

PROJECT MANUAL

**MARKHAM STREET WATER QUALITY
DEMONSTRATION PROJECT**

CONWAY, ARKANSAS

DOCUMENTS FOR BID/PERMIT
(ISSUE FOR BID/PERMIT)

VOLUME 1

Sections 00-01

swa

LANDSCAPE ARCHITECT
2001 IRVING BOULEVARD, SUITE 157
DALLAS, TX 75207

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MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 000100

PROJECT TITLE PAGE

PROJECT MANUAL

**CONSTRUCTION DOCUMENT ISSUE SET
FOR BID AND PERMIT USE**

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

City of Conway, Arkansas (Home Rule Municipality) – Owner
(Referenced as “Client” or “Owner” in these documents)

Owner Project Number/Reference:

City of Conway, Arkansas

Prime Consultant – Landscape Architect

SWA Group
Landscape Architect Project Number: CAKT 001

2001 Irving Boulevard, Suite 157
Dallas, Texas 75207
Phone: 214.954.0016
Web Site: www.swagroup.com

Issued: January 11, 2021

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END OF SECTION

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

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MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SEAL PAGE – LANDSCAPE



January 11, 2021

SPECIFICATIONS

The following section(s) listed are provided by the Landscape Architect or Landscape Architect firm as a part of the contract documents and is as indicated covered under the aforementioned seal and signature of the individual noted, whom has affiliation with the landscape architectural company.

040513	Site Masonry Mortaring and Grouting
044223	Stone Blocks, Boulders and Slabs
055013	Site Miscellaneous Metal Fabrications
055214	Site Guard and Hand Railing
062013	Site Finish Carpentry
067300	Site Composite Decking
129300	Site Furnishings
265613	Site Landscape Lighting
311316	Selective Tree Trimming
312219	Landscape and Fine Grading
321316	Landscape Architectural Cement Concrete Paving
321323	Cast-in-Place Concrete for Landscape Elements
321500	Aggregate Surfacing
323236	Gabion Walls
328400	Site Irrigation System
329113	Soil Preparation
329200	Lawns and Grasses
329300	Trees, Shrubs, Vines and Groundcovers
329400	Landscape Planting Accessories
329813	Landscape Establishment Period

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
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The following sections are provided by Landscape Architect or its sub-consultants as a performance-based design and build specification only. These sections are not covered under the sealed sections indicated above.

No Sections Provided Herein

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MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 000103

SEAL PAGE – CIVIL ENGINEER



SPECIFICATIONS

The following sections listed are provided by the Civil Engineer of record as part of the contract documents. The specifications sections listed below are only covered under this seal and signature.

024119 – Selective Demolition

033000 – Cast-In-Place Concrete

221113 – Facility Water Distribution Piping

311000 – Site Clearing

312000 – Earth Moving

312319 – Dewatering

321443 – Porous Unit Paving

334200 – Stormwater Conveyance

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SECTION 000110

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 SECOND COLUMN: SPECIFICATION SECTION NUMBER
 THIRD COLUMN: SPECIFICATION SECTION TITLE
 FOURTH COLUMN: REVISION NUMBER ("0" INDICATES ORIGINAL)
 FIFTH COLUMN: DATE OF LATEST SECTION
 SIXTH COLUMN: SPECIFICATION AUTHOR

VOLUME 01

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

<input checked="" type="checkbox"/>	00 01 00	Project Title Page	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 01 01	Landscape Architectural Seals Page	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 01 03	Civil Engineer Seals Page	0	01-11-2021	G R Smith
<input checked="" type="checkbox"/>	00 01 10	Specification Table of Contents	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 11 16	Invitation to Bid	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 21 13	Instructions to Bidders	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 25 13	Pre-Bid Meeting	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 31 19	Existing Conditions Information	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 41 43	Unit Price Schedule	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 42 43	Proposal Form	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 43 13	Bid Bond	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 51 00	Notice of Award	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 52 00	Agreement Forms	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 60 00	Project Forms	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	00 61 13	Performance and Payment Bond Form	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 72 00	General Conditions	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 73 00	Supplementary Conditions	0	01-11-2021	CITY OF CONWAY
<input checked="" type="checkbox"/>	00 74 00	Special Conditions	0	01-11-2021	CITY OF CONWAY

DIVISION 01 – GENERAL REQUIREMENTS

<input checked="" type="checkbox"/>	01 10 00	Summary of Work	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 25 00	Substitution Procedures	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 26 00	Contract Modification Procedures	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 31 00	Project Management and Coordination	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 32 00	Construction Progress Documentation	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 33 00	Submittal Procedures	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 40 00	Quality Requirements	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 42 00	References	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 45 29	Testing Laboratory Services	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 50 00	Temporary Facilities and Controls	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 56 39	Temporary Tree and Plant Protection	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 60 00	Product Requirements	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 73 00	Execution Requirements	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 73 29	Cutting and Patching	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 74 19	Construction Waste Management and Disposal	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 77 00	Closeout Procedures	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 78 23	Operation and Maintenance Data	0	01-11-2021	SWA

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<input checked="" type="checkbox"/>	01 78 39	Project Record Documents	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	01 79 00	Demonstration and Training	0	01-11-2021	SWA

VOLUME 02

DIVISION 02 – EXISTING CONDITIONS

<input checked="" type="checkbox"/>	02 41 19	Selective Demolition	0	01-11-2021	G R Smith
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DIVISION 03 – CONCRETE

<input checked="" type="checkbox"/>	03 30 00	Cast-In-Place Concrete	0	01-11-2021	G R Smith
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DIVISION 04 – MASONRY

<input checked="" type="checkbox"/>	04 05 13	Site Masonry Mortaring and Grouting	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	04 42 23	Stone Blocks, Boulders and Slabs	0	01-11-2021	SWA

DIVISION 05 – METALS

<input checked="" type="checkbox"/>	05 50 13	Site Miscellaneous Metal Fabrications	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	05 52 14	Site Guard and Hand Railings	0	01-11-2021	SWA

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

<input checked="" type="checkbox"/>	06 20 13	Site Finish Carpentry	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	06 73 00	Site Composite Decking	0	01-11-2021	SWA

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

NOT USED

DIVISION 08 – OPENINGS

NOT USED

DIVISION 09 – FINISHES

NOT USED

DIVISION 10 – SPECIALTIES

NOT USED

DIVISION 11 – EQUIPMENT

NOT USED

DIVISION 12 – FURNISHINGS

<input checked="" type="checkbox"/>	12 93 00	Site Furnishings	0	01-11-2021	SWA
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DIVISION 13 – SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 – CONVEYING EQUIPMENT

NOT USED

DIVISION 21 – FIRE SUPPRESSION

NOT USED

DIVISION 22 – PLUMBING

<input checked="" type="checkbox"/>	22 11 13	Facility Water Distribution Piping	0	01-11-2021	G R Smith
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DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

NOT USED

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DIVISION 25 – INTEGRATED AUTOMATION

NOT USED

DIVISION 26 – ELECTRICAL

<input checked="" type="checkbox"/>	26 56 13	Site Landscape Lighting	0	01-11-2021	SWA
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DIVISION 27 – COMMUNICATIONS

NOT USED

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

NOT USED

DIVISION 31 – EARTHWORK

<input checked="" type="checkbox"/>	31 10 00	Site Clearing	0	01-11-2021	G R Smith
<input checked="" type="checkbox"/>	31 13 16	Selective Tree Trimming	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	31 20 00	Earth Moving	0	01-11-2021	G R Smith
<input checked="" type="checkbox"/>	31 22 19	Landscape and Fine Grading	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	31 23 19	Dewatering	0	01-11-2021	G R Smith

DIVISION 32 – EXTERIOR IMPROVEMENTS

<input checked="" type="checkbox"/>	32 13 16	Landscape Architectural Cement Concrete Paving	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 13 23	Cast-In-Place Concrete for Landscape Elements	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 14 43	Porous Unit Paving	0	01-11-2021	G R Smith
<input checked="" type="checkbox"/>	32 15 00	Aggregate Surfacing	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 32 36	Gabion Walls	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 84 00	Site Irrigation Systems	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 91 13	Soil Preparation	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 92 00	Lawns and Grasses	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 93 00	Trees, Shrubs, Vines and Groundcovers	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 94 00	Landscape Planting Accessories	0	01-11-2021	SWA
<input checked="" type="checkbox"/>	32 98 13	Landscape Establishment Period	0	01-11-2021	SWA

DIVISION 33 – UTILITIES

<input checked="" type="checkbox"/>	33 42 00	Stormwater Conveyance	0	01-11-2021	G R Smith
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DIVISION 34 – 48

NOT USED

END OF SECTION

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SECTION 001116

INVITATION TO BID

Sealed bids addressed to the **City of Conway, Arkansas**, will be received at the City of Conway Transportation Department, 100 E Robins St, Conway, Arkansas 72032, until **10:00 am, Wednesday, March 10, 2021**, for the construction of a Water Quality Demonstration Project (Park) bounded by Markham Street, Willow Street (unconstructed), Spencer Street and Garland Street in Conway, Arkansas. The sealed bids will then be opened and publicly read aloud. The work includes all labor, material, and equipment required to perform the work as described in the project plans and specifications.

Contact Person

If there are any questions regarding the RFP, please contact Jamie Brice, Purchasing Manager @ jamie.brice@conwayarkansas.gov.

During the current Health Pandemic, Firms are encouraged to mail or drop off proposals in the drop box in front of Conway City Hall:



Request for Qualifications will be opened publicly. Proposals will be opened publicly. Vendors are encouraged to attend the public opening online via the following link: <https://conwayarkansas.gov/bids/>.

The City of Conway reserves the right to reject any and all submittals received or any portions thereof.
The City of Conway is an equal opportunity employer.
The City of Conway is not responsible for lost or misguided submittals.

Proposals shall be accompanied by a cashier's or certified check upon a national or state bank in an amount not less than five percent (5%) of the total maximum bid price payable without recourse to **City of Conway, Arkansas**, or a bid bond in the same amount from a reliable surety company, as a guarantee that the Bidder will enter into a contract and execute performance and payment bonds within ten (10) days after notice of award of Contract to him. The notice of award of Contract shall be given by the Owner within thirty (30) days following the opening of bids.

The successful Bidder must furnish a performance bond and a separate payment bond upon the forms provided herein in the amount of one hundred percent (100%) of the contract price from an approved surety company holding a permit from the State of Arkansas to act as surety, or other surety or sureties acceptable to the Owner.

The attention of bidders is called to the fact that Act 150 of 1965 (as amended), Arkansas Statutes, states that a Contractor must be licensed by the State Licensing Board for Contractors before he may undertake work when the cost thereof in Arkansas is Twenty Thousand Dollars (\$20,000.00) or more.

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Plans, specifications, proposal forms, and other contract documents may be obtained from the Mayor's Office, Conway City Hall, 1201 Oak Street, Conway, Arkansas. Electronic files can be obtained via email request to Jamie.brice@cityofconway.org. There will be a \$35 charge for a hard copy set of plans and specifications; cash, check, or credit card will be accepted. Please visit our website at www.cityofconway.org for all updated project information.

