.00" wide. A configured bench supports 200 lbs. per linear foot.
2. Low-maintenance Thermory is made from thermally modified North American White Ash, a sustainably harvested and renewable temperate hardwood.

C. Finishes

1. Fade-resistant, powder coated steel frame and supports feature a state-of-the-art primer proven to prevent rusting.
 - 1) Color: Yellow
2. Thermory is a lustrous chocolate brown color when new and will naturally age to a uniform silver/ gray overtime. The color-changing process begins immediately and varies with the amount of UV exposure.

D. Dimensions

1. 225.6" Arc Length and 24" Wide

E. Mounting

1. The bench is designed to be surface mounted using pre-drilled 0.50" diameter holes in the supports to prevent movement.
2. Mounting hardware is not included, provide stainless steel hardware.

F. Maintenance

1. Clean with mild soap and water. Let dry thoroughly. To maintain original color, regularly apply standard deck oil, such as Cutek® Extreme Wood Protection Oil.

2.5 ARC BENCH TYPE 2

A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Infinity 2' Custom Thermory Flat Bench, Powder Coat Frame Finish from the Infinity Series benches or approved equal.

1. Manufacturer Contact: Anova Furnishings, 1424 Talmage Ave. St. Louis, MO 63110
Tel: (800) 325-3047
E-mail: sales@anovafurnishings.com
Web site: <https://www.anovafurnishings.com>

B. Materials

1. The curved section is composed of =actual recycled plastic planks and steel frame and supports. A configured bench supports 200 lbs. per linear foot.
2. Low-maintenance Thermory is made from thermally modified North American White Ash, a sustainably harvested and renewable temperate hardwood.

C. Finishes

1. Fade-resistant, powder coated steel frame and supports feature a state-of-the-art primer proven to prevent rusting.
 - 1) Color: Black
2. Thermory is a lustrous chocolate brown color when new and will naturally age to a uniform silver/ gray overtime. The color-changing process begins immediately and varies with the amount of UV exposure.

- D. Dimensions
 - 1. 256" Arc Length and 24" Wide
- E. Mounting
 - 1. The bench is designed to be surface mounted using pre-drilled 0.50" diameter holes in the supports to prevent movement.
 - 2. Mounting hardware is not included, provide stainless steel hardware.
- F. Maintenance
 - 1. Clean with mild soap and water. Let dry thoroughly. To maintain original color, regularly apply standard deck oil, such as Cutek® Extreme Wood Protection Oil.

2.6 BIKE RACK

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Vibe Steel Bike Rack from the Vibe Series or approved equal.
 - 1. Manufacturer Contact: Anova Furnishings, 1424 Talmage Ave. St. Louis, MO 63110
Tel: (800) 325-3047
E-mail: sales@anovafurnishings.com
Web site: <https://www.anovafurnishings.com>
- B. Materials
 - 1. This bike rack is made from .3750" steel cut to a 4" width.
- C. Finishes
 - 1. Fade-resistant, powder coated steel features a state-of-the-art primer proven to prevent rusting.
 - 1) Color: Yellow
- D. Dimensions
 - 1. 31"H x 4"W x 27"D
- E. Mounting
 - 1. The unibody bike rack must be surface mounted to the ground with two pre-drilled .40" mounting holes on the bottom stretch of the bike rack.
 - 2. Surface mount. Stainless steel hardware provided.
- F. Maintenance
 - 1. The product is virtually maintenance-free and requires only periodic cleaning with a sponge and a solution of mild detergent and water to remove surface dirt. Do not clean with solvent or petroleum base products.

2.7 TRASH RECEPTACLE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Vibe 45 Gallon Thermory Trash Receptacle with Bonnet Top from the Vibe Series or approved equal.
 - 1. Manufacturer Contact: Anova Furnishings, 1424 Talmage Ave. St. Louis, MO 63110
Tel: (800) 325-3047
E-mail: sales@anovafurnishings.com
Web site: <https://www.anovafurnishings.com>
- B. Materials
 - 1. The receptacle is composed of low-maintenance Thermory planks made from thermally-

modified North American White Ash, a sustainably harvested and renewable temperate hardwood. Frame is 10-gauge steel with 0.375" steel legs. Reusable plastic liner is made of high-density polyethylene.

C. Finishes

1. Fade-resistant, powder coated steel features a state-of-the-art primer proven to prevent rusting.
 - 1) Color: Black
2. Thermory is a lustrous chocolate brown color when new and will naturally age to a uniform silver/gray overtime. The color-changing process begins immediately and varies with the amount of UV-exposure.

D. Dimensions

1. 49"H x 60"W x 73"D

E. Mounting

1. Each 3" wide leg has two pre-drilled holes for optional surface mounting and comes with factory installed plastic glides to avoid damage to mounting surface or powder coating on the product.

F. Maintenance

1. Clean with mild soap and water. Let dry thoroughly. To maintain original color, regularly apply standard deck oil, such as Cutek® Extreme Wood Protection Oil.

2.8 BASKETBALL GOAL

A. Basis-of-Design Product: Subject to compliance with requirements, provide Type: Launch Basketball Goal from the Launch Series or approved equal.

1. Manufacturer Contact: Goalsetter Systems, Inc. 817 Maxwell Avenue Evansville, IN 47711
Tel: 1(800) 362-4625 Fax: 1(866)-873-3536
E-mail: customercare@goalsetter.com
Web site: <https://www.goalsetter.com>

B. Materials

1. This goal post is made of a 6"x6" telescoping metal pole and a 60"x38" tempered glass backboard.

C. Finishes

1. One primer coat and two-part acrylic enamel paint, oven-cured to ensure superior adhesion and high-gloss finish.
 - 1) Color: Black

D. Dimensions

1. 153"H x 4"W x 27"D

E. Mounting

1. Follow the Ground Anchor Installation Guide that is included with the purchase of this item.

F. Maintenance

1. Before each use, check the goal system for loose hardware, excessive wear, abuse, or vandalism or signs of rust or corrosion.
2. For safety reasons, and to prolong the life of the basketball system, take the following preventative measures:
 - 1) Check all nuts and bolts. Inspect the threads and replace if necessary. If any are loose,

- tighten them.
 - 2) Check all parts for excessive wear and tear. If necessary, replace any parts that have been worn or damaged through usage.
 - 3) Check all sections of the goal system for visible rust or chipped or cracked paint, and if present, repair appropriately.
- 3. If rust or corrosion has penetrated any component, do not allow play on the goal and replace parts immediately.
 - 1) Contact Goalsetter Systems, Inc. for replacement parts. Only use parts provided by Goalsetter Systems, Inc. Use of other parts may cause the goal system to fail, could result in death, serious injury or property damage, and will void the warranty.
 - 2) Inspect the Warning Sticker on the pole. If it is ripped, faded, or illegible, contact Goalsetter Systems, Inc. to request a replacement Warning Sticker.
- 4. The exterior finish of the Goalsetter Goal is designed for outdoor environments and should only require periodic cleaning and inspection for imperfections that could develop over time. When cleaning is necessary, Goalsetter recommends using water and a mild dish detergent applied with a soft, non-abrasive cloth.

2.9

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION 129300

SECTION 13 12 00 - FOUNTAINS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Supply and installation of fountain mechanical and electrical equipment in accordance with the Contract Documents. Furnish all labor, materials, equipment, and services as required for a complete working fountain installation, as detailed in the project drawings and specifications.

1.02 RELATED WORK

1.03 REFERENCES

- A. This installation shall comply with all applicable provisions of the latest edition of the following codes:

NEC	National Electrical Code.
BOCA	National Building Code.
UPC	Uniform Plumbing Code.

- B. Materials furnished hereunder shall comply with the latest edition of applicable standard specifications published by the following organizations:

ASTM - American Society for Testing and Materials.

ANSI - American National Standards Institute.

ASME - American Society of Mechanical Engineers.

ASSE - American Society of Sanitary Engineering.

AWWA - American Water Works Association.

CS - Commercial Standards.

NEMA - National Electrical Manufacturers Association.

NSF - National Sanitation Foundation.

1.04 SYSTEM DESCRIPTION

- A. Prime contractor shall furnish all labor, materials, apparatus, tools, equipment, transportation, temporary construction, and special or occasional services as required to make a complete working fountain installation, as shown on the drawings or described in these specifications.

B. Work included:

1. Fountain display system including pumps, valves, piping and specialties.
2. Fountain filtration system including filter, media, valves, piping and specialties.
3. Fountain water treatment system and related accessories.
4. Fountain plumbing and electrical services including water, sewer and power supply to designated points of connection with site utilities.
5. All special tools for proper operation and maintenance of the equipment provided under this section.

C. Water effects shall be as follows:

1. The architectural fountain for the Herz Rose Park Splashpad is an exterior 'dry-deck' interactive style fountain with (19) jets inside a 32'-0" x 24'-0 zone. The water feature includes (6) Fountain-in-a-can assemblies with Adjustable Precision Jets, (4) Fountain-in-a-can assemblies with Shower Jets and (9) Fountain-in-a-can assemblies with Jet Cluster nozzles. Each of the (19) Fountain-in-a-can assemblies includes a grate, display jet, LED ring light fixture, water connection, drain connection and conduit connection. All jets are designed to operate at a maximum operating spray height of 6'-0". The spray height of each jet can rise and fall and be programmed as a group or individually. A wind anemometer and wind panel are included to reduce the spray heights in moderate winds and turn the fountain display off in high winds in order to reduce overspray. Water from the display jet falls back into each fountain can and drains to an underground storage tank. There are also four flush mounted channel sump drains located in the center of the plaza to collect additional water from flush mount nozzles. The pumps pull water from the storage tank for filtration and recirculation. The water level of the underground storage tank is controlled by a water level control sensor.
2. The fountain equipment will be in an underground equipment vault. The direct burial equipment vault is factory engineered, assembled and pressure tested prior to shipment. This vault contains (1) 5-HP self-priming display pump with integral basket strainer, (1) discharge strainer with stainless-steel screen, (1) variable frequency drive, a 1-HP self-priming filter pump, valve assemblies, sand filter, NSF UV Sterilizer, BECS3 water treatment system to meet code, fill manifold, sump pump, vent fan, LED light panel, and UL Listed Control Panel. Lighting is provided in the jet assemblies.

1.05 DRAWINGS

- A. Drawings for this work consist of a set of plans, detail drawings and diagrams. Other drawings may be added by the Architect during the period of construction, as required for clarification of proper installation of equipment.
- B. The drawings accompanying these specifications are to be considered as important and integral parts of same, and anything omitted from one and embodied in the other is to be considered as essential to the requirements of the contract and must be furnished and installed by the Contractor.

- C. The drawings are essentially diagrammatic, intended mainly to indicate the scope of work to be done. Equipment and material locations may be distorted for clearness in presentation.