City of Conway, Arkansas
Bart Castleberry, Mayor

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
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SECTION 002113

INSTRUCTION TO BIDDERS

PART 1 - GENERAL

1.1 PREPARATION OF BID

- A. Each bid must be submitted on the prescribed Proposal form (SECTION 00 42 43) of these specifications. The blank space must be filled in legibly with ink. In case of discrepancy between written words and figures, the written words shall govern. Erasures or other corrections on the Proposal form shall be initialed by the signer of the bid. All bids must be signed in ink by an individual authorized to bind the Bidder. All bids must be regular in every respect and no interlineation, excisions or special conditions shall be made or included in the Proposal by the bidder.
- B. No bid will be considered which covers only a part of the work. A conditional bid will not be considered.
- C. The Unit Price Schedule (bid form) shall not be detached, but shall be submitted in the original binding as furnished by the Engineer. Submission must be at the place, and at or prior to the time specified in the Advertisement for Bids.
- D. Each bid must be submitted in a sealed envelope clearly marked on the outside that it contains a bid for the **MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT** and with the hour and date of bid opening shown thereon. The name, address, and Arkansas Contractor's License Number of the Bidder shall appear in the upper left hand corner of the envelope. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope properly addressed as noted in SECTION 00 11 16 - INVITATION TO BID, of these specifications.

1.2 INTERPRETATIONS AND ADDENDA

- A. No oral interpretation will be made to any Bidder as to the meaning of the Contract Documents or any part thereof. Every request for such an interpretation shall be made in writing to City Engineer, 100 East Robins Street Conway, Arkansas 72032. Any inquiry received 48 hours prior to the opening of bids will be given consideration. Every interpretation made to a Bidder will be in the form of an Addendum to the contract Documents, and when issued, will be posted on the city of Conway's website at www.cityofconway.org at least twenty-four (24) hours before bids are opened. All such Addenda shall become part of the Contract and all Bidders shall be bound by such Addenda, whether or not received by the Bidders.

1.3 INSPECTION OF SITE

- A. Each Bidder shall visit the site of the proposed work and fully acquaint himself with the existing conditions there relating to construction and labor, and shall fully inform himself as the facilities involved, and the difficulties and restrictions attending the performance of the Contract. The Bidder shall thoroughly examine and familiarize himself with the Plans, Technical Specifications, and other Contract Documents. The Contractor by the execution of the Contract shall not be relieved of any obligation under it due to his failure to receive or examine any form or legal instrument or to visit the site and acquaint himself with the conditions there existing and the Owner will be justified in rejecting any claim based on facts regarding which he should have been on notice as a result thereof.

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1.4 BID GUARANTY

- A. The bids must be accompanied by a Bid Guaranty which shall not be less than five percent (5%) of the amount of the bid. At the option of the Bidder, the guaranty may be a certified check, or may be a bid bond substantially in the form attached. No bid will be considered unless it is accompanied by the required guaranty. Certified check must be payable to the order of City of Conway, Arkansas. Cash deposits will not be accepted. The Bid Guaranty shall insure the execution of the Agreement and the furnishing of the surety bond or bonds by the successful Bidder, all as required by the Contract Documents.
- B. Certified check, or bid bonds, of unsuccessful Bidders, will be returned upon request as soon as feasible after the opening of the bids.

1.5 COLLUSION; SUBCONTRACTS

- A. A Bidder submitting a Proposal to the Owner for the work contemplated by the Documents on which bidding is based shall not collude with any other person, firm, or corporation in regard to any bid submitted.
- B. Before executing any subcontract, the successful Bidder shall submit the name of any proposed Subcontractor for prior approval of the Owner.

1.6 STATEMENT OF BIDDER'S QUALIFICATIONS

- A. Each Bidder shall upon request of the Owner submit on the form furnished for that purpose (a copy of which is included in the Contract Documents), a statement of the Bidder's qualifications, his experience record in construction of work similar to that which here is involved, and his organization and equipment available for the work contemplated; and when specifically requested by the Owner, a detailed financial statement. The Owner shall have the right to take such steps as it deems necessary to determine the ability of the Bidder to perform his obligations under the Contract and the Bidder shall furnish the Owner all such information and data for this purpose as it may request. The right is reserved to reject any bid where an investigation of the available evidence or information does not satisfy the Owner that the Bidder is qualified to carry out properly the terms of the Contract.

1.7 TIME FOR RECEIVING BIDS

- A. A bid received prior to the advertised hour of opening will be kept securely, and will remain sealed until the hour of opening. The officer whose duty it is to open them will decide when the specified time has arrived, and any bid received subsequent to that time will be returned unopened.

1.8 OPENING OF BIDS

- A. At the time and place fixed for the opening of bids, the Owner first will cause the bid guarantees to be checked as stipulated above. The Owner then will cause the qualified bids to be opened and publicly read aloud, irrespective of any irregularities therein. Bidders and other persons properly interested may be present, in person or by representative.

1.9 WITHDRAWAL OF BIDS

- A. Bids may be withdrawn on written request if the request is received prior to the time fixed for the opening of bids.

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1.10 AWARD OF CONTRACT; REJECT OF BIDS

- A. The Contract will be awarded to the responsible Bidder submitting the lowest total bid complying with the conditions of the Notice to Contractors and other parts of these Contract Documents. The Bidder to whom the award is made will be notified at the earliest possible date. The Owner, however, reserves the right to reject any or all bids and to waive any informality in bids received whenever such rejection or waiver is in its interests.
- B. The Owner reserves the right to consider as unqualified to do the work any Bidder who does not habitually perform with his own forces the major portions of such work as it is involved in construction of these improvements.

1.10 EXECUTION OF AGREEMENT; PERFORMANCE AND PAYMENT BOND

- C. Subsequent to the award and within ten days after the prescribed forms are presented for signature, the successful Bidder shall execute and deliver to the Owner an Agreement in the form included in the Contract Documents in such number of copies as the Owner may require.
- D. Having satisfied all conditions of award as set forth elsewhere in these Documents, the successful Bidder shall, within the period specified above, furnish a surety bond in a penal sum not less than the amount of the Contract as awarded, as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature, including utility and transportation services employed or used by him in performing the work. Such bond shall be as included in the Contract Documents and shall bear the same date as, or a date subsequent to, that of the Agreement. The current power of attorney for the person who signs for any surety company shall be attached to such bond.
- E. The failure of the successful Bidder to execute such Agreement and to supply the required bond or bonds within ten (10) days after the prescribed forms are presented for signature, or within such extended period as the Owner may grant, based upon reasons determined sufficient by the Owner, shall constitute a default, and the Owner may either award the Contract to the next lowest responsible Bidder or re-advertise for bids.

1.11 BONDS AND INSURANCE

- A. Attention of Bidders is called to Act 82 of the 1935 Acts of the Arkansas General Assembly, which requires that all bid bonds, performance bonds, labor bonds, employer's liability insurance, public liability insurance, workmen's collective insurance, and property damage insurance must be secured through resident agents of Arkansas.
- B. All companies furnishing bid bonds and performance bonds shall appear on the U.S. Treasury Department's most current list (Circular 570, as amended) and be authorized to transact business in the State of Arkansas.

1.11 LEGAL QUALIFICATIONS

- C. All Bidders, in order to submit a bonafide Proposal, must be licensed under the terms of Act 150 of the 1965 Acts of the Arkansas General Assembly, as amended, when the amount of the Contract is Twenty Thousand Dollars (\$20,000.00) or more.
- D. The successful Bidder, if a corporation created under the laws of some state other than the State of Arkansas, will be required to qualify, or to have qualified, with the Secretary of State of Arkansas to do business in the State of Arkansas.

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1.12 MODIFICATION OF BID

- E. No modification of any bid already submitted will be considered unless such modification is received prior to the hour set for opening for bids.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 002513

PRE-BID MEETING

PART 1 - GENERAL

1.1 PRE-BID MEETING

- A. Owner and Landscape Architect will conduct a Pre-bid meeting as indicated below:
 - 1. Meeting Date: **T.B.D.**
 - 2. Meeting Time: **1 p.m., local time.**
 - 3. Location: **T.B.D.**

- B. Attendance:
 - 1. Prime Bidders: Attendance at Pre-bid meeting is required.
 - 2. Subcontractors: Attendance at Pre-bid meeting is recommended.

- C. Bidder Questions: Submit written questions to be addressed at Pre-bid meeting minimum of two (2) business days prior to meeting.

- D. Site/facility visit or walkthrough.
 - 1. Due to current global pandemic conditions and requirements of the State of Arkansas a organized site visit will not occur at this meeting. However, bidders should visit the site under their own accord during the bidding timeframe to verify and understand site conditions and access. Site is open for visitation during the hours of 9am and 4pm, Monday thru Friday. Please notify Owner of approximate date and time bidder will be visiting the site.

- E. Agenda: Pre-bid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:
 - 1. Procurement and Contracting Requirements:
 - a. Instructions to Bidders.
 - b. Bidder Qualifications.
 - c. Bonding.
 - d. Insurance.
 - e. Bid Security.
 - f. Bid Form and Attachments.
 - g. Bid Submittal Requirements.
 - h. Bid Submittal Checklist.
 - i. Notice of Award.

 - 2. Communication during Bidding Period:
 - a. Obtaining documents.
 - b. Bidder's Requests for Information.
 - c. Bidder's Substitution Request/Prior Approval Request.
 - d. Addenda.

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3. Contracting Requirements:
 - a. Agreement.
 - b. The General Conditions.
 - c. The Supplementary Conditions.
 - d. Other Owner requirements.

4. Construction Documents:
 - a. Scopes of Work.
 - b. Temporary Facilities.
 - c. Use of Site.
 - d. Work Restrictions.
 - e. Alternates, Allowances, and Unit Prices.
 - f. Substitutions following award.

5. Separate Contracts:
 - a. Work by Owner (if any).
 - b. Work of Other Contracts (if any).

6. Schedule:
 - a. Project Schedule.
 - b. Contract Time.
 - c. Liquidated Damages.
 - d. Other Bidder Questions.

7. Post-Meeting Addendum.

- F. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
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SECTION 003119

EXISTING CONDITIONS INFORMATION

PART 1 - GENERAL

1.1 EXISTING CONDITION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. Bidders are expected to examine the site and sub-surface investigation reports and then decide for themselves the character of the materials to be encountered. Contractor is responsible for further investigations, utility location services etc. as deemed required based on known and perceived conditions.
- C. Boundary Survey includes information on existing property boundaries and easements including known abandoned or terminated easements and lot line. Boundary Survey information, prepared by Gorrondona and Associates, Inc. dated January 30, 2020, and is the basis for the boundary plan document and serves as the base information for the contract documents and can be provided in electronic .DWG file format for use upon request.
- D. Existing Conditions Drawings (as provided by survey) includes information on existing known elements, existing known utilities and/or conditions including known previous construction at Project site and are provided upon request in digital format, as information only. Survey information that includes information on existing conditions, prepared by Gorrondona and Associates, Inc. dated January 30, 2020, and is the basis for the existing conditions plan document and serves as the base information for the contract documents and can be provided in electronic .DWG file format for use upon request.
- E. Geotechnical Survey and Report shall be provided upon completion after the bidding purpose.
- F. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