1.06 SUBSTITUTIONS

- A. The use of manufacturers' names and catalog numbers followed by the phrase "or equal" is generally used to establish a standard of quality and utility for the specified items and to provide a dimensional reference for construction documents that are drawn to scale.
- B. Submittals for "equal" items shall, where applicable, include the following data which are not necessarily required for specified items:
1. Performance characteristics.
 2. Materials.
 3. Finish.
 4. Certification of conformance with specified codes and standards.
- C. Submittals of "equal" components or systems may be rejected if:
1. The material or equipment would necessitate the alteration of any portion of the mechanical, electrical, architectural or structural design.
 2. Dimensions vary from the specified material or equipment in such a manner that accessibility or clearances are impaired or the work of other trades is adversely affected.
- D. Proposed substitutions for materials or equipment must be submitted ten (10) days prior to final bid date with complete drawing documents for consideration as approved equals. Otherwise, such substitutions will not be permitted. Proposals for substitutions shall be made only by the prime bidders. Manufacturers, distributors, and sub-contractors shall not make proposals to the Architect for substitutions.
- E. No substitution shall be made unless authorized in writing by the Architect. Should a substitution be accepted, and should the substitute material prove defective or otherwise unsatisfactory for the service intended, and within the guarantee period, the Contractor shall replace this material or equipment with material or equipment specified, at his own expense, and to the satisfaction of the Architect.
- F. Contractors submitting bids on substitute materials and equipment must also submit a bid on the "as specified" materials and equipment.
- G. Contractors submitting bids on substitute materials and equipment must also provide a written performance guarantee certifying that the substitute materials and equipment will produce the specified water effects.

1.07 SUBMITTALS

- A. The Contractor shall submit complete shop drawings to the Architect for approval, in quantities required for proper distribution and in accordance with the requirements of the General Conditions.
- B. Shop drawings shall include or incorporate those final drawings furnished by the Equipment Supplier, as specified herein, together with all additional information and drawings by the Contractor required in showing the proper installation of all equipment. Preliminary or schematic drawings provided by the equipment supplier shall not be used for installation.
- C. The Contractor shall deliver drawings for approval, after the signing of the contract, so as not to delay the construction required under other sections.
- D. Submittals may be rejected if they are difficult to read due to insufficient scale, poor image quality, poor drafting quality or if the required information is not included.
- E. Work shall not proceed until the Architect has approved submittals.

1.08 QUALITY ASSURANCE

- A. All workmanship and materials shall conform and comply with the requirements of building ordinances, codes, rules and regulations of all departments of Federal, State, county and city having lawful jurisdiction over the work in this section.
- B. When these specifications and/or drawings call for or describe materials, workmanship or construction of a better quality, higher standard or larger size than is required by the above mentioned rules and regulations, the provisions of these specifications and/or drawings shall take precedence over the requirements of said rules and regulations.
- C. The Contractor shall furnish, without extra charge, any additional material and/or labor required for compliance with these rules and regulations, although not mentioned in these specifications or indicated on the drawings.
- D. All materials shall be new and shall conform with applicable standards in every case where such standards have been established for the particular material in question.
- E. Workmen skilled in the craft that they are assigned shall execute all work.
- F. Adequate supervision shall be provided to maintain high quality workmanship.
- G. The Contractor shall provide labeled equipment-certifying approval, as hereinafter specified, by Underwriters Laboratories (UL).

1.09 SITE CONDITIONS

- A. The Contractor shall be responsible for the protection of the Owner's property from injury or loss due to his work. All damage to existing property (buildings, utilities, pavement, etc.) or planting (trees, shrubs, lawn or ground cover) caused by the Contractor during his operation or as a result of malfunction of installed work during the guarantee shall be repaired at the Contractor's

- B. The Contractor shall fully inform himself regarding any available space limitations and unusual requirements, for the installation of all materials and work furnished under this section. Although the location of equipment may be shown on the drawings in certain positions, the Contractor shall also be guided by the Architectural details and conditions at the job, correlating his work with that of the other sections.

1.10 PERMITS AND FEES

- A. Permits: The Contractor shall secure and pay for all permits, inspections, and certificates of inspection, of any governmental and inspection body having jurisdiction over all or any part of the work included under this section, and/or such inspections, etc., required by these specifications.
- B. Fees: The Contractor shall secure and pay for all fees and assessments in connection with the work under this contract, and shall include this cost in his bid and contract price.

1.11 GUARANTEE

- A. In entering into a contract covering this work, the 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.
- B. The Contractor further guarantees that the workmanship and material will be of the best quality procurable and that none but experienced workmen, familiar with each particular class of work, will be employed.
- C. The 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 which may develop at any time within one (1) year from the date of system startup. Any repairs or replacements required because of defects, as outlined in this clause, are to be made promptly and approved in writing by the Architect.

1.12 MAINTENANCE MANUAL

- A. The Equipment Supplier shall deliver to the Owner three (3) copies of the Operations and Maintenance Manual, together with any additional information or manuals that would assist in the proper maintenance of equipment.
- B. The Contractor shall arrange and provide for the technical instruction of the Owner's maintenance personnel, by the Equipment Supplier's personnel, for such time as is reasonably required to acquaint them with the operation and maintenance of all equipment furnished or installed under this section.

PART 2 PRODUCTS

2.01 GENERAL

- A. Prime contractor shall be responsible for purchasing all specialized fountain materials for the fountain and shall then furnish electrical fountain components to the electrical contractor and mechanical fountain components to the mechanical contractor for installation and connection.
- B. Equipment not listed within these specifications or on drawings as furnished by the Equipment Supplier but required for the complete installation of the fountain mechanical and/or the Contractor shall furnish electrical systems, unless otherwise specified.
- C. Products shown on the drawings but not specified herein shall be provided in accordance with information shown on the drawings and the general provisions of this part of the specification.

2.02 SPECIALIZED FOUNTAIN MATERIAL SUPPLIER

- A. All Fountain equipment specified and supplied to the Contractor shall be supplied by a single fountain equipment supplier unless otherwise specified herein.
- B. The Equipment Supplier must currently be in the business of supplying fountain equipment for a minimum of ten years and shall have previously supplied fountain equipment similar in size and complexity.
- C. The Equipment Supplier shall also provide engineering design as it pertains to the fountain system and the equipment supplied, referring specifically to complete hydraulic and electrical design. This shall include: display system, filtration system, water level control system and electrical control system design; pump selection and pump pit or equipment room sizing; piping system sizing, and suction pit and/or sump design; and, lighting and junction box selection and layout.
- D. The engineering design information shall further be delineated on final schematic, installation, and detail drawings showing the proper installation of the supplier's equipment. These drawings shall be furnished to the Contractor by the Equipment Supplier as an integral part of his fountain equipment package.
- E. Approved Equipment Supplier: Fountain People, Inc. 4600 HWY. 123, San Marcos, Texas 78666. Contact: Bryan Had, telephone 770-366-3302, e-mail bryan.had@fountainpeople.com

2.03 MATERIAL SUPPLIER'S RESPONSIBILITY

- A. All materials and component parts, excluding lamps, supplied by the Equipment Supplier shall be
- SITE FURNISHINGS

guaranteed to be free from defects of materials and/or workmanship, for a period of one (1) year from date of fountain start-up.

- B. **Design Responsibility:** The Equipment Supplier shall accept complete design responsibility for the hydraulic and electrical system, providing that all equipment is supplied by him as indicated. This does not include responsibility for the actual installation of the equipment except where the equipment is installed by the Equipment Supplier.
- C. **Performance Guarantee:** The Equipment Supplier shall provide a written performance guarantee certifying that the fountain system will perform to the designed water heights and patterns, and to create the designed lighting effects, provided the equipment is supplied by a single Equipment Supplier and the installation is in accordance with the supplier's recommendations and drawings.
- D. Any material supplied by the Equipment Supplier that is not actually manufactured by the Equipment supplier shall be supplied under the name of the particular equipment manufacturer's name.

2.04 Fountain Components

Item#	Qty	Model #	Description
		FIAC-2000-APJ	Fountain-In-A-Can with Hydro-Valve and Adjustable Precision Jet Nozzle, a “pour in place” flush mount spray effect with instant switching HydroValve, and 360-degree light fixture. The assembly includes a stainless-steel canister with 1/4” thick stainless-steel grate and contains (1) interchangeable precision jet nozzle, 360-degree 24V, 36-Watt, LED ring light with colored RGB diodes, fast acting Hydro-Valve, manual adjustment valve, junction box, bonding lug, 1-1/2” inlet connection, 2” drain connection, and (2) 3/4” conduit connections for valve & light. Assembly is shipped with (3) anchor bolts, leveling nut & washers.
		FIAC-2000-JC	Fountain-In-A-Can with Hydro-Valve and Jet Cluster Nozzle, a “pour in place” flush mount spray effect with instant switching HydroValve, and 360-degree light fixture. The assembly includes a stainless-steel canister with 1/4” thick stainless-steel grate and contains (1) interchangeable jet cluster nozzle, 360-degree 24V, 36-Watt, LED ring light with colored RGB diodes, fast acting Hydro-Valve, manual adjustment valve, junction box, bonding lug, 1-1/2” inlet connection, 2” drain connection, and (2) 3/4” conduit connections for valve & light. Assembly is shipped with (3) anchor bolts, leveling nut & washers.
		FIAC-2000-SJ	Fountain-In-A-Can with Hydro-Valve and Shower Jet Nozzle, a “pour in place” flush mount spray effect with instant switching HydroValve, and 360-degree light fixture. The assembly includes a

			stainless-steel canister with 1/4" thick stainless-steel grate and contains (1) interchangeable shower jet nozzle, 360-degree 24V, 36-Watt, LED ring light with colored RGB diodes, fast acting Hydro-Valve, manual adjustment valve, junction box, bonding lug, 1-1/2" inlet connection, 2" drain connection, and (2) 3/4" conduit connections for valve & light. Assembly is shipped with (3) anchor bolts, leveling nut & washers.
		JB8-3-100	Junction Box, flush mount, UL listed, underwater cast bronze junction box with internal grounding lug, neoprene gasket, 1" power connection, and three (3) 3/4" side connections for lights. Includes brass cord seals and plugs.
		JB8-4-100	Junction Box, flush mount, UL listed, underwater cast bronze junction box with internal grounding lug, neoprene gasket, 1" power connection, and four (4) 3/4" side connections for lights. Includes brass cord seals and plugs.
		PC-8882-D	Potting compound for use in underwater junction boxes, 21 oz. package, meets NEC article 680 as an approved potting compound.
		AN-1D	Wind Speed Sensor, polycarbonate constructed 3-cup anemometer with UV inhibitors, beryllium copper shaft and Teflon bearings. Requires 18/3 cable by installer.
		WLS-CLH3	Water level control sensor; compact and flexible with 3 electrodes and a control unit, polypropylene housing, 1-1/2" NPT connection.
		PCS-32-W	32" VGB Plastic Channel Sump Assembly, dimensions: 33" x 4-9/32" x 5-9/16", three bottom ports: 2-2/2" spigot x 2" socket x 2" NPT, two 2" threaded plugs, #316 Stainless Steel fasteners, VGB Grate has 38.79 sq. in open area for water flow. IAPMO Listed and complies with ANSI/APSP-16-2011 & CPSC Requirements. White in color.
		PWA-30	Double wall 30-gallon acid storage tank with fittings 3" supply piping, 2" capped drain, 3/4" incoming conduit fitting and metering chemical feed pump 120V,60Hz/1Ø, 1.4 Amps (Acid Tank)
		PWC-30	Double wall 30-gallon acid storage tank with fittings 3" supply piping, 2" capped drain, 3/4" incoming conduit fitting and metering chemical feed pump 120V,60Hz/1Ø, 1.4 Amps (Chlorine Tank)
		LPST-2000-P24341	Underground Water Storage Tank, high density polyethylene construction, using FDA and NSF resins, monolithic ribbed design for superior top load strength, and repeated filling and emptying cycles. Low profile design for shallower excavations, flats located to accept bulkhead fittings (tank adapters), and ventilation piping. Tie-down manhole cover with 16" hatchway riser, stabilization 'lugs' at corners to aid in transportation, handling, lifting and tie-down. Internally, tank includes floating surface skimmer. Tank material conforms to 21 CFR 111.1520 standards.
		FPV-G-	Direct Burial Vault, heavy duty FRP enclosure measuring 9'-7" x 7'-9" x 8'-11" deep, that is structurally engineered and certified for in-