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UNIT PRICE SCHEDULE

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

ITEM #	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE BID (DOLLARS)	AMOUNT BID (DOLLARS)
1	SITE PREPARATION	1	LS	_____	_____
2	REMOVAL AND DISPOSAL OF UTILITIES	1	LS	_____	_____
3	TREE REMOVAL AND DISPOSAL	14	EA	_____	_____
4	TREE PROTECTION	1	LS	_____	_____
5	BUILDING AND FOUNDATION REMOVAL	2	EA	_____	_____
6	CONCRETE SALVAGE FOR REUSE	1	LS	_____	_____
7	SILT FENCE	1	LF	_____	_____
8	STABILIZED CONSTRUCTION ENTRY	1	EA	_____	_____
9	INLET PROTECTION	1	LS	_____	_____
10	AGGREGATE CHECK DAMS	2	EA	_____	_____
11	WATER METER REHABILITATION	1	EA	_____	_____
12	MOBILIZATION	1	LS	_____	_____
13	CONSTRUCTION SIGNAGE/BARRICADES	1	LS	_____	_____
14	CONSTRUCTION SITE PROTECTION	1	LS	_____	_____
15	TEMPORARY FACILITIES	1	LS	_____	_____
16	MASS GRADING	1	LS	_____	_____

UNIT PRICE SCHEDULE

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

ITEM #	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE BID (DOLLARS)	AMOUNT BID (DOLLARS)
17	FINE GRADING	1	LS	_____	_____
18	STORM WATER PIPING (RCAP)	1	LS	_____	_____
19	4' CONCRETE JUNCTION BOX	1	EA	_____	_____
20	8" NYLOPLAST BASIN W/ DOME GRATE	2	EA	_____	_____
21	DUAL WALL SOIL TIGHT HDPE PIPE	1	LS	_____	_____
22	SINGLE WALL PERFORATED HDPE WITH FILTER SOCK (WALLS)	1	LS	_____	_____
23	STORMWATER CONCRETE OUTFALL (AT GABION WALL)	1	EA	_____	_____
24	STORMWATER ACCESSORIES	1	LS	_____	_____
25	6" NDS HDPE DRAIN GRATE	4	EA	_____	_____
26	CONCRETE WASH OUT	1	EA	_____	_____
27	STABILIZED CONSTRUCTION ENTRANCE	1	EA	_____	_____
28	CONCRETE WASHOUT	1	EA	_____	_____
29	BROOM FINISH PED. CONCRETE PAVEMENT (P-1)	1	LS	_____	_____
30	TEXT ENGRAVING (P-6)	1	LS	_____	_____
31	RECYCLED CONCRETE PADS AND AGGREGATE PAVEMENT (P-2)	1	LS	_____	_____

UNIT PRICE SCHEDULE

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

ITEM #	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE BID (DOLLARS)	AMOUNT BID (DOLLARS)
32	WOOD DECKING AND SUB- STRUCTURE SYSTEM (P-3)	1	LS	_____	_____
33	WOOD DECK PIER AND FOOTINGS	1	LS	_____	_____
34	WOOD DECK RAILING (M-1)	1	LS	_____	_____
35	GABION WALL SYSTEMS (W-1)	1	LS	_____	_____
36	STONE RETAINING WALLS (W-2)	1	LS	_____	_____
37	BOULDER SEATING (A-1)	1	LS	_____	_____
38	PERMEABLE PAVER SYSTEM (P-4)	1	LS	_____	_____
39	PERMEABLE PAVER SYSTEM (P-5)	1	LS	_____	_____
40	CONCRETE BANDS (P-7)	1	LS	_____	_____
41	DECOMPOSED AGGREGATE PAVEMENT (P-8)	1	LS	_____	_____
42	NATIVE STONE BOULDERS AT CREEK (S-1)	1	LS	_____	_____
43	AGGREGATE AT CREEK (S-2)	1	LS	_____	_____
44	MONUMENT SIGNAGE (M-2) (FOOTINGS, GABIONS AND STEEL)	1	EA	_____	_____
45	ACORN POLE LIGHT (L-1) AND FOUNDATION	1	LS	_____	_____
46	TREE UPLIGHTS AND CABLING (L-2)	1	LS	_____	_____
47	SITE ELECTRICAL CONDUIT	1	LS	_____	_____

UNIT PRICE SCHEDULE

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

ITEM #	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE BID (DOLLARS)	AMOUNT BID (DOLLARS)
48	SITE ELECTRICAL SYSTEM	1	LS	_____	_____
49	TRASH RECEPTACLE	7	EA	_____	_____
50	BIKE RACKS	3	EA	_____	_____
51	MOVABLE CHAIRS	20	EA	_____	_____
52	MOVABLE TABLES	5	EA	_____	_____
53	PET WASTE DISPENSERS	5	EA	_____	_____
54	VERTICAL INFORMATIONAL SIGNAGE	2	EA	_____	_____
55	HORIZ. INFORMATIONAL SIGNAGE	2	EA	_____	_____
56	LANDSCAPE IRRIGATION CONNECTION EQUIPMENT (METER/VALVE/STRAINER/BACKFLOW)	1	EA	_____	_____
57	LANDSCAPE IRRIGATION	1	LS	_____	_____
58	AMENDED TOPSOIL PREP/INSTALL	1	LS	_____	_____
59	LANDSCAPE MULCH	1	LS	_____	_____
60	TREES (EXCAVATION, TREE, INSTALL)	1	LS	_____	_____
61	TREE STAKING AND GUYING	1	LS	_____	_____
62	TREE OBSERVATION TUBE AND DRAINAGE	1	LS	_____	_____
63	SHOVEL CUR PLANT EDGING	1	LS	_____	_____

UNIT PRICE SCHEDULE

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

ITEM #	DESCRIPTION	EST. QUANTITY	UNIT	UNIT PRICE BID (DOLLARS)	AMOUNT BID (DOLLARS)
64	STEEL PLANT EDGING	1	LS	_____	_____
65	PLANTINGS - GRASSES	1	LS	_____	_____
66	PLANTINGS – PER./GROUNDCOVERS	1	LS	_____	_____
67	PLANTINGS – WETLAND FRINGE MIX	1	LS	_____	_____
68	PLANTINGS – WILDFLOWER MIX	1	LS	_____	_____
69	PLANTINGS – RAIN GARDEN MATRIX	1	LS	_____	_____
70	PLANTINGS – REMEDIATION MIX	1	LS	_____	_____
71	PLANTINGS – SHRUBS/HERBACEOUS	1	LS	_____	_____
72	PLANTINGS - VINES	1	LS	_____	_____
73	FINAL CLEAN-UP	1	LS	_____	_____
74	CONTRACTOR CONTINGENCY	1	LS	_____	_____
75	MISCELLANEOUS (LIST BELOW)	1	LS	_____	_____
76	MISCELLANEOUS (LIST BELOW)	1	EA	_____	_____
77	MISCELLANEOUS (LIST BELOW)	1	LS	_____	_____
78	MISCELLANEOUS (LIST BELOW)	1	LS	_____	_____

UNIT PRICE SCHEDULE

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT

NOTE: ALL QUANTITY ESTIMATES LISTED ARE APPROXIMATE AND CONTRACTOR IS RESPONSIBLE FOR BID QUANTITIES THAT CORRESPOND TO PLANS AND SPECIFICATIONS PROVIDED FOR BIDDING.

TOTAL UNIT PRICE BID:

(words)

(figures)

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 004243

PROPOSAL FORM

Place _____

Date _____

Proposal of _____,

a corporation organized and existing under the laws of the State of _____

or

Proposal of _____,

a partnership consisting of _____

(Strike out the term not applicable)

To: CITY OF CONWAY, ARKANSAS

This bid results from your invitation for bids for the **MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT**.

The undersigned Bidder, having visited the site of the work, having examined the Plans, Specifications, and other Contract Documents including all Addenda, and being familiar with all of the conditions relating to the construction of the proposed project, hereby agrees to comply with all other conditions or requirements set forth in the Plans, Specifications, and other Contract Documents, and further proposes to furnish all material, supplies, equipment, and appliances specified for incorporation into the project and to furnish all labor, tools, equipment and incidentals to complete the work in accordance with the Plans, Specifications, and other Contract Documents at and for the prices stated herein.

The undersigned Bidder agrees to begin work within ten (10) calendar days after the issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within ONE hundred fifty (150) calendar days thereafter (except as modified in SECTION 007200 - GENERAL CONDITIONS of these Contract Documents). Should the work fail to be completed within the time herein stated, the Contractor shall pay to the Owner, as fixed and agreed liquidated damages, and not as a penalty, the sum, for each day of delay until the work is completed and accepted, as stipulated in SECTION 007400 - SPECIAL CONDITIONS, of these Contract Documents. It is understood that additional time for the completion of the project is to be allowed only for delays as stipulated in the GENERAL CONDITIONS of these Contract Documents.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

Bidder acknowledges receipt of the following addendum (addenda):

_____ Dated _____

_____ Dated _____

The undersigned Bidder agrees that this bid shall be good and shall not be withdrawn for a period of sixty (60) calendar days after the opening thereof. If written notice of the acceptance of this Proposal is mailed, telegraphed, or delivered to the undersigned within sixty (60) days after the opening thereof, or at any time thereafter before this Proposal is withdrawn, the undersigned agrees to execute and deliver an Agreement in the prescribed form, and furnish the required Performance and Payment Bond, within ten (10) days after the Agreement is presented to him for signature.

It is understood by the undersigned Bidder that the Owner reserves the right to reject any or all bids. The projects may be awarded to the lowest responsive bid to the lowest responsive bid or as deemed in the best interest of the city.

Accompanying this Proposal as bid security is certified check/bid bond (Strike One)

in the amount of _____ Dollars

(\$ _____), being not less than five percent (5%) of the total of the bid. If the undersigned Bidder is the successful Bidder, but fails or refuses to execute the contract and furnish the required bond within the prescribed ten (10) days of the notification of award, then this bid security is to become the property of the Owner as liquidated damages for the delay and additional expense to the Owner caused by such failure or refusal.

(Witness)

(Name of Bidder)

By _____

(Address)

(Print Name and Title)

SEAL (If Bidder is a corporation)

(Office Address of Bidder)

NOTES: Sign in ink. Do not detach.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 004313

BID BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT we the undersigned, _____, as PRINCIPAL, and
_____, as SURETY, are held

and firmly bound unto **City of Conway**, Arkansas, hereinafter called the OWNER in the penal

sum of _____ (\$ _____),

lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these Presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT WHEREAS, the Principal has submitted the accompanying Proposal, dated _____, for

**MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CONWAY, ARKANSAS**

NOW, THEREFORE, if the Principal shall not withdraw said Proposal within sixty (60) days after the opening of same, and shall within ten (10) days after the prescribed forms are presented to him for signature, enter into a written Contract with the Owner in accordance with the Proposal as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such Contract, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument, under their

several seals this _____ day of _____, 2021, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representatives, pursuant to authority of its governing body.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SEAL

_____	_____
_____	(Principal)
_____	By _____
(Witness) _____	_____
_____	(Title)
_____	_____
_____	(Address)

SEAL

_____	_____
_____	(Corporate Surety)
_____	By _____
_____	_____
_____	(Address)

NOTE: Power-of-attorney for person signing for surety company must be attached to bond.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 005100

NOTICE OF AWARD

PART 1 - GENERAL

1.1 BID INFORMATION

- A. Bidder: **<Insert successful bidder name>**.
- B. Bidder's Address: **<Insert street address, city, state, zip, and telephone>**.
- C. Prime Contract: **<Insert prime contract name>**.
- D. Project Name: MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
- E. Project Location: 1151 Markham Street (bordered by Markham, Garland, Spencer and Mill Streets), Conway, Arkansas, 72032.
- F. Owner: City of Conway, c/o Transportation Department, (Conway Arkansas).
- G. Landscape Architect: SWA Group.
- H. Landscape Architect Project Number: CAKT 001.