		P24341	ground installation. Furnished with 36" x 36" lockable landscape access hatch (green) and ladder up extension pole. The vault includes (1) 5-HP fountain display pump with integral basket strainer, discharge strainer with stainless-steel screen, includes throttling valves and (1) variable frequency drive and 1-HP filter pump with integral basket strainer, sand filter with multi-port valve assembly, NSF UV Sterilizer, BECS3 PH/ORP Water Treatment System with ethernet connection, suction & discharge isolation & throttling valves, 3/4" water fill manifold, sump pump assembly, forced air ventilation system, LED Lighting Panel with controller, and internal power supplies, wind control panel, a UL electrical control panel with pump starters and motor protectors, digital timeclocks, HOA switches, water level control relays, sequencing controller, and main disconnect switch. Unit is factory engineered, assembled, and tested prior to shipment. Power requirement: 120/208 Volt, 3-phase, 4-wire feeder + GND.
		VCA-300-P	Vent Cap Assembly, PVC construction, 3" connection
		VCA-600	Vent Cap Assembly, cast iron construction, 6" connection

^ ITEM REQUIRED FOR FOUNTAIN CONCRETE POUR.

PART 3 EXECUTION

3.01 SITE AND DRAWING EXAMINATION

- A. Any Contractor submitting a proposal for this work shall first examine the site of the proposed work and all conditions at the site that he may fully understand any facilities, difficulties, and restrictions attending the execution of the contract. No subsequent allowances shall be made because of omission, error, or negligence in connection with this provision.
- B. Any Contractor submitting a proposal for this work shall carefully examine the architectural and structural drawings and specifications for the work in this particular trade.
- C. Questions pertaining to work that does not appear to be sufficiently detailed or explained, or pertaining to the true meaning of any part of the drawings or specifications, or discrepancies found existing in or between the specification and/or drawings, shall be referred to the Architect for clarification or correction.

3.02 COORDINATION

- A. The Contractor shall cooperate with subcontractors of other trades, whose work is in any way affected by, or affects the work under this section.
- B. The Contractor shall also coordinate the work under this section with that of other trades, as required, to effect a completely satisfactory installation consistent with the requirements and intent of the contract drawings and specifications, to avoid omissions and delays in the work.

- C. The Contractor shall furnish necessary materials in ample quantities as required to avoid delay in the progress of the work and shall so store them as to prevent interference with other work.

3.03 GENERAL INSTALLATION

- A. Install and connect all equipment in accordance with manufacturer's instructions and recommendations unless otherwise noted. If specified installation is contrary to manufacturer's instructions, cease installation of affected components or systems. Notify Project Manager and Architect/Engineer and do not resume installation without clear instructions.
- B. Protect all pipes, conduits, equipment and other parts of the work against injury by exposure to the weather during construction while stored and after installed in place.
- C. Accurately locate items to be cast in concrete and rigidly support to resist loads imposed during concrete pour.

3.04 DIRECT-BURIAL VAULT SYSTEM INSTALLATION

A. General:

1. Installation shall be in strict accordance with manufacturer's instructions and recommendations.
2. Handle vault with forklift or lift using the provided lifting lugs. Rig vault so all lugs see equal lifting force.
3. Vault system must be protected at all times from flooding. Conduit and vent piping entries shall be protected from moisture entry prior to connection and drain piping and/or temporary power supply for sump pumps shall be connected immediately upon placement in excavation.
4. Vault piping and conduit connections shall not be externally loaded or used to support piping or conduit.
5. Vent piping, where required, shall not exceed twenty feet in length and ends of vent piping shall be protected with screen to prevent entry of insects.

B. Install as follows:

1. Excavate as required and pour a flat ballast slab as per manufacturer's instructions.
2. Place vault into excavation and anchor to ballast slab using the stainless steel anchor cables provided by manufacturer.
3. Connect drain piping and/or temporary power to sump pump where required.
4. Connect all piping and conduit.
5. Pressure test-piping system.

6. Connect vent piping and protect openings.
7. Connect wiring to lugs and terminals provided in vault panel.
8. Install backfill material around vault.
9. Install vent pipe caps and screen.

C. Backfilling:

1. Backfill material shall be free-flowing gravel or crushed stone and shall be a nature rounded aggregate of 1/4" nominal size. Do not use sand or dirt for backfill.
2. A minimum of two feet of backfill material shall be provided between the vault and surrounding earth on all sides of vault. Top of vault may be backfilled with soil as specified by Architect up to a depth of twelve inches. If top of vault is located more than 12" below final grade, backfill material as described in #1 above, shall be provided between the vault and soil layer above vault.

D. Filter Media Installation

1. Filter media, where required, shall be installed in strict accordance with written instruction from manufacturer. Media must be installed in filter tank prior to circulating water through filter. Operation of filter without media may damage filter.

3.05 VALVE INSTALLATION

A. General:

1. Provide isolation valves on each side of all pumps, strainers, filters or any other device or equipment that must be isolated for maintenance.
2. Provide throttling valves in discharge piping which supplies nozzles, waterfall diverters or any device or equipment which requires flow to be throttled or adjusted.
3. Provide check valves in discharge piping that connects two or more pools of different elevations to prevent backflow.
4. Valves with stems shall be installed with stem horizontal or above. Do not install with valve stems below horizontal centerline.
5. Angle valves shall close against pressure.

B. Applications:

1. Isolation valves shall be gate, ball or butterfly unless otherwise specified.

2. Throttling valves shall be globe, ball or butterfly. Butterfly valves used for throttling must be equipped with infinite control handles up to 6" in size and hand wheel operators for sizes larger than 6".
3. Valves installed underwater or underground shall be of all non-corrosive material and furnished with non-corrosive handles or operators.

3.06 PIPE INSTALLATION

A. General:

1. Install piping straight and true without loops or traps in accordance with the best modern practice.
2. Make pipe runs as direct as possible using a minimum number of fittings.
3. Slope piping to the pump for drainage. If piping cannot be sloped to pump, make provision for the complete draining of each pipe line by connecting minimum a 1-1/2" drain line and valve to lowest point in pipe run.
4. Pump suction piping shall be a straight run into the pump free of pipe bends or tees for a minimum of ten pipe diameters preceding the pump's suction connection unless otherwise indicated on drawings.
5. Pump suction piping reduction 4" or larger shall be made with eccentric type fittings to eliminate the entrapment of air in the suction piping.
6. Cut pipe and tubing ends square. Remove rough edges and burrs so that a smooth and unobstructed flow will be obtained.
7. Cut pipe to measurements established at the site. Work into place without springing or forcing.
8. Protect all openings in piping during construction to prevent entrance of foreign matter.
9. Provide flanges or unions as indicated and as necessary to allow removal and re-installation of any item of equipment or accessory without cutting, welding or soldering.
10. All connections between dissimilar metals shall be made with dielectric fittings.
11. Arrange exposed piping straight, parallel and perpendicular to the walls of the structure unless otherwise shown on the drawings.
12. All city water lines connected to fountain system shall be protected by a backflow preventer approved for application and a pressure regulator which limits supply pressure to a maximum 50 psi.

B. Pipe joints:

1. Welded pipe: Perform all welding in accordance with the requirements of ASME Boiler Pressure Piping Code or ANSI B31.1.
2. Threaded pipe:
 - a. Cut all threads with axis of thread coinciding with axis of pipe.
 - b. No more than two threads shall show beyond fittings.
 - c. Make up joints with Teflon tape or paste.

- d. Remake leaky joints with new materials.
3. Compression copper joints:
 - a. Use soft tubing.
 - b. Cut ends using tubing cutter. Ream and clean.
 - c. Install tube fitting as per manufacturer's instructions.
4. PVC pipe:
 - a. Bevel all pipe ends with a coarse file or beveling tool.
 - b. 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.
 - c. Apply a coating of appropriate primer to the entire I.D. surface of the fitting socket and to an equivalent area on the O.D. of the pipe end.
 - d. Apply solvent cement using an appropriate natural bristle brush as follows: Apply a liberal coating or cement around the entire perimeter of the pipe end to a width slightly more than the equivalent socket depth of the fitting. Apply a light but complete coating once around the entire depth of the socket surface, avoiding excessive cement application. Apply a second liberal coating onto the pipe end.
 - e. 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.
 - f. Do not disturb or move the joint for at least one hour after joining.
 - g. Do not solvent weld pipe if atmospheric temperature is below 40 degrees F. or above 90 degrees F., or if it is raining.
 - h. 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 the container.
- C. Underground piping:
 1. Excavate trenching for underground piping to required depths providing sufficient slope for proper pipe fall and adequate space at both sides and bottom of trench to facilitate pipe installation.
 2. Tamp trenches hard.
 3. Install piping on 6" deep bed of pea gravel in the bottom of trench.
 4. Perform piping tests before coating or wrapping pipe.
 5. Backfill trench with pea gravel to a height of 12" above top of pipe.
 6. Backfill to surface in 6" layers with a minimum of 95% compaction. At paved areas, material may be gravel, or native soil. At planted areas, soil shall be as specified by the Architect.

1. Copper, encased in concrete: Exterior shall be wrapped with one layer of pipe wrap at half lap.
2. Copper piping, underground: Exterior shall be coated with two coats of coal tar mastic to a total thickness of 8 to 10 mils. Allow 12 hours drying time between applications. Clean and prepare pipe exterior in accordance with manufacturer's recommendations.

E. Penetrations:

1. Core drilling for pipe penetrations shall be accomplished only at locations and in a manner approved by the Architect.
2. Provide a metal sleeve or core drilled hole for every pipe passing through a concrete wall or floor.
3. Provide a waterstop or membrane clamp for every pipe or sleeve penetrating an exterior concrete wall or floor or the fountain wall or floor, whichever is appropriate to the waterproofing method and as shown on the drawings.
4. Seal sleeves passing through exterior walls with resilient seal and foam sealant, or as indicated on the Drawings.

3.07 UNDERWATER LIGHT FIXTURE INSTALLATION

- A. Install underwater lighting fixtures in accordance with Article 680 of the National Electrical Code (NEC) and as per manufacturer's instructions.
- B. Secure underwater light flexible cords to junction boxes using brass compression type strain relief seals approved for application.
- C. Exposed underwater flexible cords may not exceed 10 feet in length.
- D. Protect all underwater lighting circuits operating above 15 volts with a Class "A" ground fault circuit interrupter (GFCI). Circuits operating below 15 volts shall be protected by a transformer UL listed and marked for application.
- E. Provide sufficient flexible cord to allow underwater light fixtures to be removed from the water for re-lamping and normal maintenance.

3.08 UNDERWATER JUNCTION BOX INSTALLATION

- A. Install underwater junction boxes in accordance with Article 680 of the National Electrical Code (NEC) and as per manufacturer's instructions.
- B. Install all junction boxes connected to underwater light fixtures, but located outside of fountain basin, as an underwater junction box if not located 4 feet or more from pool and 8" or higher above maximum pool water level.

- C. Underwater junction boxes shall be sealed after being wired as follows:
1. Seal all conduit openings using duct seal or other approved sealant.
 2. Make sure all wiring connections are grouped in center of box away from box walls and recessed below opening.
 3. Fill junction box completely with potting compound to encapsulate electrical connections and prevent moisture entry.

3.09 CONDUIT INSTALLATION

- A. Install wiring in sealed conduit in accordance with best modern practice, except flexible cord approved for submersible application shall be used between underwater light fixtures and underwater junction boxes.
- B. Applications (Unless otherwise indicated on drawings):
1. Conduit located within pool and all stub-ups through pool floor or walls shall be red brass.
 2. Conduit located in equipment room or exposed to sunlight shall be steel.
 3. Buried conduit shall be PVC.
- C. Conceal conduit located in finished areas unless otherwise indicated on drawings.
- D. Cut ends of all conduit square and carefully ream to remove rough edges.
- E. Seal ends of conduit during construction to prevent entry of moisture or contaminants.
- F. Provide a bushing to protect conductors from abrasion where conduit enters a box or other fitting.
- G. Where junctions, bends or offsets are required on exposed runs of conduit, fittings with accessible covers shall be provided. Bends around corners of beams, walls or equipment will not be permitted.
- H. Do not use threadless couplings and/or connectors with conduit installed in wet locations or where buried in concrete or other fill. All threads shall be NPT (tapered pipe threads) run up tight with Teflon tape or sealant. Running threads will not be permitted.
- I. Bend conduit so that conduit is not damaged and such that the inside diameter is not effectively reduced. No more than the equivalent of two 90-degree bends shall be used on any single run of conduit between accessible outlets and/or other fittings.
- J. Provide dielectric fittings for all connections made between dissimilar metals.
- K. Seal all conduits after conductor installation to prevent entry of moisture.

3.10 CONDUCTOR INSTALLATION

- A. Install conductors in conduit after conduit has been installed and all moisture and debris have been removed

from conduit, junction boxes and other conduit fittings.

- B. Install conductors connected to equipment having a tendency to cause noise or vibration in flexible conduit not to exceed four feet in length. Cover all flexible conduit subject to moisture with watertight plastic and make all connections with watertight fittings.
- C. Install only stranded type copper conductors with waterproof insulation between underwater junction boxes and Fountain Control Panel. Do not use solid copper conductors.
- D. Do not use cleaning agents or lubricants that might have a deteriorating effect on conductor coverings.
- E. Make all electrical connections to mechanical equipment as required to place this equipment in operating service.
- F. Connect conductors to terminals using approved connectors. Wires in panel cabinets, pull boxes, and wiring gutters shall be neatly grouped and fanned out to the terminals.

3.11 CONDUCTOR COLOR CODING

- A. Color code conductors (600 volts and under) and identify by one color with continuity being maintained throughout the project.
- B. Color code as follows:
 - 1. Phase "A" - Black.
 - 2. Phase "B" - Red.
 - 3. Phase "C" - Blue.
 - 4. "Neutral" - White.
 - 5. "Ground" - Green.

3.12 EQUIPMENT IDENTIFICATION

- A. Provide a securely attached permanent nameplate for each piece of equipment, where appropriate, containing all data required to properly identify the equipment, (i.e., manufacturer, type, size, capacity, horsepower, etc.).
- B. Provide a permanently attached valve tag of non-corrosive material for each valve, to provide information to correlate the valve with the outlet or fitting served.
- C. Provide a legible copy of the "As-built" schematic diagram, permanently encased in plastic or glass, to provide the Owner's operating personnel ready correlation of each valve identified with each outlet or fitting served.
- D. Provide nameplates for all pressure and/or compound gauges, pressure switches, vacuum switches and other sensory or control devices to identify and provide information to correlate the device to operation and maintenance manual.
- E. Provide nameplates on exterior of all electrical panels to identify panel and designate maximum voltage within

- F. Provide labels for all panel control switches and pilot lights to identify equipment controlled and function.
- G. Provide labels in all power distribution panels designating device connected to each circuit breaker.
- H. Provide labels on each time clock, control relay, contactor, and motor starter within control panels to identify and provide information to correlate the device to panel electrical drawings.

3.13 RECORD DRAWINGS

- A. The Contractor or subcontractor shall keep on the job, one complete set of contract working drawings, on which he shall record any deviations or changes from such drawings made during construction. The record drawings shall show changes in size, type, capacity, etc., of material, device or piece of equipment, rerouting of any piping or conduit, or changes in other building services.
- B. These drawings shall also record the location of all concealed services, piping, conduit and other equipment, by indication of measured dimensions to each such line, from readily identifiable and accessible reference points.
- C. Before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to a sepia Mylar procured from the Architect at cost. All work shall be neat, in ink and subject to the approval of the Architect.
- D. After final acceptance the approved sepia drawings shall be delivered to the Architect in good condition, as a permanent record of the installation as actually constructed.

3.14 DEFECTIVE WORK AND MATERIALS

- A. All materials or work found to be defective or not in strict conformity with the drawings, or different from the requirements of the drawings and specifications, or defaced or injured, shall be removed and satisfactory material and work substituted.

3.15 CLEAN UP

- A. Upon completion of the work of this section, the Contractor shall remove all unused equipment and implements of service, and leave the entire area involved in a neat, clean, and acceptable condition as approved by the Owner.
- B. All soiled, abraded or discolored surfaces of decorative fountain work shall be cleaned, polished and left free from blemishes or defects.
- C. All water pipe lines shall be flushed free of debris as follows:
 - 1. Completely drain all piping and equipment.
 - 2. Remove all construction debris and thoroughly sweep pools clean.

3. Fill the system to the required capacity.
4. Circulate the water throughout the system for one hour, using the display pump. Do not allow cloudy water to pass through the filter tank.
5. Completely drain pool, piping and equipment and remove all debris that may have collected in suction and/or discharge strainers.

3.16 TESTS AND ADJUSTMENTS

- A. General: The Contractor shall test all equipment installed by him, as necessary, to show that it complies with all requirements specified. Testing shall be done in a manner approved by the Architect.
- B. Piping tests:
 1. Provide all temporary piping, pumps, and gauges necessary to conduct the specified tests.
 2. Conduct all tests before concealment of work and before any coating, paint or wrap is applied.
 3. Use water as test medium. Do not test piping with air or any other compressible gas. Vent air from all piping being tested before applying pressure.
 4. Replace or repair any part that leaks. Repeat test until criteria are met.
 5. Do not subject any item to a test pressure greater than the pressure rating of the item.
 6. Underground piping shall be tested as follows:
 - a. Pressurize all underground piping (except for drain system) to 40 psi prior to backfilling (spot backfilling to anchor piping may be done prior to pressurizing). Piping shall remain pressurized until all backfilling, grading, planting and concrete work in the area of the piping is completed.
 - b. Pressurize all underground drain piping beneath the equipment space to 15 psi prior to backfilling (spot backfilling to anchor piping may be done prior to pressurizing). Piping shall remain pressurized until all backfilling and concrete work in the area of the piping is completed.
 7. The completed piping systems shall be tested as follows:
 - a. Conduct each test for a minimum continuous duration of eight hours.
 - b. Hydrostatically pressure test all storm and sanitary drain piping at 15 psi.
 - c. Hydrostatically pressure test all other piping and equipment at 40 psi.
 - d. Strike all solder joints with a soft-face hammer while under pressure.
 8. Log pressure readings for all tests required at the beginning and end of each test. Note the location and cause of any failures and method of repair on a daily log. Submit copy of log to the Architect.
- C. Electrical tests:
 1. All electrical circuits, feeders, and equipment shall be tested and proven free of improper grounds,

open circuits or shorts, as required by the public authorities, to demonstrate compliance with codes or laws.

- D. The Contractor shall, at his expense, make the fountain operational using an authorized Technician from the Equipment Supplier and make tests, adjustments, and corrections, until it is shown to be in proper operating condition.

3.17 THIRTY-DAY OPERATION PERIOD

- A. As soon as the fountain structure has been completed and all-mechanical and electrical equipment has been installed and tested, the fountain may be placed in operation.
- B. Prior to acceptance of the installation by the Owner, the Contractor shall demonstrate a concurrent thirty-day, fully automated, uninterrupted daily operation of not less than twelve hours nor more than twenty hours for all systems provided under this section.
- C. The Contractor shall supervise the operation of the equipment and be responsible for the proper operation and maintenance thereof and make no claim against the Owner for any damage to the equipment during such operation. The Contractor shall make such changes, adjustments, or replacements of equipment as may be required to make the installation comply with the Specifications, or to replace any defective parts or materials.
- D. The Owner will pay water and normal operational supplies during the thirty-day operation period the costs of electricity. The Contractor shall pay for all operating costs resulting from system deficiencies.

END OF SECTION

SECTION 26 27 26.00 - WIRING DEVICES

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.
- B. See Section 26 05 33.00 for weatherproof cover plate requirements.

1.2 SUMMARY

- A. Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Verify color selections with Owner's Representative.
- B. Section Includes:
 - 1. Receptacles
 - 2. Device wall plates

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. SPD: Surge protection device.
- F. Tamper-resistant: This term and "safety type" shall be taken to mean the same thing for receptacles.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For equipment and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1, include the following:
 1. Routine maintenance requirements for equipment and all installed components.
 2. Manufacturer's written instructions for testing and adjusting.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Source Limitations: Obtain devices from single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Do not deliver or install equipment until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above equipment is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 COORDINATION

- A. Coordinate layout and installation of equipment and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for access.
- B. Receptacles for Owner-Furnished Equipment: Match plug configurations.
- C. Cord and Plug Sets: Match equipment requirements.