1.2 NOTICE OF AWARD OF CONTRACT

- A. Notice: The above Bidder is hereby notified that their bid, dated **<insert date>**, for the above Contract has been considered and the Bidder is hereby awarded a contract for Stipulated Sum (Single Prime) Contract including without limitation the following:

- 1. Tree Protection Work.
- 2. Demolition Work.
- 3. Grading and Excavation Work.
- 4. Civil Utilities Work.
- 5. Electrical/Lighting Work.
- 6. Plumbing Work.
- 7. Concrete Construction.
- 8. Gabion Retaining Wall Construction.
- 9. Concrete Pavement Work.
- 10. Pre-cast Paver Work.
- 11. Masonry (Stone) Work.
- 12. Metal Fabrication Work.
- 13. Aggregate Pavement Work.
- 14. Landscape/Irrigation Work.
- 15. Signage Work.
- 16. Furniture Provision/Installation.

- B. Alternates Accepted: The following alternates have been accepted by Owner and have been incorporated in the Contract Sum:

- 1. Alternate No. 1: **<Insert alternate title>**.
- 2. Alternate No. 2: **<Insert alternate title>**.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

- C. Contract Sum: The Contract Sum is <Insert written amount> dollars (\$<Insert numeric amount>).

1.3 EXECUTION OF CONTRACT

- A. Contract Documents: Copies of the Contract Documents (final plans and specifications) will be made available to the awarded Bidder immediately. The Bidder must comply with the following conditions precedent within ten (10) working days of the above date of issuance of the Notice:
1. Deliver to Owner two (2) sets of fully executed copies of the Contract Documents.
 2. Deliver with the executed Contract Documents Bonds and Certificates of Insurance required by the Contract Documents.
- B. Compliance: Failure to comply with conditions of this Notice within the time specified will entitle Client to consider the Bidder in default, annul this Notice, and declare the Bidder's Bid security forfeited.
1. Within ten working (10) days after the Bidder complies with the conditions of this Notice, Owner will return to the awarded Bidder one fully executed copy of the Contract Documents.

1.4 NOTIFICATION

- A. This Notice is issued by:

Owner: **City of Conway, Arkansas**

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
<Executive Director>

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 005200

AGREEMENT FORM

THIS AGREEMENT made this _____ day of _____, 2021 by and between

a Corporation organized and existing under the laws of the State of _____;

a partnership consisting of _____;

an individual trading as _____;

(Strike out the two terms not applicable)

hereinafter called the "Contractor" and City of Conway, Arkansas, hereinafter called the "Owner".

WITNESSETH:

That the Contractor and the Owner for the consideration stated herein mutually agree as follows:

ARTICLE 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, machinery, tools, equipment, incidentals and services, including utility and transportation services and perform and complete all work required for the **MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT**, in strict accordance

with the Contract Documents, including all Addenda thereto numbered _____ and dated

_____ and _____ dated _____ as prepared by the Engineer.

ARTICLE 2. The Contract Price. The Owner will pay the Contractor, because of his performance of the Contract, for the total quantities of work performed at the unit price or lump sum price stipulated in the Unit Price Schedule, subject to additions, and deductions as provided in SECTION 007200 - GENERAL CONDITIONS, PARAGRAPH 1.13 - CHANGES IN THE WORK.

ARTICLE 3. Contract Time. The Contractor agrees to begin work within ten (10) calendar days after issuance by the Owner of a "Work Order" or "Notice to Proceed" and to complete the work within One hundred fifty (150) calendar days thereafter (except as modified in GENERAL CONDITIONS of these Contract Documents). If the Contractor shall fail to complete the work within the time specified, he and his Surety shall be liable for payment to the Owner, as liquidated damages ascertained and agreed, and not in the nature of a penalty, the amount specified in SECTION 00 74 00 - SPECIAL CONDITIONS of these Contract Documents for each day of delay. To the extent sufficient in amount, liquidated damages shall be deducted from the payments to be made under this Contract.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

ARTICLE 4. Contract. The executed Contract Documents shall consist of the following:

- a. This Agreement
- b. Addenda
- c. Notice to Contractors
- d. Instructions to Bidders
- e. Proposal
- f. General Conditions
- g. Supplementary Conditions
- h. Special Conditions
- i. Technical Specifications
- j. Drawings

This Agreement, together with other Documents enumerated in this Article 4, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, form the Contract between the parties hereto. In the event that any provisions in any component part of this Contract conflicts with any provision of any other component part, the conflict shall be resolved by the Engineer whose decision shall be final.

ARTICLE 5. Surety. The Surety on the Performance-Payment Bond shall be a surety company of financial resources satisfactory to the Owner and authorized to do business in the State of Arkansas.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in four (4) counterparts, each of which shall be considered an original on the day and year first above written.

ATTEST:

	(Company Name)
_____	_____
(Contractor witness signature)	(Official signature)
_____	_____
(Printed name)	(Printed name, title)

	(Street address)

	(City, State, Zip)
	City of Conway, Arkansas
	(Owner)
_____	_____
(Owner witness signature)	(Official signature)
_____	Bart Castleberry, Mayor
(Printed name)	(Printed name, title)

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 006000

PROJECT FORMS

PART 1 - GENERAL

1.1 FORM OF AGREEMENT

- A. The following form of Owner/Contractor Agreement shall be used for Project:
 - 1. Refer to City of Conway Bid and Contract Information provided by Owner.

1.2 ADMINISTRATIVE FORMS

- A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.
- B. Insurance and Bonds
 - 1. Refer to City of Conway Bid and Contract Information provided by Owner.
- C. Information and Modification Forms:
 - 1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."
 - 2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."
 - 3. Change Order Form: Refer to City of Conway Bid for city/project specific form.
 - 4. Contingency Draw Form: Refer to City of Conway Bid for city/project specific form.
 - 5. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."
 - 6. Form of Change Directive: AIA Document G714, "Construction Change Directive."
 - 7. Or approved equals by all parties.
- D. Payment Forms:
 - 1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
 - 2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
 - 3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
 - 5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."
 - 6. Or approved equals by all parties.
- E. Completion Forms
 - 1. Certificate of Substantial Completion: AIA Document G704
 - 2. Consent of Surety to Reduction in or Partial Release of Retainage: AIA Doc S707A
 - 3. Or approved equals by all parties.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 006113

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

THAT WE, _____ as
Principal, hereinafter called Principal, and _____ of
_____ State of _____, as Surety, hereinafter
called the Surety, are held and firmly bound unto **City of Conway**, Arkansas, as Obligee, hereinafter called
Owner, in the amount of _____ Dollars(\$ _____)

in lawful money of the United States of America, for the payment of which sum well and truly to be made,
we bind ourselves, our heirs, executors, administrators, and successors, jointly, severally, and firmly by
these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS, The Principal entered into a Contract with the Owner by written Agreement

dated the _____ day of _____, 2021, a copy of which is attached hereto and made
a part hereof, hereinafter referred to as the Contract, for Faulkner County, **MARKHAM STREET WATER
QUALITY DEMONSTRATION PROJECT** in the city of Conway, Arkansas.

NOW THEREFORE, if the Principal shall well and truly perform and complete in good, sufficient, and
workmanlike manner all of the work required by said Contract and within the time called for thereby to the
satisfaction of the Owner, and shall pay all persons for labor, materials, equipment, and supplies furnished by
said Principal in accordance with said Contract (failing which such persons shall have a direct right to action
against the Principal and Surety under this obligation, but subject to the Owner's priority) and shall hold and
save harmless the Owner from any and all claims, loss, and expense of every kind and nature arising because
of or resulting from the Principal's operation under said Contract, except payments to the Principal rightly due
the Principal for work under said Contract, then this obligation shall be null and void; otherwise to remain in full
force and effect.

Any alterations which may be made in the terms of the Contract, or in the work to be done under it, or the
giving by the Owner of an extension of time for the performance of the Contract, or any other forbearance on
the part either of the Owner or Principal to the other shall not release in any way the Principal and Surety, or
either of them, their heirs, personal representatives, successors, or assigns from their liability hereunder, notice
to the Surety of any alteration, extension, or forbearance hereby being waived.

In no event shall the aggregate liability of the Surety exceed the sum set herein.

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

No suit, action, or proceeding shall be brought on this bond outside the State of Arkansas. No suit, action, or proceeding shall be brought on this bond, except by the Owner, after six (6) months from the date on which final payment to the Contractor falls due. No suit, action, or proceeding shall be brought by the Owner after two (2) years from the date on which final payment to the Contractor falls due.

This bond is executed pursuant to the terms of Arkansas Statute 51-637. Executed on

this _____ day of _____, 2021.

SEAL

(Principal)

By _____

Title _____

SEAL

(Surety)

By _____

(Attorney-in-Fact)

NOTES:

- 1. This bond form is mandatory. No other forms will be acceptable.**
- 2. The date of the Bond must not be prior to the date of the Contract.**
- 3. Any surety executing this Bond must appear on the U.S. Treasury Department's most current list (Circular 570, as amended) and be authorized to transact business in the State of Arkansas.**
- 4. Attach Power of Attorney.**

MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 007200

GENERAL CONDITIONS

PART 1 – GENERAL

1.1 DEFINITIONS

- A. Wherever used in any of the Contract Documents, the following meanings shall be given to the terms herein defined:
1. The term "Contract" means the Contract executed by the Local Public Agency and the Contractor of which these GENERAL CONDITIONS form a part.
 2. The term "Local Public Agency" or "Owner" means **City of Conway, Arkansas**, which is authorized to undertake this Contract.
 3. The term "Contractor" means the person, firm or corporation entering into the Contract with the Local Public Agency to construct and install the improvements embraced in this project.
 4. The term "Engineer" means Conway City Engineer or other designated professional consultant or individual providing the local public agency with engineering services, its successor, or any other person or persons employed by said Local Public Agency to furnish engineering services in connection with the construction embraced in the Contract.
 5. The term "Local Government" means the **City of Conway, Arkansas**, within which the Project is situated.
 6. The term "Contract Documents" means and shall include the following: Executed Agreement, Addenda (if any), Invitation to Bid, Instructions to Bidders, Proposal, General Conditions, Supplementary Conditions, Special Conditions, Technical Specifications, and Drawings.
 7. The term "Drawings" or "Plans" means the construction drawings prepared for this project.
 8. The term "Technical Specifications" means that part of the Contract documents which describes, outlines and stipulates the quality of the materials to be furnished; the quality of workmanship required; and the controlling requirements to be met in carrying out the construction work to be performed under this Contract.
 9. The term "Addendum" means any change, revision or clarification of the Contract Documents which has been duly issued by the Local Public Agency to prospective Bidders prior to the time of receiving bids.
 10. The term "Subcontractors" shall mean the individual, partnership or corporation entering into an agreement with the Contractor to perform any portion of the work covered by the Plans and Specifications.
 11. The term "Work" shall mean the furnishing of all necessary labor, tools, equipment, appliances, supplies and material other than materials furnished by the Owner as specified to complete the construction covered by the Plans and Specifications.
 12. The term "Surety" shall mean any person, firm or corporation that has executed, as Surety, the Contractor's Performance Bond securing the performance of the Contract.

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1.2 SUPERINTENDENCE BY CONTRACTORS

- A. Except where the Contractor is an individual and gives his personal superintendence to the work, the Contractor shall provide a competent superintendent, satisfactory to the Local Public Agency and the Engineer, on the work at all times during working hours with full authority to supervise and direct the work and who shall be the Contractor's agent responsible for the faithful discharge of the Contractor's obligations under the Contract.
- B. The Owner shall have the authority to require the Contractor to remove from the work any incompetent or insubordinate superintendent.