1.10 WARRANTY

- A. Standard Warranty: 1 year(s).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper)
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
 3. Hubbell Incorporated; Wiring Device-Bryant (Hubbell)
 4. Leviton Mfg. Company Inc. (Leviton)
 5. Pass & Seymour/Legrand (Pass & Seymour)
 6. Lutron Electronics, Inc. (Lutron)
 7. Hubbell Incorporated (Hubbell)
 8. Wiremold/Legrand (Wiremold)
 9. FSR Inc. (FSR)
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. For receptacle circuits protected with 15A breakers, provide NEMA 5-15R equivalents for the devices shown below.
- D. Provide Weather-Resistant Receptacles with UL "WR" marking, compliant with NEC 406.8, for all applications in wet or damp locations.
- E. Where GFI protected receptacles are shown on drawings, provide a separate GFI receptacle for each one shown. Do not feed downstream receptacles from load-side (GFI-protected) terminals of upstream receptacles.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R (20A) or 5-15R (15A), UL 498, and FS W-C-596.
1. Provide duplex and single specification grade receptacles, 2-pole, 3-wire grounding, self-grounding, green grounding screw, ground terminals and poles internally connected to mounting yoke, color coded base, 20-amperes, 125-volts, with metal plaster ears, back & side wiring, NEMA configuration 5-20R.
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), CR5362 (duplex)
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex)
 - c. Bryant; 5351 (single), 5352A (duplex)
 - d. Leviton; 5351 (single), 5362 (duplex)
 - e. Pass & Seymour; 5351 (single), 5362 (duplex)
 3. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through or non-feed-through type depending on application.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GF20#LA.
 - c. Bryant; GF20#LA.
 - d. Pass & Seymour; 2097.
 - e. Leviton; 6490

2.5 WALL PLATES

- A. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant. Refer to Section 26 05 33.00.

2.6 FINISHES

- A. Device Color (unless otherwise indicated or required by NFPA 70 or device listing):
 1. General Wiring Devices Connected to Normal-Utility Branch of Power System: Gray.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine devices before installation. Reject devices that are moisture damaged or physically damaged.
- B. Examine elements and surfaces to receive equipment for compliance with installation tolerances and other conditions affecting performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Provide grounded ("neutral") conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used.
2. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
3. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
4. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
5. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
10. Install wiring devices only in electrical boxes that are clean; free from building materials, dirt, and debris. Install wiring devices after wiring work is completed. Install wall plates only after respective wall surfaces have received their final finish.
11. Consider locations indicated on the drawings to be approximate (unless specifically dimensioned on drawings). Determine exact locations of each floor outlet, case by case, after consulting with Owner and Design Professionals, and after reviewing architectural documents so outlets are properly located to accommodate the final furniture and equipment layouts. Study the general construction with relation to spaces and equipment surrounding each outlet.
12. Do not use aluminum products in concrete.
13. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Support boxes independent of conduit.

- E. Receptacle Orientation: Install receptacles so that the ground pin is oriented in a consistent manner throughout the facility, so that the orientation is compliant with all prevailing codes and regulations, and so that the orientation is acceptable to the electrical inspector. Where there is no existing building standard or other project requirement, install receptacles with ground pin up. Where receptacles are installed horizontally, install so that neutral connection faces up.

- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wallplates.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.3 GFCI RECEPTACLES

- A. Install feed-through-type GFCI receptacles where downstream receptacles are fed from the line side of the GFCI receptacle.

3.4 IDENTIFICATION

- A. Comply with Section 26 05 53.00 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform Tests and Inspections
- B. General Tests and Inspections:
 - 1. Inspect, test and adjust components, assemblies, and equipment installations, including connections.
 - 2. Test continuity of each circuit.
 - 3. Test and adjust controls, operations, etc. as applicable. Replace damaged and malfunctioning devices and equipment.
- C. Additional Tests for Receptacles:
 - 1. Line Voltage (120V): Acceptable range is 105 to 132 V.
 - 2. Test for correct polarity and grounding.
 - 3. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 4. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 5. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 6. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 7. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- D. Installed equipment will be considered defective if it does not pass tests and inspections. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- E. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 STARTUP SERVICE

- A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

- A. Adjust so devices are level, plumb and securely mounted, and so devices are operating properly.

3.8 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.
- B. Replace components whose interiors have been exposed to water (including condensation) or other liquids prior to Substantial Completion.

3.9 CLEANING

- A. Vacuum dirt and debris, and wipe down components; do not use compressed air to assist in cleaning.

3.10 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain devices, and accessories.

END OF SECTION 26 27 26.00

Submittal Form – 262726.00 – Wiring Devices

Provide and complete this sheet and submit as a cover sheet for submittals requested within this section.

Electrical Contractor: _____ Electrical Supplier: _____

Electrical Contractor Rep: _____ Electrical Supplier Rep: _____

Electric Contractor Ph. Number: _____ Electric Supplier Ph. Number: _____

Electric Contractor Rep email: _____ Electric Supplier Rep email: _____

Submitted Manufacturers (list device type and manufacturer):

	Yes	No
Manufacturers listed as basis of design or listed equivalent manufacturers?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		
Manufacturers' qualifications meet or exceed those required under quality assurance section within this specification?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		
Manufacturers' warranty meets or exceeds the warranty period specified within this specification?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		
Submitted components meet all requirements listed within this specification?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		
Wiring device colors have been coordinated with Owner and Design Professionals?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		
Product data submittals are clear, crisp and distinctly legible – including graphics?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		
Product data submittals are clearly marked as to exactly which devices are submitted for review with the understanding that all unmarked devices will be ignored during review?	<input type="checkbox"/>	<input type="checkbox"/>
If No, Explain _____		

SECTION 26 51 00.00 - LIGHTING

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.
- B. Refer to Section 26 05 03.00 "Submittals for Electrical Systems" for submittal requirements.
- C. Refer to Section 26 09 19.00 "Enclosed Contactors" for enclosed contactors associated with lighting control.

1.2 SUMMARY

- A. Provide all labor, materials, equipment, equipment, programming, services, etc. as required for complete and fully operational lighting and lighting control systems.
- B. Section Includes:
 - 1. Luminaires, light sources, drivers, etc.
 - 2. Luminaire supports

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. Labeled: Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by who's labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
- D. LER: Luminaire efficacy rating.
- E. LED: Light emitting diode type luminaires with integral drivers.
- F. Listed: Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.
- G. Lumen: Measured output of lighting source, luminaire, or both.
- H. Luminaire: Complete lighting unit consisting of lighting source or sources, and some or all of the following components: optical control devices, contacts, mechanical components to support or attach the

luminaire, and electrical and electronic components to start, operate, dim or control and maintain the operation of lighting source, and driving and transformation components.

- I. Lighting Source: LED boards or equivalent LED assembly
- J. THD: Total harmonic distortion

1.4 ACTION SUBMITTALS

- A. Forms: Include filled-out versions of the forms at the end of this specification section.
- B. Product Data:
 - 1. Arrange luminaire submittals in booklet form with separate sheets for each luminaire, assembled by luminaire "type" in alphabetical order.
 - 2. Submit details indicating compatibility with ceiling system.
 - 3. Provide light source and driver, low voltage transformer, etc. schedules (by luminaire type). Provide technical submittal data in separately tabbed sections for lamp or source submittals and for other component submittals.
 - 4. If third party components are provided with a luminaire to meet the specification, the product data sheet for these components must also be provided with the luminaire product data sheet; simply "marking up" the luminaire product data sheet is unacceptable.
 - 5. Product data sheets prepared solely by a Distributor or Contractor are unacceptable. Product data sheets shall be submitted with the manufacturer's representative's header on each sheet. Failure to provide product data sheets in this format will result in immediate return of the submittal package without review.
- C. Only fully complete submittals will be reviewed. Failure to provide light source and driver, low voltage transformer, etc. schedule submittals (by luminaire type) at time of luminaire submittal will result in immediate return of submittal package without review.
- D. Submit Lighting Control Device, System and Accessory submittal(s) at the same time and in conjunction with the Luminaire submittal to verify that all associated components are verified with each other. None of the submittals will be reviewed apart from the other; they will be returned, marked "Revise and Resubmit". Failure to provide all submittals pre-coordinated and concurrently will result in immediate return of submittals, without review, and marked "Revise and Resubmit" with no further comments. This applies for the following specification sections.
 - 1. 26 09 23.00 Lighting Control Devices.
 - 2. 26 27 26.00 Wiring Devices.
- E. Include data sheets for the following:
 - 1. Luminaires
 - a. Original manufacturer datasheets or first generation printed copies of manufacturer's electronic datasheet (i.e. printed copy of a PDF file).
 - b. Datasheets shall include dimensions, finishes and technical support data including energy efficiency data. Provide data sheets for applicable luminaire support and accessories.
 - c. Each datasheet to be labeled with the project name, luminaire "type" and exact catalog number. Affix to same location on each sheet.
 - d. Where datasheets depict multiple products, versions or options, highlight (indicate with an arrow) all applicable model(s), version(s) and option(s) applying to the specific product the Contractor will be providing. The submitted items must be from "approved materials".
 - 2. Lamps
 - a. Original manufacturer datasheets or first generation printed copies of manufacturer's electronic datasheet (i.e. printed copy of a PDF file).

- b. Datasheets shall include all technical data described in this section and data including, but not limited to, life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
 - c. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet.
 - 3. Driving and Transformation Components
 - a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
 - b. Datasheets shall include all technical data described in this section and energy-efficiency data.
 - c. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet
 - 4. Low voltage transformer/systems.
 - a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
 - b. Datasheets shall include all technical data described in this section and energy-efficiency data.
 - c. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet
 - 5. LED Source and Driver System
 - a. Original manufacturer datasheets or first generation printed copies of manufacturer’s electronic datasheet (i.e. printed copy of a PDF file).
 - b. Datasheets shall include:
 - 1) Voltage
 - 2) Input watts
 - 3) Energy efficiency data
 - 4) Initial Lumen output
 - 5) Source correlated color temperature (CCT)
 - 6) Source color rendering index (CRI) value
 - c. Verification that the system has been tested to IES LM-79-2008 standards
 - d. Verification that the system is RoHS compliant, lead free and mercury free
 - e. Name of the LED manufacturer
 - f. Name and model of the LED driver
 - g. Verification that the LED’s have been tested to IES LM-80-2008 standards and the rated life of the system in hours
 - h. Verification that factory-installed integral filtering and design exists to ensure THD does not exceed 20% regardless of quantities and/or mixes with other manufactured LED systems.
 - i. Warranty for LED’s and drivers
 - j. Each datasheet to be labeled with the project name, luminaire “type” and exact catalog number. Affix to same location on each sheet
 - F. Within 16 business hours of request by the Design Professional or Owner’s Representative, submit the following for review:
 - 1. Quality Assurance support documentation, as identified in this section.
 - 2. Bill of Materials, with unit pricing.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Source quality-control test reports.
 - B. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Closeout Submittal shall include operation, installation and specification data in closeout submittals. Include emergency, operation, and maintenance manuals.
 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes. List by luminaire "type".
 2. Provide a list of all driving and transformation component types used on Project; use ANSI and manufacturers' codes. List by "type".
 3. Provide a list of all LED sources and driver types used on Project; use ANSI and manufacturers' codes. List by luminaire "type".

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain equipment and components from single manufacturer for luminaires of the same type and "family" style.
- B. Product Selection for Restricted Space: Drawings indicate dimensions for typical equipment configurations including clearances between equipment and adjacent surfaces and other items. Ensure product complies with the layouts indicated in the drawings.
- C. Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment in sections or lengths that can be moved past obstructions in delivery path.
- B. Handle and prepare equipment for installation according to respective manufacturer's recommendations.
- C. Remove loose packing and flammable materials from inside equipment. If stored in space that is not permanently enclosed and air conditioned, provide temporary electric heating and conditioning to prevent condensation or other damage to materials (do not use any method that can damage any component or that emits UV radiation).

1.9 PROJECT CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving equipment into place.
- B. Environmental Limitations:
 1. Do not deliver or install equipment until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above equipment is complete, and temporary HVAC system is

- operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- 2. Rate equipment for continuous operation under the conditions defined by respective manufacturer.

- C. Comply with NFPA 70.

1.10 COORDINATION

- A. Coordinate layout and installation of luminaires and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.11 WARRANTY

- A. Standard Warranty: 5 year(s).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide products indicated on Drawings. Provide products of one of the manufacturers listed in this section for products that are not defined on the Luminaire Schedule. Provide specification grade luminaires that comply with minimum requirements as stated therein. If a particular "type" does not include basis of design manufacturer or model number, provide "pre-approved equivalent" manufacturer's and model numbers compliant with, and equivalent to: quality, performance, dimensions, and aesthetics as the respective basis of design for Design Professional review no less than five business days prior to bid due date.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

- A. Luminaires designated by letters are defined as indicated on the Luminaire Schedule.
- B. Provide luminaires, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy-efficient light sources, contacts, reflectors, wiring, etc.. Ship luminaires factory-assembled, with components required for a complete operating installation.
- C.
- D. Review drawings and specifications of other trades to verify ceiling types, modules, and suspension systems appropriate to installation.
- E. Luminaires: Comply with UL 1598.
- F. Metal Parts: Free of burrs and sharp corners and edges.
- G. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- H. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit replacing lighting source(s) without use of tools. Design to prevent

doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position. Fabricate luminaires with concealed hinges and catches, with metal parts grounded as common unit, and so constructed as to dampen generated noise.

- I. Factory-Applied Labels: Comply with UL 1598. Include recommended lighting sources, and driving and transformation components. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lighting sources are in place.
 1. Label shall include the following characteristics:
 - a. "USE ONLY" and include specific lamp type.

2.3 LIGHT EMITTING DIODE (LED) SYSTEMS

- A. Light Emitting Diode (LED) Systems
 1. LED Source
 - a. Provide factory installed LED modules that are specifically designed for, and matched and mated to, the respective luminaire in which they are used.
 - b. Provide LED modules that can easily be replaced in the field and are readily accessible for replacement.
 - c. Provide color temperature as indicated in Luminaire Schedule.
 2. LED Driver
 - a. Provide factory installed driver(s) for the LED source utilized that are specifically coordinated to the LED source and luminaire in which they are used.
 - b. Provide driver(s) having specific operating characteristics defined in the Luminaire Schedule.
 - c. Provide driver(s) that can easily be replaced in the field and are readily accessible for replacement.
 - d. Provide specification sheet for the specific driver as part of the Luminaire Submittal.
 3. Total Harmonic Distortion (THD) Rating: Less than 20 percent.
 - a. Provide factory-installed integral filtering system to ensure THD does not exceed 20 percent regardless of quantities and/or mixes with other manufactured LED systems.

2.4 LUMINAIRE SUPPORT COMPONENTS

- A. Support fixtures in compliance with NEC.
- B. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- C. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- D. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single luminaire. Finish same as luminaire.
- E. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- F. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- G. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

- H. Hook Hangers: Integrated assembly matched to luminaire and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- I. For gymnasiums, lab spaces and other open ceiling spaces where fixtures are suspended, provide an additional air craft cable support securely fastened to act as a safety chain providing a redundant support. Select cable based on manufacturer's recommendations, accounting for weight of luminaire assembly, external forces that could be applied, minimum 200% factor of safety, etc. Decorative pendants are exempt from this requirement.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Luminaires:
 - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
 - 2. Install lighting sources in each luminaire.
- B. Temporary Lighting: If it is deemed necessary, and permitted by Owner's Representative and Design Professionals, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is substantially complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Driving and Transformation Components: Distance between the driving and transformation components and luminaire shall not exceed that recommended by the luminaire and driving and transformation components manufacturer. Verify, with manufacturers, maximum distance between driving and transformation components and luminaire.
- D. Lay-in Ceiling Luminaires Supports: Unless required otherwise under other sections or unless project requirements and conditions require otherwise, grid may be used as a support element, subject to coordinating installations with ceiling system installer to ensure the ceiling system installer accounts for the weights of each luminaire and of all luminaires collectively, and installs specially marked and designated ceiling support components.
 - 1. Install ceiling support system rods or wires for each luminaire. Locate not more than 6 inches from luminaire corners.
 - 2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
 - 3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- E. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
- F. Provide wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

- G. Install surface and recessed ceiling luminaires on grid and tile ceilings to agree with module of ceiling either displacing a tile, or unit on center of tile, or centered on grid lines.
- H. Install flush mounted luminaires properly to eliminate light leakage between luminaire frame and finished surface.
- I. Do not locate splice or tap within an arm, stem, or chain. Provide wiring continuous from splice in outlet box of the building wiring system to driving and transformation component terminals in luminaires.
- J. Provide Type AC/MC Cable or wiring in minimum 1/2" diameter flexible metal conduit (with full parity sized green insulated equipment ground wire) for "drops" from building wiring system junction boxes to suspended ceiling mounted luminaires. Limit the length of these "drops" to 72". Install "drops" to luminaires in gypsum board, and similar inaccessible ceiling systems, from identified accessible junction boxes.
- K. Connect luminaires utilized for emergency egress lighting ahead of switching and other controls. The only exceptions to this are photocell-only controls for outdoor emergency egress luminaires.
- L. Provide luminaires and luminaire outlet boxes with hangers to properly support luminaire weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Owner's Representative and review by ceiling installer. Anchor luminaires installed in, or on, suspended ceiling systems in strict compliance with NEC, including advance coordination with the ceiling installer. Support surface mounted luminaires greater than 2 feet in length at a point in addition to the outlet box luminaire stud.
- M. Fasten electrical luminaires and brackets securely to structural supports. Install luminaires level and plumb.
- N. Where special mounting conditions are encountered, such as mounting to rounded columns or similar special circumstances, provide special custom factory-fabricated mounting means (i.e., brackets designed to conform with curvature of rounded columns, or to conform with similar special surfaces).
- O. Provide stems and chains for luminaires as designated by the Owner's Representative where deemed necessary by the Owner's Representative to achieve a functional and neat installation. Contact Owner's Representative to determine pendant, stem, and chain lengths if mounting height is not indicated.
- P. Provide plaster frames, or gypsum board frames, or similar kits for recessed luminaires installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.
- Q. Wear clean white cotton gloves when handling the luminaires reflective and diffusing surfaces. Clean surfaces including dust, finger prints, paint, etc. with a clean dry cheesecloth after interior work has been completed. Remove plastic shipping bags from luminaires only after work in the respective area is complete.
- R. Where applicable, verify that measured illuminance values comply with respective isolux (or equivalent) plot diagram values.
- S. Provide full assembly for luminaires that are shipped with any loose components, regardless of who furnishes the luminaires.

3.2 LIGHTING STANDARDS AND POST LIGHTS

- A. Utilize belt slings or rope (not chain or cable) to protect finishes of poles and standards when raising and setting finished poles and standards.

- B. Provide sufficient space encompassing hand access and cable entrance holes for installation of underground cabling where applicable.
- C. Fasten electrical poles, luminaires and brackets securely to structural supports.
- D. Provide concrete base for each luminaire standard pole. Provide base that is reinforced, and, unless indicated deeper on drawings, of the depth recommended by the manufacturer. Provide galvanized steel washers, nuts and anchor bolts, in diameters, lengths and classes as directed by pole manufacturer.
- E. After ensuring that the poles are plumb, neatly fill the entire space between top of concrete bases and bottom of pole bases with grout. Provide poles with matching factory base covers ("skirts"). This applies even if not specifically indicated on Luminaire Schedule.
- F. Separately-fuse luminaires within the pole-base handholes.

3.3 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform Tests and Inspections.
- B. Tests and Inspections:
 - 1. Inspect, test and adjust components, assemblies, and equipment installations, including connections.
 - 2. Test continuity of each circuit.
 - 3. Test and adjust controls, safeties, operations, etc. as applicable. Replace damaged and malfunctioning controls and equipment.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to emergency source and retransfer to normal.
- D. Installed products, components and accessories will be considered defective if they do not pass tests and inspections. Correct malfunctioning materials on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new materials and retest.
- E. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly.

- B. Make adjustments and perform settings/programming to lighting controls and control systems so that all luminaires are fully operational compliant with design requirements and to the satisfaction of the Owner and Design Professionals.

3.7 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.
- B. Replace components whose interiors have been exposed to water (including condensation) or other liquids prior to Substantial Completion.

3.8 CLEANING

- A. Vacuum dirt and debris, and wipe down components; do not use compressed air to assist in cleaning.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, clean, re-lamp and maintain equipment, devices, controls, instrumentation, and accessories, and to use and reprogram lighting control systems as applicable.

END OF SECTION 26 51 00.00

Submittal Form - 265100.00 - Luminaires

Provide and complete this sheet and submit as a cover sheet for submittals requested within this section.

Electrical Contractor: _____ Electrical Supplier: _____

Electrical Contractor Rep: _____ Electrical Supplier Rep: _____

Electric Contractor Ph. Number: _____ Electric Supplier Ph. Number: _____

Electric Contractor Rep email: _____ Electric Supplier Rep email: _____

Explanation responses to questions below must indicate specific luminaire type comment refers to.

	Yes	No
Luminaire product data sheets are formatted with the manufacturer's representatives' header on each sheet, and include submittals for third party components?	<input type="checkbox"/>	<input type="checkbox"/>

If No, Explain _____

Luminaire submittal table has been filled out completely and is attached with this form, including identification of third party components in Comments area?	<input type="checkbox"/>	<input type="checkbox"/>
---	--------------------------	--------------------------

If No, Explain _____

Manufacturers listed as basis of design or listed equivalent manufacturer?	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

If No, Explain _____

Manufacturer's qualifications meet or exceed those required under quality assurance section within this specification?	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

If No, Explain _____

Submitted luminaires, lamps (sources), ballasts (drivers), and associated components meet all requirements listed within this specification?	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

If No, Explain _____

Manufacturer's warranty meets or exceeds warranty period specified within this spec.?	<input type="checkbox"/>	<input type="checkbox"/>
---	--------------------------	--------------------------

If No, Explain _____

Are all system components referenced in other sections by the same manufacturer, coordinated with this system and included in this submittal (such as occupancy sensors)?	<input type="checkbox"/>	<input type="checkbox"/>
---	--------------------------	--------------------------

If No, Explain _____

Are all lighting related specification sections, including those with lighting control devices or systems, being submitted concurrently with this submittal?	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------

If No, Explain _____

<u>Type</u>	<u>Manufacturer</u>	<u>Series</u>	<u>As Specified (Yes or No)</u>	<u>Comments</u>

SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete walks
 - 2. Concrete ramp
 - 3. Concrete base of unit pavers
 - 4. Raised concrete curbs
 - 5. Flush concrete curbs
- B. Related Requirements:
 - 1. Section 320516 "Site Aggregates" for course aggregate materials for pavement bases and subbases.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Design Mixtures: For each concrete paving mixture, including any bid alternates. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities"
- B. 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.
- C. ACI Publications: Comply with ACI 301 (ACI 301M).
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
 2. Build mockups of each type of concrete paving, including any bid alternatives accepted (if included), in the location and of the size indicated or, if not indicated, build mockups where directed by Owner's Representative and not less than 6' x 6'.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner's Representative specifically approves such deviations in writing.
 4. Approved mockups may become part of the completed Work.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:
 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.
- B. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C 150, white portland cement Type II. [Type V]. [Supplement with the following:]
 - a. Fly Ash: ASTM C 618, Class C
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - 2. Blended Hydraulic Cement: ASTM C 595, Type I, portland-pozzolan cement.
- B. Normal-Weight Aggregates: ASTM C 33, 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 (19 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Water: Potable and complying with ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- 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 concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Monofilament Fibers:
 - 1) Axim Italcementi Group, Inc.; FIBRASOL II P.
 - 2) Euclid Chemical Company (The), an RPM company; Fiberstrand 100, Fiberstrand 150.
 - 3) FORTA Corporation; FORTA ECONO-MONO or FORTA Mighty-Mono.
 - 4) Grace, W. R. & Co. - Conn.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.
 - 6) QC Construction Products; QC FIBERS.