1.3 CONTRACTOR'S EMPLOYEES

- A. The Contractor shall employ only competent skillful workers and shall at all times enforce strict discipline and good order among the employees.
- B. The Contractor shall neither permit nor suffer the introduction or use of alcoholic beverages or controlled substances upon or about the work embraced in this Contract.
- C. The Owner may require the Contractor to dismiss from the work such employee or employees as the Owner or the Engineer may deem incompetent, or careless, or insubordinate.

1.4 SAFETY OF CONTRACTOR'S EMPLOYEES

- A. The Contractor shall be responsible for the safety of his employees during the progress of the work as well as the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any damage which may result from their failure or their improper construction, maintenance or operation.

1.5 SUBCONTRACTS

- A. The Contractor is responsible to the Owner for the acts and omissions of his subcontractors and of persons either directly or indirectly employed by the subcontractors and that nothing contained in the Contract Documents shall create any contractual relation between any subcontractor and the Owner.

1.6 OTHER CONTRACTS

- A. The Local Public Agency may award, or may have awarded other Contracts for additional work, and the Contractor shall cooperate fully with such other Contractors, by scheduling his own work with that to be performed under other Contracts as may be directed by the Local Public Agency. The Contractor shall not commit or permit any act which will interfere with the performance of work by any other Contractor as scheduled.

1.7 CONTRACTOR'S INSURANCE

- A. Before any work is commenced, the Contractor shall furnish an approved certificate of insurance addressed to the Owner, showing that he carries the following insurance which shall be maintained throughout the term of the Contract.

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1. Workmen's Compensation -- Statutory Limit
 2. Employer's Liability for Hazardous Work -- If Needed
 3. Public Liability (Bodily Injury) -- \$1,000,000/occurrence
 4. Property Damage -- \$1,000,000/occurrence
 5. Builder's Risk -- Insurable Portion
- B. The Contractor shall carry or require that there be carried the insurance listed in (1) through (4) above for the protection of all his employees and those of his Subcontractors engaged in work under this Contract, and for the protection of the public.
- C. If the work includes pipelines or other underground structures, the Property Damage Liability shall include explosion, collapse and underground coverage.
- D. The premiums for all insurance and the bond required herein shall be paid by the Contractor.
- E. It shall be the obligation of the Contractor to complete and deliver to the Owner the structure required by these Contract Documents regardless of any loss, damage to, or destruction of the structure prior to delivery.

1.8 OWNER'S AND ENGINEER'S PROTECTIVE LIABILITY INSURANCE

- A. The Contractor shall obtain Owner's Protective Liability insurance, which shall be in force for the entire project period, naming as the insured therein, **City of Conway, Arkansas**. Such insurance shall be provided as a separate policy from the Contractor's insurance as listed above. Limits of liability shall be the following:
1. Bodily Injury Liability (Including Death) -- \$1,000,000 each occurrence
 2. Physical Damage Liability (Damage to or Destruction of Property) -- \$1,000,000 each occurrence
- B. A copy of the insurance policy shall be delivered to the Owner and Engineer.

1.9 FITTING AND COORDINATION OF THE WORK

- A. The Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of all trades, Subcontractors, or material men engaged upon this Contract. He shall be prepared to guarantee to each of his Subcontractors the locations and measurements which they may require for the fitting of their work to all surrounding work.

1.10 MUTUAL RESPONSIBILITY OF CONTRACTORS

- A. If, through acts of neglect or through failure to comply with any applicable Government regulations by the Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the work, the Contractor shall settle with such other Contractor or Subcontractor by agreement or arbitration, if such other Contractor or Subcontractor will so settle. If such other Contractor or Subcontractor shall assert any claim against the Local Public Agency on account of any damage alleged to have been so sustained, the Local Public Agency will notify this Contractor, who shall defend at his own expense any suit based upon such claim, and, if any judgment or claims against the Local Public Agency shall be allowed, the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith.

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1.11 PAYMENT

A. PAYMENT TO CONTRACTOR

1. The Engineer shall prepare (with the required assistance from the Contractor) the requisition for partial payment. If the bid is a lump sum price or contains lump sum prices, the Contractor shall furnish to the Engineer, upon request, a detailed cost breakdown of the several items of work involved in the lump sum prices. The Engineer will use this cost breakdown to determine the amount due the Contractor as progress payment. A cut-off time shall be established near the last day of the month such as to allow sufficient time for the requisition to be prepared, approved by the Contractor, and submitted by the Engineer to the Owner by the first day of the successive month. The amount of the payment due to the Contractor shall be determined by the total value of work completed to date, deducting ten percent (10%) for retainage, adding the value of submitted paid invoices covering construction materials, properly stored on the site and deducting the amount of all previous payments. After the project is fifty percent (50%) complete, no additional retainage beyond ten percent (10%) of the first fifty percent (50%) of the project cost will be withheld provided that the Contractor is making satisfactory progress and there is no specific cause for greater withholding until completion of the project at which time the retainage will be released with the final payment. The total value of work completed to date shall be based on the estimated quantities of work completed and on the unit prices and lump sum prices contained in the Proposal. The value of materials properly stored on the site shall be based upon the estimated quantities of such materials and the invoice prices. Copies of paid invoices, covering construction materials for which material payments are made, shall be furnished to the Engineer before such material payments are made.
2. Monthly or partial payments made by the Owner to the Contractor are monies advanced for the purpose of assisting the Contractor to expedite the work of construction. All material and complete work covered by such monthly or partial payments shall remain the property of the Contractor and he shall be responsible for the care and protection of all materials and work upon which payments have been made. Such payments shall not constitute a waiver of the right of the Owner to require the fulfillment of all terms of the Contract and the delivery of all improvements embraced in this Contract complete and satisfactory to the Owner in all details.

B. WITHOLDING PAYMENTS

1. The Local Public Agency may withhold from any payment otherwise due the Contractor so much as may be necessary to protect the Local Public Agency and if it so elects may also withhold any amounts due from the Contractor to any Subcontractors or material dealers, for work performed or material furnished by them. The foregoing provisions shall be construed solely for the benefit of the Local Public Agency and will not require the Local Public Agency to determine or adjust any claims or disputes between the Contractor and his Subcontractors or material dealers, or to withhold any monies for their protection unless the Local Public Agency elects to do so. The failure or refusal of the Local Public Agency to withhold any monies from the Contractor shall not impair the obligations of any Surety or Sureties under any bond or bonds furnished under this Contract. Such withholding may also occur as a result of the Contractor's failure or refusal to prosecute the work with such diligence as will insure its completion within the time specified in these Contract Documents, or as modified as provided in these Contract Documents, or if the Contractor fails to comply with any applicable regulations promulgated by the U.S. Government or any other Government agencies.

C. FINAL PAYMENT

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1. After final inspection and acceptance by the Local Public Agency of all work under the Contract, the requisition for final payment shall be prepared which shall be based upon the carefully measured or computed quantity of each item of work at the applicable unit prices and lump sum prices stipulated in the Proposal. The total number of the final payment due the Contractor under this Contract shall be the amount computed as described above less all previous payments. All prior payments shall be subject to correction in the final payment. Final payment to the Contractor shall be made subject to his furnishing the Local Public Agency with a release in satisfactory form of all claims against the Local Public Agency arising under and by virtue of his Contract, other than such claims, if any, as may be specifically excepted by the Contractor from the operation and the release as provided under the section entitled DISPUTES under GENERAL CONDITIONS.
2. The Local Public Agency, before paying the final estimate, may require the Contractor to furnish releases or receipts from all Subcontractors having performed any work and all persons having supplied materials, equipment (installed on the Project) and services to the Contractor, if the Local Public Agency deems the same necessary in order to protect its interest. The Local Public Agency, however, may if it deems such action advisable, make payment in part or in full to the Contractor without requiring the furnishing of such releases or receipts and any payments so made shall in nowise impair the obligations of any Surety or Sureties furnished under this Contract.
3. Withholding of any amount due the Local Public Agency under the section entitled LIQUIDATED DAMAGES FOR DELAY under SPECIAL CONDITIONS, shall be deducted from the payments due the Contractor.
4. All equipment warranties and general guarantee and maintenance bond provisions shall become effective for one year upon date of final acceptance of the complete project by the Local Public Agency.

D. PAYMENTS SUBJECT TO SUBMISSION OF CERTIFICATES

1. Each payment to the Contractor by the Local Public Agency shall be made subject to submission by the Contractor of all written certifications required.

1.12 USE OF COMPLETED PORTIONS

- A. The Owner shall have the right to use any completed or partially completed portion of the work and such use shall not be considered as an acceptance of any work.

1.13 CHANGES IN THE WORK

- A. The Local Public Agency may make changes in the scope of the work required to be performed by the Contractor under the Contract or make additions thereto, or omit work therefrom without invalidating the Contract, and without relieving or releasing the Contractor from any of his obligations under the Contract or any guarantee given by him pursuant to the Contract provisions, and without affecting the validity of the Guaranty Bonds, and without relieving or releasing the Surety or Sureties of said bonds. All such work shall be executed under the terms of the original Contract unless it is expressly provided otherwise.
- B. Except for the purpose of affording protection against any emergency endangering life or property, the Contractor shall make no change in the materials used or in the specified manner of constructing and/or installing the Improvements, or supply additional labor, services or materials beyond that actually required for the execution of the Contract, unless in pursuance of a written order from the Local Public Agency authorizing the Contractor to proceed with the change. No claim for an adjustment of the Contract price will be valid unless so ordered.

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- C. After the work is complete, a final change order will be prepared to be accepted by the Owner and Contractor to adjust final payment as required to cover the actual units of work acceptably completed.
- D. If the applicable unit prices are contained in the Agreement (established as a result of either a unit price or a Supplemental Schedule of Unit Prices) the Local Public Agency may order the Contractor to proceed with desired changes in the work, the value of such changes to be determined by the measured quantities involved and the applicable unit and lump sum prices specified in the Contract; provided that in case of a unit price Contract the net value of all changes does not increase or decrease the original total amount shown in the Agreement by more than twenty- five (25) percent.
- E. If applicable unit prices are not contained in the Agreement as described above or if the total net change increases or decreases the total Contract price more than twenty-five (25) percent, the Local Public Agency shall, before ordering the Contractor to proceed with a desired change, request an itemized Proposal from him covering the work involved in the change after which the procedure shall be as follows:
 - 1. If the Proposal is acceptable the Local Public Agency will prepare the Change Order in accordance therewith for acceptance by the Contractor and
 - 2. If the Proposal is not acceptable and prompt agreement between the two (2) parties cannot be reached, the Local Public Agency may order the Contractor to proceed with the work on a Force Account basis, under which the net cost shall be the sum of the actual costs that follow:
 - a. Labor, including foremen;
 - b. Materials entering permanently into the work;
 - c. The ownership or rental cost of construction plant and equipment during the time of use on the extrawork;
 - d. Power and consumable supplies for the operation of power equipment;
 - e. Insurance;
 - f. Social Security and old age and unemployment contributions.
- F. To the net cost shall be added a fixed fee agreed upon, but not to exceed fifteen (15) percent of the net cost, to cover supervision, overhead, bond, and any other general expense, and profit.
- G. Each Change Order shall include in its final form:
 - 1. A detailed description of the change in the work.
 - 2. The Contractor's Proposal (if any) or a conformed copy thereof.
 - 3. A definite statement as to the resulting change in Contract price and/or time.
 - 4. The statement that all work involved in the change shall be performed in accordance with Contract requirements except as modified by the Change Order.

1.14 CLAIMS FOR EXTRA COST

- A. If the Contractor claims that any instructions by Drawings or otherwise involve extra cost or extension of time, he shall, within ten (10) days after the receipt of such instructions, and in any event before proceeding to execute the work, submit his protest thereto in writing to the Local Public Agency, stating clearly and in detail the basis of his objections. No such claim will be considered unless so made.

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- B. Claims for additional compensation for extra work, due to alleged errors in ground elevations, contour lines, or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted or would result, in handling material, or performing more work, than would be reasonable estimated from the Drawings and maps issued.
- C. Any discrepancies which may be discovered between actual conditions and those represented by the Drawings and maps shall at once be reported to the Local Public Agency and work shall not proceed except at the Contractor's risk, until written instructions have been received by him from the Local Public Agency.
- D. If, on the basis of the available evidence, the Local Public Agency determines that an adjustment of the Contract Price and/or Time is justifiable, the procedure shall then be as provided in the Section entitled CHANGES IN THE WORK under GENERAL CONDITIONS.

1.15 OWNER'S RIGHT TO TERMINATE CONTRACT

- A. If the Contractor shall be adjudged a bankrupt or shall file a petition for an arrangement or reorganization under the Bankruptcy Act, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his solvency, or if he should persistently or repeatedly refuse or should fail, except under conditions where extension of time is approved, to supply adequate workmen, equipment and material, or disregard laws, ordinances, or the instructions of the Engineer, or otherwise be guilty of a violation of any provisions of the Contract; provided further that if the Contractor at any time fails to comply with any applicable Federal or State regulation which prevents either the Local Public Agency or the Contractor from fulfilling its obligations under these Contract Documents, then the Owner upon certification of the Engineer that sufficient cause exists to justify such action may, without prejudice to any other right or remedy, and after giving the Contractor ten (10) days' written notice, terminate the employment of the Contractor.
- B. At the expiration of the said ten (10) days, the Owner may immediately serve notice upon the Surety to complete the work.
- C. In the case the Surety fails to comply with the notice within thirty (30) days after service of such notice, the Owner may complete the work and charge the expense of the completion, including labor, materials, tools, implements, machinery or apparatus to said Contractor and the expense so charged shall be deducted and paid by the Owner out of such monies as may be due, or that may thereafter at any time become due to the Contractor under and by virtue of this agreement. And in case such expense is less than the sum which would have been payable under this Contract if the same had been completed by the Contractor, then said Contractor shall be entitled to receive the difference. And in case such expense is greater than the sum which would have been payable under this Contract if the same had been completed by said Contractor, then the Contractor and his Surety shall pay the amount of such excess to the Owner, on demand from said Owner or Engineer of the amount so due.

1.16 SUSPENSION OF WORK

- A. Should contingencies arise to make such action necessary, the Owner shall have the right to suspend the whole or any part of the work for a period not to exceed sixty (60) days by giving the Contractor notice in writing three (3) days prior to the suspension.
- B. The Contractor after written notice to resume work shall begin within ten (10) days from the date of such notice.

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- C. If the work or any part thereof shall be stopped by the Owner's notice and the Owner fails to notify the Contractor to resume work within sixty (60) days, the Contractor may abandon that portion of the work so suspended and the Contractor shall be paid for all work performed on the portion so suspended at unit prices quoted in the bid for completed work involved, at agreed prices on any extra work involved and at a fair and equitable price for partially completed work involved.
- D. The Engineer may suspend work pending the settlement of any controversy. The Contractor shall not be entitled to any claim for loss or damage by reason of such delay, nor shall he be entitled to any extension of time but an extension may be granted by the Owner in his discretion.

1.17 DELAYS - EXTENSION OF TIME - LIQUIDATED DAMAGES

- A. If the Contractor is delayed at any time in the progress of the work by any act or neglect of the Owner, the Owner's Engineer or employees, or by any separate contractor employed by the Owner, or by changes ordered in the work or by strikes, lock-outs, fire, unusual delay in transportation, unavoidable casualty or any other cause beyond the Contractor's control, then the time of completion shall be extended for such reasonable time as the Owner may decide; provided, however, said time of completion shall be extended upon the following conditions and no other.
 - 1. Requests for extension of time shall be in writing. No extension of time shall be granted automatically.
 - 2. The Contractor claiming an extension of time because of any of the contingencies hereinabove mentioned, shall, within ten (10) days of the occurrence of the contingency which justifies the delay, notify the Owner in writing of his claim and the reasons therefor.
 - 3. In event of a continuing cause of delay only one claim is necessary.
- B. Excusable Delays: The right of the Contractor to proceed shall not be terminated nor shall the Contractor be charged with liquidated damages for any delays in the completion of the work due:
 - 1. To any acts of the Government, including controls or restrictions upon requisitioning of materials, equipment, tools, or labor by reason of war, National Defense, or any other national emergency;
 - 2. To any acts of the Owner;
 - 3. To causes not reasonable foreseeable by the parties of this Contract which are beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God or of the public enemy, acts of another Contractor in the performance of some other Contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and weather of unusual severity such as hurricanes, tornadoes, cyclones and other extreme weather conditions.
 - 4. To any delay of any subcontractor occasioned by any of the causes specified in subparagraphs (1), (2), and (3) of this paragraph.

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- C. It is acknowledged between the parties to this Contract that the work to be performed by the Contractor will result in a benefit to all customers of the Owner and that a delay in completion of the work will be detrimental to many customers of the Owner. It is further acknowledged that, while work is in progress, the Owner shall incur an indeterminable amount of expense as a result of necessary supervision of the work and other overhead and administrative expenses. It is further acknowledged that the work to be performed will permit the Owner to furnish larger amounts of water to its customers for which the Owner shall receive income and that a delay in the work will cause a loss of the income, the exact amount of which is impossible of ascertainment.
- D. It is, therefore, agreed that if there is a delay in the work beyond the period elsewhere herein specified which has not been authorized by the Owner as set forth above, then the Owner may deduct from the Contract price the amount stated in the Special Conditions, bound herewith, as liquidated damages.

1.18 DISPUTES

- A. All disputes arising under this Contract or its interpretation, whether involving law or fact or both, or extra work, and all claims for alleged breach of Contract shall within ten (10) days of commencement of the dispute be presented by the Contractor to the Local Public Agency for decision. All papers pertaining to claims shall be filed in quadruplicate. Such notice need not detail the amount of the claim, but shall state the facts surrounding the claim in sufficient detail to identify the claim, together with its character and scope. In the meantime, the Contractor shall proceed with the work as directed. Any claim not presented within the time limit specified within this paragraph shall be deemed to have been waived, except that if the claim is of a continuing character and notice of the claim is not given within ten (10) days of its commencement, the claim will be considered only for a period commencing ten (10) days prior to the receipt by the Local Public Agency of notice thereof.
- B. The Contractor shall submit in detail his claim and his proof thereof. Each decision by the governing body of the Local Public Agency will be in writing and will be mailed to the Contractor by registered mail, return receipt requested.
- C. If the Contractor does not agree with any decision of the Local Public Agency, he shall in no case allow the dispute to delay the work, but shall notify the Local Public Agency promptly that he is proceeding with the work under protest and he may then except the matter in question from the final release.

1.19 ASSIGNMENT OR NOVATION

- A. The Contractor shall not assign or transfer, whether by an assignment or novation, any of its rights, duties, benefits, obligations, liabilities, or responsibilities under this Contract without the written consent of the local Public Agency; provided, however, that assignments to banks, trust companies, or other financial institutions may be made without the consent of the Local Public Agency. No assignment or novation of this Contract shall be valid unless the assignment or novation expressly provides that the assignment of any of the Contractor's rights or benefits under the Contract is subject to a prior lien for labor performed, services rendered, and materials, tools, and equipment supplied for the performance of the work under this Contract in favor of all persons, firms, or corporations rendering such labor or services or supplying such materials, tools or equipment.

1.20 TECHNICAL SPECIFICATIONS AND DRAWINGS

- A. The Drawings and this Specification are to be considered cooperative. All work necessary for the completion of the facility shown on the Drawings, but not described in this Specification, or described in this Specification but not shown on the Drawings, OR REASONABLY IMPLIED BY EITHER OR BOTH, shall be executed in the best manner, the

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same as if fully shown and specified. When no figures or memoranda are given, the Drawings shall be accurately followed, according to their scale, but in all cases of discrepancy in figures or details, the decision of the Engineer shall be obtained before proceeding with the Work. If Contractor adjusts any such discrepancy without first having obtained the approval of the Engineer, it shall be at his own risk, and he shall bear any extra expense resulting therefrom.

1.21 SHOP DRAWINGS

- A. Shop Drawings shall be required for all equipment, materials, and as required by the Engineer. All Shop Drawings, Machinery Details, Layout Drawings, etc., shall be submitted to the Engineer in four (4) copies for review (unless otherwise specified) sufficiently in advance of requirements to afford ample time for checking, including time for correcting, resubmitting, and rechecking if necessary. The Contractor may proceed, only at his own risk, with manufacture or installation of any equipment or work covered by said Shop Drawings, etc. until they are reviewed and no claim, by the Contractor, for extension of the Contract time will be granted by reason of his failure in this respect.
- B. Any Drawings submitted without the Contractor's stamp of approval will not be considered and will be returned to him for proper resubmission. If any Drawings show variations from the requirements of the Contract because of standard shop practice or other reason, the Contractor shall make specific mention of such variation in his letter of transmittal in order that, if acceptable, suitable action may be taken for proper adjustment of Contract price and/or time, otherwise the Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract even though the Drawings have been reviewed.
- C. The review of Shop Drawings by the Engineer shall be considered an accommodation to the Contractor to assist him in the execution of the Contract. The Engineer's review of such Drawings shall not relieve the Contractor of his responsibility to perform the work in strict accord with the Plans and Specifications, and approved changes.
- D. If the Shop Drawing is in accord with the Contract or involves only a minor adjustment in the interest of the Local Public Agency not involving a change in Contract price or time, the Engineer shall so stamp the Drawing and shall contain in substance the following:

"Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner".

1.22 REQUESTS FOR SUPPLEMENTARY INFORMATION

- A. It shall be the responsibility of the Contractor to make timely requests of the Local Public Agency for any additional information not already in his possession which should be furnished by the Local Public Agency under the terms of this Contract, and which he will require in the planning and execution of the work. Such requests may be submitted from time to time as the need is approached, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay. Each request shall be in writing, and list the various items and the latest date by which each will be required by the Contractor. The first list shall be submitted within two (2) weeks after the Contract award and shall be as complete as possible at that time. The Contractor shall, if requested, furnish promptly any assistance and information the Engineer may require in responding to these requests of the Contractor. The Contractor shall be fully responsible for any delay in his work or to others arising from his failure to comply fully with the provisions of this Section.