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. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; Caltexol CIMFILM.

- b. BASF Construction Chemicals, LLC; Confilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.
 - g. Euclid Chemical Company (The), an RPM company; Eucobar.
 - h. Kaufman Products, Inc.; VaporAid.
 - i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work may include, but are not limited to, the following:
 - a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Conspec by Dayton Superior; D.O.T. Resin Cure or DSSCC Clear Resin Cure.
 - d. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - e. Edoco by Dayton Superior; DSSCC Clear Resin Cure or Resin Emulsion Cure V.O.C. (Type I).
 - f. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; AQUA KURE - CLEAR.
 - i. L&M Construction Chemicals, Inc.; L&M CURE R.
 - j. Meadows, W. R., Inc.; 1100-CLEAR SERIES.
 - k. Nox-Crete Products Group; Resin Cure E.
 - l. SpecChem, LLC; PaveCure Rez.
 - m. Symons by Dayton Superior; Resi-Chem Clear.
 - n. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
 - o. TK Products, Division of Sierra Corporation; TK-2519 WB or TK-2519 DC WB.
 - p. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.
- F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.
- 1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anti-Hydro International, Inc.; A-H Curing Compound #2 WP WB.

- b. ChemMasters; Safe-Cure 2000.
- c. Conspec by Dayton Superior; D.O.T. Resin Cure White or DSSCC White Resin Cure.
- d. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
- e. Edoco by Dayton Superior; Resin Emulsion Cure V.O.C. (Type II).
- f. Euclid Chemical Company (The), an RPM company; Kurez VOX White Pigmented.
- g. Kaufman Products, Inc.; Thinfilm 450.
- h. Lambert Corporation; AQUA KURE - WHITE.
- i. L&M Construction Chemicals, Inc.; L&M CURE R-2.
- j. Meadows, W. R., Inc.; 1100-WHITE SERIES.
- k. SpecChem, LLC; PaveCure Rez White.
- l. Symons by Dayton Superior; Resi-Chem White.
- m. Vexcon Chemicals Inc.; Certi-Vex Enviocure White 100.

2.7 RELATED MATERIALS

- A. Expansion and isolation joint filler strips: ASTM D1751, asphalt-saturated cellulosic fiber.

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.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi (27.6 MPa)
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
 - 3. Slump Limit: [4 inches (100 mm)] , plus or minus 1 inch (25 mm).
- 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: 4-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 - 2. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 - 3. Air Content 3-1/2 percent plus or minus 1.5 percent for 3/4-inch (19-mm) 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, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, and/or plasticizing and retarding admixture in concrete as required for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concretes exposed to deicing chemicals as follows:
1. Fly Ash or Pozzolan: 25 percent.
 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. (0.90 kg/cu. m).
- H. 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.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For concrete batches larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete pavements to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 - 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Division 31 Section "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

- 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 (50-mm) 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 (38 mm) into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) 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.
- F. Do not add water to fresh concrete after testing.
- G. 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.
- H. 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.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Owner's Representative.
- J. Screed paving surface with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

- L. Slip-Form Paving: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. 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.
- M. When adjoining pavement is placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- N. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- O. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. 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 (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 DETECTABLE WARNING INSTALLATION

- A. Blockouts: Form blockouts in concrete for installation of detectable concrete paving units specified elsewhere in the specifications.
 1. Tolerance for Opening Size: Plus 1/4 inch (6 mm)

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 (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm) and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 PAVING TOLERANCES

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

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.
11. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

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

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to Owner's Representative, 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 Owner's Representative 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 Owner's Representative.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.12 REPAIRS 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 Owner's Representative.
- B. Drill test cores, where directed by Owner's Representative, 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

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Hot-applied joint sealants.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, Samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 4. Testing will not be required if joint-sealant manufacturers submit joint-preparation data that are based on previous testing, not older than 24 months, of sealant products for compatibility with and adhesion to joint substrates and other materials matching those submitted.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.5 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafco Inc; RoadSaver Silicone.
 - b. Dow Corning Corporation; 888.
 - c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafco Inc; RoadSaver Silicone SL.
 - b. Dow Corning Corporation; 890-SL.
 - c. Pecora Corporation; 300 SL.
- C. Multicomponent, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Meadows, W.R.,Inc; Pourthane NS.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafco Inc; Superseal 444/777
- B. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Types I, II, and III.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Meadows, W.R.,Inc; Sealtight Hi-Spec
 - b. Right Pointe; D3405 Hot Applied Sealant

2.4 JOINT SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint- sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 - 1. Remove excess joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

3.5 PROTECTION

- A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVING-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving.
 - 1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single-component, nonsag, silicone joint sealant, Single-component, self-leveling, silicone joint sealant.
 - 3. Urethane Joint Sealant for Concrete: Multicomponent, pourable, traffic grade.
 - 4. Hot Applied Joint Sealant for Concrete: single-component joint sealant.
 - 5. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving.
 - 1. Joint Location:
 - a. Joints between concrete and asphalt paving.
 - b. Joints between concrete curbs and asphalt paving.
 - c. Other joints as indicated.
 - 2. Hot Applied Joint Sealant: single-component joint sealant.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 321373

SECTION 32 14 00 - UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete pavers set in bituminous setting bed
 - 2. Concrete detectable warning pavers
- B. Related Requirements:
 - 1. Section 321313 "Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.

1.3 ACTION SUBMITTALS

- A. Product Data: For materials other than water and aggregates.
- B. Product Data: For the following:
 - 1. Pavers (all types).
 - 2. Bituminous setting materials.
 - 3. Edge restraints.
- C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- D. Samples for Verification: For full-size units of each type of unit paver indicated.
- E. Shop Drawings: for Signature Plaza Area indicating layout of pavers, dimensions, cuts, and colors for approval by landscape architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
- B. Samples: For each type of paver blend or type indicated provide samples for verification that include sufficient numbers of paver units to demonstrate the full range of colors.

1.5 QUALITY ASSURANCE

A. Mockups

1. After sample panel approval but before beginning construction, construct full-sized mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, surface quality, and execution.
2. Prepare mockups sufficiently in advance of the start of installation to allow time for review including construction and review of multiple mockups if required to demonstrate compliance with requirements.
3. Construct mockup of each paver type listed in the drawings and specifications. Mock ups should include patterns and mix of color blends. Construct mock ups to the following sizes:
 - a. Types 1 full size units – 4' X 4'
4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed work.
5. If Landscape Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.
6. Approved mockups may not become part of the completed Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.
- E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.7 FIELD CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Bituminous Setting Bed:
 1. Install bituminous setting bed only when ambient temperature is above 40 deg F (4 deg C) and when base is dry.
 2. Apply asphalt adhesive only when ambient temperature is above 50 deg F (10 deg C) and when temperature has not been below 35 deg F (2 deg C) for 12 hours immediately before application. Do not apply when setting bed is wet or contains excess moisture.

3. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Paver design for each paving area is based upon the manufacturers, products, sizes, and colors indicated below. Other equal products and manufacturers must be approved by Landscape Architect.
- B. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 CONCRETE PAVERS

- A. Type 1-.

2.3 BITUMINOUS SETTING-BED MATERIALS

- A. Primer for Base: ASTM D 2028/D 2028M, cutback asphalt, grade as recommended by unit paver manufacturer.
- B. Fine Aggregate for Setting Bed: ASTM D 1073, No. 2 or No. 3.
- C. Asphalt Cement: ASTM D 3381/D 3381M, Viscosity Grade AC-10 or Grade AC-20.
- D. Neoprene-Modified Asphalt Adhesive: Paving manufacturer's standard adhesive consisting of oxidized asphalt combined with 2 percent neoprene and 10 percent long-fibered mineral fibers containing no asbestos.

- E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

2.4 BITUMINOUS SETTING-BED MIX

- A. Mix bituminous setting-bed materials at an asphalt plant in approximate proportion, by weight, of 7 percent asphalt cement to 93 percent fine aggregate unless otherwise indicated. Heat mixture to 300 deg F (149 deg C).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
- C. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive course for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Minimum Qualifications: 5-years of experience working on similar project installations.
- B. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- C. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- D. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
 - 1. For concrete pavers, a block splitter may be used.

- E. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.
- F. Joint Pattern: As indicated on the drawings.
- G. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
 - 2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch (25 mm) below top edge.

3.4 BITUMINOUS SETTING-BED APPLICATIONS (concrete detectable warning pavers)

- A. Apply primer to concrete slab or binder course immediately before placing setting bed.
- B. Prepare for setting-bed placement by locating 3/4-inch- (19-mm-) deep control bars approximately 11 feet (3.3 m) apart and parallel to one another, to serve as guides for striking board. Adjust bars to subgrades required for accurate setting of paving units to finished grades indicated.
- C. Place bituminous setting bed where indicated, in panels, by spreading bituminous material between control bars. Spread mix at a minimum temperature of 250 deg F (121 deg C). Strike setting bed smooth, firm, even, and not less than 3/4 inch (19 mm) thick. Add fresh bituminous material to low, porous spots after each pass of striking board. After each panel is completed, advance first control bar to next position in readiness for striking adjacent panels. Carefully fill depressions that remain after removing depth-control bars.
 - 1. Roll setting bed with power roller to a nominal depth of 3/4 inch (19 mm). Adjust thickness as necessary to allow accurate setting of unit pavers to finished grades indicated. Complete rolling before mix temperature cools to 185 deg F (85 deg C).
- D. Apply neoprene-modified asphalt adhesive to cold setting bed by squeegeeing or troweling to a uniform thickness of 1/16 inch (1.6 mm). Proceed with setting of paving units only after adhesive is tacky and surface is dry to touch.
- E. Place pavers carefully by hand in straight courses, maintaining accurate alignment and uniform top surface. Protect newly laid pavers with plywood panels on which workers can stand. Advance protective panels as work progresses, but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers. If additional leveling of paving is required, and before treating joints, roll paving with power roller after sufficient heat has built up in the surface from several days of hot weather.
- F. Joint Treatment: Place unit pavers with hand-tight joints. Fill joints by sweeping sand over paved surface until joints are filled. Remove excess sand after joints are filled.