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1.23 REFERENCE TO MANUFACTURER OR TRADE NAME - "OR EQUAL CLAUSE"

- A. If the Plans, Specifications or Contract Documents, laws, ordinances or applicable rules and regulations permit the Contractor to furnish or use a substitute that is equal to any material or equipment specified, and if the Contractor wishes to furnish or use a proposed substitute, he shall make written application to the Engineer for approval of such a substitute certifying in writing that the proposed substitute will perform adequately the functions called for in the general design, be similar and of equal substance to that specified, and be suited to the same use and capable of performing the same functions as that specified, the use of such substitute will not require revisions of related work, and identifying all variations of the proposed substitute from specified and indicating available maintenance service. No substitute shall be ordered or installed without the written approval of the Engineer who will be the judge of equality and may require the Contractor to furnish such other data about the proposed substitute as he considers pertinent. No substitute shall be ordered or installed without such performance guarantee and bonds as the Owner may require which shall be furnished at Contractor's expense.
- B. Where such substitutions alter the design or space requirements indicated on the Contract Drawings, detailed drawings shall be prepared and submitted by the Contractor delineating any changes in or additions to the work shown on the Contract Drawings, and such drawings and changes or additions to the work shall be made by the Contractor at no additional expense to the City. In all cases, the burden of proof that the material or equipment offered for substitution is equal in construction, efficiency and service to that named on the Contract Drawings and in these Contract Documents shall rest on the Contractor and unless the proof is satisfactory to the Engineer, the substitution will not be approved.

1.24 SAMPLES, CERTIFICATES AND TESTS

- A. The Contractor shall submit all material, product, or equipment samples, descriptions, certificates, affidavits, etc., as called for in the Contract Documents or required by the Engineer, promptly after award of the Contract and acceptance of the Contractor's bond. No such material or equipment shall be manufactured or delivered to the site, except at the Contractor's own risk, until the required samples or certificates have been approved in writing by the Engineer. Any delay in the work caused by late or improper submission of samples or certificates for approval shall not be considered just cause for an extension of the Contract time. Submit four (4) copies of data for Engineer's review.
- B. Each sample submitted by the Contractor shall carry a label giving the name of the Contractor, the project for which it is intended, and the name of the producer. The accompanying certificate or letter from the Contractor shall state that the sample complies with Contract requirements, shall give the name and brand of the product, its place of origin, the name and address of the producer and all specifications or other detailed information which will assist the Engineer in passing upon the acceptability of the sample promptly. It shall also include the statement that all materials or equipment furnished for use in the project will comply with the samples and/or certified statements.
- C. Approval of any materials shall be general only and shall not constitute a waiver of the Local Public Agency's right to demand full compliance with Contract requirements. After actual deliveries, the Engineer will have such check tests made as he deems necessary in each instance and may reject materials and equipment and accessories for cause, even though such materials and articles have been given general approval. If materials, equipment or accessories which fail to meet check tests have been incorporated in the work, the Engineer will have the right to cause their removal and replacement by proper materials or to demand and secure such reparation by the Contractor as is equitable.

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- D. Except as otherwise specifically stated in the Contract, the costs of sampling and testing will be divided as follows:
1. The Contractor shall furnish without extra cost, including packing and delivery charges, all samples required for testing purposes, except those samples taken on the project by the Engineer;
 2. The Contractor shall assume all costs of re-testing materials which fail to meet Contract requirements;
 3. The Contractor shall assume all costs of testing materials offered in substitution for those found deficient; and
 4. The Local Public Agency will pay all other expenses.

1.25 PERMITS AND CODES

- A. The Contractor shall give all notices required by and comply with all applicable laws, ordinances, and codes of the Local Government. All construction work and/or utility installations shall comply with all applicable ordinances, and codes including all written waivers.
- B. Should the Contractor fail to observe the foregoing provisions and proceed with the construction and/or install any utility at variance with any applicable ordinance or code, including any written waivers, the Contractor shall remove such work without cost to the Local Public Agency.
- C. The Contractor shall at his own expense, secure and pay to the appropriate department of the Local Government the fees or charges for all permits for street pavements, sidewalks, sheds, removal of abandoned water taps, sealing of house connection drains, pavement cuts, building, electrical, plumbing, water, gas and sewer permits required by the local regulatory body or any of its agencies.
- D. The Contractor shall comply with applicable local laws and ordinances governing the disposal of surplus excavation, materials, debris and rubbish on or off the site of the work, and commit no trespass on any public or private property in any operation due to or connected with the Improvements embraced in this Contract.

1.26 CARE OF WORK

- A. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances, and methods, and for any injury, including death, to any person, and for any damage to property which may result from their failure, or from their improper construction, maintenance, or operation. He shall indemnify and save harmless the Local Public Agency and the Engineer and their employees and agents, against any judgement with costs, which may be obtained as a result of such injury or property damage, because of the alleged liability of the Local Public Agency or of the Engineer.
- B. The Contractor shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance, whether or not the same has been covered in whole or in part by payments made by the Local Public Agency.
- C. The Contractor shall provide sufficient competent watchmen, as required to protect the work both day and night, including Saturdays, Sundays, and holidays, from the time the work is commenced until final completion and acceptance.

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- D. In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without special instructions or authorization from the Local Public Agency, is authorized to act at his discretion to prevent such threatened loss or injury, and he shall so act. He shall likewise act if instructed to do so by the Local Public Agency. Any compensation claimed by the Contractor on account of such emergency work will be determined by the Local Public Agency as provided in the Section entitled CHANGES IN THE WORK under GENERAL CONDITIONS.
- E. The Contractor shall avoid damage as a result of his operations to existing sidewalks, streets, curbs, pavements, utilities (except those which are to be replaced or removed), adjoining property, etc., and he shall at his own expense completely repair any damage thereto caused by his operations.
- F. The Contractor shall shore up, brace, underpin, secure, and protect as may be necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the Improvements embraced in this Contract. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless the Local Public Agency, and the Engineer, from any damages on account of settlements or the loss of lateral support of adjoining property and from all loss or expense and all damages for which it may be claimed that the Local Public Agency, or the Engineer, is liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

1.27 QUALITY OF WORK AND PROPERTY

- A. All property, materials and equipment shall be new and free of defects upon completion of the Contractor's performance and unless different standards are specified elsewhere in the Contract Documents shall be of the best type and quality available for the purpose. All of the Contractor's work shall be performed with the highest degree of skill and completed free of defects and in accordance with the Contract Documents. Any work, property, materials, or equipment not in conformance with these standards shall be considered defective. If any work, property, materials or equipment is discovered to have been defective or not in conformance with the Contract Documents, whether said discovery is made before or after completion of performance, the Contractor, at his expense, after written notice from the Owner or Engineer, shall promptly replace or correct the deficiency and pay any engineering costs and consequential expense or damage incurred by the Owner in connection therewith. If the Contractor fails to promptly correct all deficiencies, the Owner shall have the option of remedying the defects at the Contractor's cost. If the Contractor is required to furnish shop drawings or designs the above provisions shall apply to such drawings or designs.
- B. Neither the Owner's payment, acceptance, inspection or use of the work, property, materials, or equipment, nor any other provision of the Contract Documents shall constitute acceptance of work, property, materials, or equipment which is defective or not in accordance with the Contract Documents. If the Contractor breaches any provision of the Contract Documents with respect to the quality of the work, property, materials, equipment or performance, whether initial or corrective, its liability to the Owner shall continue until the statute of limitations with respect to such breach of contract has expired following discovery of the defect. All parts of this section are cumulative to any other provisions of the Contract Documents and not in derogation thereof. If it is customary for a warranty to be issued for any of the property to be furnished hereunder, such warranty shall be furnished, but no limitations in any such warranty shall reduce the obligations imposed under the Contractor in the Contract Documents or by Arkansas Law, but if any greater obligations than imposed in this Contract is specified in any such warranty or by Arkansas Law, those greater obligations shall be deemed a part of this Contract and enforceable by the Owner.

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1.28 ACCIDENT PREVENTION

- A. The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes, including applicable parts of Safety Code No. 9, Arkansas Department of Labor, shall be observed. The Contractor shall take or cause to be taken such safety and health measures, additional to those herein required, as he may deem necessary or desirable. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws.
- B. The Contractor shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the Local Public Agency with reports concerning these matters.
- C. The Contractor shall indemnify and save harmless the Local Public Agency, and the Engineer, from any claims for damages resulting from personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this Contract.

1.29 SANITARY FACILITIES

- A. The Contractor shall furnish, install, and maintain ample sanitary facilities for the workmen. As the needs arise, a sufficient number of enclosed temporary toilets shall be conveniently placed as required by the sanitary codes of the State and Local Government. Drinking water shall be provided from an approved source, so piped or transported as to keep it safe and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing and governing health regulations.

1.30 USE OF PREMISES

- A. The Contractor shall confine his equipment, storage of materials, and construction operations to the Rights-of-Way to accommodate the permanent construction furnished by the Local Public Agency, or as may be directed otherwise by the Local Public Agency, and shall not unreasonably encumber the site of other public Rights-of-Way with his materials and construction equipment. In case such Rights-of-Way furnished by the Local Public Agency are not sufficient to accommodate the Contractor's operations, he shall arrange with the Local Government, or with the owner or owners of private property for additional area or areas, and without involving the Local Public Agency in any manner whatsoever.
- B. The Contractor shall comply with all reasonable instructions of the Local Public Agency and the ordinances and codes of the Local Government, regarding signs, advertising, traffic, fires, explosives, danger signals, and barricades.

1.31 REMOVAL OF DEBRIS, CLEANING, ETC.

- A. The Contractor shall periodically or as directed during the progress of the work, remove and legally dispose of all surplus excavated material and debris, and keep the project site and public Rights-of-Way reasonably clear. Upon completion of the work, he shall remove all temporary construction facilities, debris and unused materials provided for the work, and put the whole site of the work and public Rights-of-Way in a neat and clean condition. Trash burning on the site of the work will be subject to prior approval of the Local Public Agency

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and existing State and local regulations.

1.32 RETURN OF OWNER'S MATERIALS, EQUIPMENT OR PROPERTY

- A. Any materials, equipment or other property which belongs to the Owner, removed by the Contractor, shall be delivered to the Owner's designated warehouse unless its re-use is specified in the Plans and Specifications. If the Contractor fails to deliver the materials, equipment or other property, its value as determined by the Engineer shall be deducted from amounts due the Contractor.

1.33 OBSERVATION OF WORK

- A. The Engineer, his authorized representative, and any Federal, State, County or local authority representative having jurisdiction over any part of the work or area through which the work is located, shall at all times have access to the work in progress.
- B. The detailed manner and method of performing the work shall be under the direction and control of the Contractor, but all work performed shall at all times be subject to the observation of the Engineer or his authorized representative to ascertain its conformance with the Contract Documents. The Contractor shall furnish all reasonable aid and assistance required by the Engineer for the proper observation and examination of the work and all parts thereof.
- C. The Engineer is not responsible for the Contractor's means, methods, techniques, sequences or procedures of construction, or safety precautions and programs incident thereto.
- D. Observers may be appointed by the Engineer or Owner. Observers shall have no authority to permit any deviation from the Plans and Specifications except on written order from the Engineer and the Contractor will be liable for any deviation except on such written order. Observers shall have authority, subject to the final decision of the Engineer, to condemn and reject any defective work and to suspend the work when it is not being performed properly.
- E. The observer shall in no case act as superintendent or foreman or perform other duties for the Contractor, nor interfere with the management of the work by the latter. Any advice which the observer may give the Contractor shall in no way be construed as binding to the Engineer in any way or releasing the Contractor from fulfilling all of the terms of the Contract.
- F. Any defective work may be rejected by the Engineer at any time before final acceptance of the work, even though the same may have been previously overlooked and estimated for payment and payment therefor made by the Owner.
- G. The Contractor shall notify the Engineer sufficiently in advance of backfilling or concealing any facilities to permit proper observation. If the facilities are concealed without approval or consent of the Engineer, the Contractor shall uncover for observation and recover such facilities all at his own expense, when so requested by the Engineer.
- H. Should it be considered necessary or advisable by the Engineer at any time before final acceptance of the entire work to make an examination of work already completed, by uncovering the same, the Contractor shall on request promptly furnish all necessary facilities, labor, and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his Subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the actual cost of labor and material necessarily involved in the examination and replacement, plus fifteen (15) percent of such costs to cover superintendence, general expenses and profit, shall be allowed the

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Contractor and he shall, in addition, if completion of the work of the entire Contract has been delayed thereby, be granted a suitable extension of time on account of the additional work involved.