3.5 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
- D. Remove all mock ups at the completion of construction.

END OF SECTION 321400

SECTION 32 91 13 - SOIL PREPARATION

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 planting soils specified by composition of the mixes.
- B. Related Requirements:
 - 1. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 2. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- H. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- I. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

- J. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- K. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- L. SSSA: Soil Science Society of America.
- M. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- N. 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.
- O. 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.
- P. USCC: U.S. Composting Council.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.
 - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.

- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
 - 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.9 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by Contractor under the direction of the testing agency.
 - 1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
 - 2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
 - 3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
 - 4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.10 TESTING REQUIREMENTS

- A. For each unamended soil type, furnish soil analysis and a written report by a qualified soil- testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange; sodium absorption ratio; deleterious material; pH; and mineral and plant nutrient content of the soil.
 - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60

2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Landscape Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
3. Report suitability of tested soil for turf growth and shrub/perennial growth.
 - a. Based on test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus and potash nutrients and soil amendments to be added to produce satisfactory planting soil for healthy, viable plant growth
 - b. Report presence of problem salts, minerals, or heavy metals including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Do not move or handle materials when they are wet or frozen.
 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- A. Planting-Soil for Turfgrass Areas: Existing, on-site surface soil, with the duff layer, if any, retained during excavation process; and stockpiled on-site; modified to produce viable planting soil. Supplement existing topsoil with imported topsoil when quantities are insufficient. Blend topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil for planting bed areas:
 1. Ratio of Loose Compost to Soil: 1:3 by volume.
 2. Weight of Lime per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.

3. Weight of Sulfur: per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.
 4. Weight of Commercial Fertilizer per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.
- B. Planting-Mix for Planting Bed Areas : Existing, on-site surface soil, with the duff layer, if any, retained during excavation process; and stockpiled on-site; modified to produce viable planting soil. Supplement existing topsoil with imported topsoil when quantities are insufficient. Blend topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil for planting bed areas:
1. Ratio of Loose Compost to Soil: 1:3 by volume.
 2. Ratio of Loose Sphagnum Peat to Soil: 1:3 by volume.
 3. Weight of Lime per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.
 4. Weight of Sulfur: per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.
 5. Weight of Slow Release Fertilizer per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
1. Reaction: pH of 5.5 to 8.
 2. Soluble-Salt Concentration: 5 - 10 dS/m.
 3. Moisture Content: 35 to 55 percent by weight.
 4. Organic-Matter Content: 50 to 60 percent of dry weight.
 5. Particle Size: Minimum of 98 percent passing through a 1-inch sieve.
 6. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 TURF AREAS PREPARATION

- A. Remove existing grass and weeds from areas to receive turf application and legally dispose of off Owner's property. Where weeds are extensive, treat with selective herbicide.
- B. Loosen subgrade to a minimum depth of 8 inches. Remove stones larger than 1 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Thoroughly blend turf area planting soil off-site or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend in place.
 - 1. Delay mixing fertilizer with planting soil if planting will not proceed within 3 days.
 - 2. Mix lime with dry soil before mixing fertilizer.
- D. Spread turfgrass area planting soil to total depth of 6 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Spread approximately $\frac{1}{2}$ the thickness of unamended soil, amendments and fertilizer over loosened subgrade. Mix thoroughly into the top 4 inches of subgrade. Spread remainder of planting soil.
- E. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.
- F. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PLANTING BED AREA PREPARATION

- A. Remove existing grass and weeds from areas to receive planting bed application and legally dispose of off Owner's property. Where weeds are extensive, treat with selective herbicide.
- B. Loosen subgrade to a minimum depth of 12 inches. Remove stones larger than 1 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Thoroughly blend planting bed area planting soil off-site or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend in place.
 - 1. Delay mixing fertilizer with planting soil if planting will not proceed within 3 days.
 - 2. Mix lime with dry soil before mixing fertilizer.
- D. Spread planting bed area planting soil to total depth of 12 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Spread approximately $\frac{1}{2}$ the thickness of unamended soil, amendments and fertilizer over loosened subgrade. Mix thoroughly into the top 4 inches of subgrade. Spread remainder of planting soil.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- F. Application of Mycorrhizal Fungi: At time directed by Landscape Architect, broadcast dry product uniformly over prepared soil at application rate recommended by Manufacturer.

3.4 PROTECTION

- A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- B. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Landscape Architect and replace contaminated planting soil with new planting soil.

3.5 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

END OF SECTION 329113

SECTION 32 92 00 - TURF AND GRASSES

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. Sodding.
- B. Related Requirements:
 - 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Three years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Lawncare Manager.
 - c. Landscape Industry Certified Lawncare Technician.
 - 5. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

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

- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
 - 1. Spring Planting: April 1- June 15.
 - 2. Fall Planting: September 1 – December 15.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. 70%-80% Turf-type tall Fescue, a minimum of two cultivars.
 - 2. 20%-30% Indiana bluegrass (*Poa pratensis*), a minimum of three cultivars.

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.4 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.
 - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moistening prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.5 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow turf to a height of 1-1/2 to 2 inches.

- D. Turf Post-fertilization: Apply commercial fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.6 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 95 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.7 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.8 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.9 MAINTENANCE SERVICE

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

1. Sodded Turf: 30 days from date of planting inspection_

END OF SECTION 329200

SECTION 32 93 00 – PLANTS

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. Plants.
- 2. Tree stabilization.
- 3. Landscape steel edge.
- 4. Organic mulch.
- 5. Crushed limestone surface.

- B. Related Requirements:

- 1. Section 329113 "Soil Preparation" for preparation of planting areas and composition of planting soils
- 2. Section 329200 "Turf and Grasses" for turf (lawn)

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- E. Finish Grade: Elevation of finished surface of planting soil.
- F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and

molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

- G. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- H. Planting Area: Areas to be planted.
- I. Planting Mix for Planting Bed Areas: Existing, on-site soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.
- J. Backfill Mixture: Existing, on-site soil that has been modified with soil amendments and perhaps fertilizers to backfill planting excavations.
- K. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- L. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- M. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- N. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before installing sod areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 PREINSTALLATION MEETINGS

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

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale

rod or other measuring device in each photograph. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

- B. Samples for Verification: For each of the following:
1. Organic Mulch: 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 2. Crushed Limestone Surface: 2 lb of crushed limestone in sealed plastic bags labeled with source. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.
 3. Edging Materials and Accessories: 12" length to verify color and size selected.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Material Test Reports: For existing, native surface and imported topsoil.
- E. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."

3. Installer's Project Manager: Require Installer's project manager to have the following credentials and be available to the project as follows:
 - a. Hold a minimum of a four-year bachelor degree in the field of landscape contracting, landscape management, agronomy, landscape architecture or horticulture or be a Landscape Industry Certified Manager from the Professional Landcare Network
 - b. Be available to respond to inquiries from the Owner's Representative.
 4. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - a. Hold a minimum of a two-year degree in the field of landscape contracting, landscape management, agronomy, or horticulture or be a Landscape Industry Certified Technician
 - b. Be present on the project site a minimum of 85% of the time the Installer's crew is present on site.
 5. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Owner's Representative or Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Owner's Representative and Landscape Architect of sources of planting materials seven days in advance of delivery to site.
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.
- E. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- G. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 2. Do not remove container-grown stock from containers before time of planting.
 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
1. Spring Planting: March 15th – April 30th.
 2. Fall Planting: September 1 – December 31.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization edgings and tree grates.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 2. Warranty Periods: From date of planting inspection by Owner's Representative.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

2.2 FERTILIZERS

- A. Slow Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Shredded hardwood.
 - 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 - 3. Color: Natural.

2.4 BACKFILL PLANTING MIXTURE

- A. Backfill planting mixture: Existing, on-site surface soil, with the duff layer, if any, retained during excavation process; and stockpiled on-site; modified to produce viable planting soil. Supplement existing topsoil with imported topsoil when quantities are insufficient. Blend topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil for planting bed areas:
 - 1. Ratio of Loose Compost to Soil: 1:3 by volume.
 - 2. Ratio of Loose Sphagnum Peat to Soil: 1:3 by volume.
 - 3. Weight of Lime per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.
 - 4. Weight of Sulfur: per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.
 - 5. Weight of Slow Release Fertilizer per 1000 sq. ft.: Amount, if any, in soil report from a qualified soil-testing laboratory.

2.5 CRUSHED LIMESTONE SURFACE

- A. Crushed limestone for pedestrian plazas shall be a clean mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D422:

U.S. Standard Sieve Size	Percent Passing, by Weight
½"	99
¼"	60-80
#4	45-75
#10	30-50
#40	18-32
#200	22 Max.
Sand Equivalent	15 Min.

2.6 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.7 TREE-STABILIZATION MATERIALS

- A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

- B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.

2. Wood Screws: ASME B18.6.1.

2.8 LANDSCAPE STEEL EDGE

- A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. Russell, J. D. Company (The).
 - d. Sure-loc Edging Corporation.
 2. Edging Size: 3/16 inch thick by 4 inches deep.
 3. Stakes: Tapered steel, a minimum of 12 inches long.
 4. Accessories: Standard tapered ends, corners, and splicers.
 5. Finish: Manufacturer's standard paint.
 - a. Paint Color: Black.

2.9 MISCELLANEOUS PRODUCTS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- B. Burlap: Non-synthetic, biodegradable.
- C. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.

3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to manufacturer's written recommendations.

3.4 EXCAVATION FOR TREES

- A. Planting Pits and Trenches: Excavate circular planting pits.
1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

2. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 6. Maintain supervision of excavations during working hours.
 7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 8. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as planting soil.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Backfill: Planting soil.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.

- D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
 - 1. Backfill: Planting soil.
 - 2. Carefully remove root ball from container without damaging root ball or plant.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 - 1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - 2. Upright Staking and Tying: Stake trees with two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet high and up to 4 inches in caliper. Space stakes equally around trees.
 - 3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 - 4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

- B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated.
 - 1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
 - a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
 - b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - c. Support trees with guy cable, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - d. Attach flags to each guy wire, 30 inches above finish grade.
 - e. Paint turnbuckles with luminescent white paint.

3.8 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing or as indicated on the drawings.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Multi-stem Trees in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 24-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3. Gravel Mulch: Spread weed barrier fabric over entire area to receive gravel much. Overlap sections at least 6 inches and pin at the edges according to manufacturer's written recommendations. Apply 3-inch average thickness of gravel mulch over areas shown on the plan, and finish level with adjacent finish grades.

3.10 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.

3.11 CRUSHED LIMESTONE SURFACE INSTALLATION

- A. Install where and as detailed on the Drawings. Depth shown on Drawings is measured after compaction. Treat crushed limestone plaza surface areas with pre-emergent herbicide.

3.12 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.13 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.14 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size as those being replaced for each tree of 4 inches or smaller in caliper size.
 - 2. Species of Replacement Trees: Same species being replaced.

3.15 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.16 MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Maintenance Period: Sixty days from date of Substantial Completion.
- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: Sixty days from date of Substantial Completion.

END OF SECTION 329300