- I. Observation of materials and appurtenances to be incorporated in the Improvements embraced in this Contract may be made at the place of production, manufacture or shipment, whenever the quantity justifies it, and such observation and acceptance, unless otherwise stated in the Technical Specifications, shall be final, except as regards (1) latent defects, (2) departures from specific requirements of the Contract, (3) damage or loss in transit, or (4) fraud or such gross mistakes as amount to fraud. Subject to the requirements contained in the preceding sentence, the observation of materials as a whole or in part will be made at the project site.
- J. All condemned or rejected work shall be promptly taken out and replaced by satisfactory work. Should the Contractor fail or refuse to comply with the instructions in this respect, the Owner may, upon certification by the Engineer, withhold payment, proceed to terminate the Contract or perform work as provided herein.

1.34 REVIEW BY LOCAL PUBLIC AGENCY OR OWNER

- A. The Local Public Agency, its authorized representatives and agents, shall at all times during work hours have access to and be permitted to observe and review all work, materials, equipment, payrolls, personnel records pertaining to this Contract, provided, however, that all instructions and approval with respect to the work will be given to the Contractor only by the Local Public Agency through its authorized representatives or agents. Representatives of Federal, State, and local government agencies also have the right of physical inspection of the work during work hours.

1.35 PROHIBITED INTERESTS

- A. No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer, or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof.

1.36 FINAL INSPECTION

- A. When the Improvements embraced in this Contract are substantially completed, the Contractor shall notify the Local Public Agency in writing that the work will be ready for final inspection on a definite date which shall be stated in the notice. The notice will be given at least ten (10) days prior to the date stated for final inspection, and bear the signed concurrence of the representative of the Local Public Agency having charge of observation. If the Local Public Agency determines that the status of the Improvements is as represented, it will make the arrangements necessary to have final inspection commenced on the date stated in the notice, or as soon thereafter as practicable. The inspection party will also include the representatives of each Department of the Local Government and any other involved government agencies when such improvements are later to be accepted by the Local Government and/or other government agencies.

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1.37 PATENTS

- A. The Contractor shall hold and save harmless the Local Public Agency, its officers, and employees, from liability of any nature or kind, including costs and expenses, for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Local Public Agency, unless otherwise specifically stipulated in the Technical Specifications.

1.38 WARRANTY OF TITLE

- A. No material, supplies, or equipment for the work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the Local Public Agency free from any claims, liens, or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this Contract shall have any right to a lien upon any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Local Public Agency. The provisions of this paragraph shall be inserted in all subcontracts and material Contracts and notice of its provisions shall be given to all persons furnishing materials for work when no formal Contract is entered into for such materials.

1.39 GENERAL GUARANTY

- A. Neither the final certificate of payment nor any provision in the Contract nor partial or entire use of the Improvements embraced in this Contract by the Local Public Agency or the public shall constitute an acceptance of work not done in accordance with the Contract or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall promptly remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within a period of twelve (12) months from the agreed upon day of final acceptance of the work. The Local Public Agency will give notice of defective materials and work with reasonable promptness.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 007300

SUPPLEMENTARY CONDITIONS

PART 1 - GENERAL

1.01 PROGRESS SCHEDULE

- A. The Contractor shall submit a construction contract schedule of the bar graph (or other approved) type seven (7) calendar days prior to the preconstruction conference showing the following information as a minimum:
 - 1. Actual date construction is scheduled to start if different from the date of notice to proceed.
 - 2. Planned contract completion date.
 - 3. Beginning and completion dates for each phase of work.
 - 4. Respective dates for submission of shop drawings and the beginning of manufacture, the testing of, and the installation of materials, supplies, and equipment.
 - 5. All construction milestone dates.
 - 6. A separate graph showing work placement in dollars versus contract time. The schedule shall incorporate contract changes as they occur. The schedule shall be maintained in an up-to-day condition and shall be available for inspection at the construction site at all times.
- B. The construction contract schedule shall be submitted in conjunction with and/or in addition to any other specification requirements concerning schedules.

1.02 DRAWINGS

- A. Five (5) sets of Plans and Specifications shall be furnished to the Contractor, at no charge, for construction purposes. If Plans have been reduced to one-half size, three (3) sets of those together with two (2) sets reproduced on the original scale shall constitute the five (5) sets of Plans furnished to the Contractor. Additional copies may be obtained at cost of reproduction upon request.
- B. The Contractor shall keep one (1) copy of all drawings and Contract Documents in good condition readily accessible at the site of the work available to the Engineer and his authorized representatives.

1.03 RECORD DRAWINGS

- A. Before any work is started, the Contractor shall obtain one set of Plans to be used for Record Drawings. Record Drawings will be kept on full-size plan sheets; no half-size sheets will be permitted. The Record Drawings shall be stored and maintained in good condition at all times by the Contractor and shall be made available to the Engineer at the work site immediately at the Engineer's request. All writing, notes, comments, dimensions, etc. shall be legible. The Record Drawings shall be stored flat and shall not be rolled. The Record Drawings shall be submitted to the Engineer before the project can be accepted.

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- B. The Contractor's work shall be documented on the Record Drawings in an on-going manner. Distances, offsets, depths, etc. shall be accurately measured from permanent fixed objects so that the Owner can expose any item of the work in the future with a minimum of effort. All such measurements shall be made before the items of work are covered or backfilled. The Contractor shall be required to expose and recover/backfill the work at his own expense if, in the Engineer's opinion, the measurements need to be verified.

1.04 TRENCH AND EXCAVATION SAFETY SYSTEM

- A. The OSHA Standard for Excavation and Trenches Safety System found in 29 CFR 1926, Subpart P requires trench and excavation safety measures for excavations greater than 5 feet. These Standards shall conform to the following requirements.
- B. Trench Excavation and Safety System: All work under this item shall be in accordance with the current edition of the OSHA Standard for Excavation and Trench Safety Systems, 29 CFR 1926 Subpart P.
- C. The Contractor shall notify all utility companies and Owners in accordance with the OSHA requirements given in 29 CFR 1926.651(b)(2) for the purpose of locating utilities and underground installations.
- D. Where the trench or excavation endangers the stability of a building, wall, street, highway, utilities, or other installation the Contractor shall provide support systems such as shoring, bracing, or underpinning to ensure the stability of such structure or utility.
- E. The Contractor may elect to remove and replace or relocate such structures or utilities with the written approval of the Utility Owner, the Engineer, and the Owner.
- F. Payment for the work required by this item shall be included in the lump sum price bid for Trench and Excavation Safety listed in the Unit Price Schedule herein. After award of the contract, the Contractor shall submit to the Engineer a breakdown of cost for the trench excavation and safety work involved in the lump sum price bid and shall, with each periodic payment request, submit a certification by the "competent person" as defined in 29 CFR 1926.650(b) that the Contractor has complied with the provisions of the OSHA Standard for Excavation and Trench Safety Systems, 29 CFR 1926 Subpart P, for work for which payment is requested.

1.05 STORM WATER POLLUTION PREVENTION PLAN

- A. The Arkansas Department of Environmental Quality has issued NPDES Permit No. ARR150000 to cover projects disturbing more than one acre. The City has prepared a Storm Water Pollution Prevention Plan to identify the specific and general best management practices to be incorporated in the permit to conform to the ADEQ Permit.
- B. The Contractor and his subcontractors will be required to sign the appropriate certification in the Storm Water Pollution Prevention Plan. The provisions of this Plan and revisions thereof shall be strictly adhered to by the contractor and his subcontractors.
- C. No additional payments will be made to the contractor for conformance to this Plan other than payment for the specific items of work listed in the Unit Price Schedule. All general compliance cost associated with adhering to the Plan will be considered subsidiary to the general items of the contract.

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- D. Fines or penalties imposed on the City of Conway by the Arkansas Department of Environmental Quality due to noncompliance with the Permit or Plan will be deducted from payments due the contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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CITY OF CONWAY, ARKANSAS

SECTION 007400

SPECIAL CONDITIONS

PART 1 - GENERAL

1.01 GENERAL

- A. The provisions of this section of the Specifications shall govern in the event of any conflict between them and the "General Conditions".

1.02 LOCATION OF PROJECT

- A. This project is located in the City of Conway, Faulkner County, Arkansas. The work for this project involves construction of a park setting and water quality demonstration park and associated drainage and other features bordered by Markham Street, Willow Street (unconstructed), Spencer Street and Garland Street.

1.03 SCOPE OF WORK

- A. The work to be performed under this Contract consists of furnishing all materials, labor, supervision, tools and equipment necessary for demolition of buildings and site elements, drainage improvements, grading, concrete pavement, permeable paver pavement, gabion retaining wall construction, aggregate and boulder placements, stone slab retaining wall, aggregate pavement, monumental and informational signage, composite decking system, irrigation, planting, seeding and short term maintenance and establishment as shown on the plans.

1.04 TIME ALLOTTED FOR COMPLETION

- A. The time allotted for completion of the work shall be two hundred seventy (270) consecutive calendar days, which time shall begin with ten (10) days of the work order or notice to proceed, or upon the date the Contractor moves on the site to begin the work, whichever is the earliest date. After award of the Contract is made and the Contract Documents are completed, the Engineer shall issue a Work Order, notifying the Contractor to proceed with the construction of the project, subject to the provisions of this paragraph.

1.05 FORMS, PLANS AND SPECIFICATIONS

- A. Forms of Proposal, Contract and Bonds, and Plans and Specifications may be examined and obtained Mayor's Office at the Conway City Hall, 1201 Oak Street in Conway, Arkansas, at the cost of fifty dollars per set (\$35.00), no refund will be made. Electronic copies of these documents can also be obtained from the Mayor's office at no charge.

1.06 LIQUIDATED DAMAGES FOR DELAY

- A. The Contractor agrees that time is the essence of this Contract, and that for each day of delay beyond the number of calendar days herein agreed upon for the completion of the work herein specified and contracted for (after due allowance for such extension of time as is provided for in General Conditions), the Owner may withhold, permanently, from the Contractor's total compensation, the sum of Five Hundred Dollars (\$500.00) as stipulated damages for each day of such delay.

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1.07 KNOWLEDGE OF CONDITIONS

- A. The Contractor states that he has examined all the available records and has made a field examination of the site and right-of-way and that he has informed himself about the character, quality and quantity of surface and subsurface materials and other conditions to be encountered; the quantities in various sections of the work; the character of equipment and facilities needed for the prosecution of the work; the location and suitability of all construction materials; the local labor conditions; and all other matters in connection with the work and services to be performed under this contract.
- B. Any records of surface and subsurface conditions, water conditions, or other observations that have been made by the Engineer or the Owner have been done with reasonable care and accuracy and will be made available to the Contractor for his information. The Contractor acknowledges that there is no expressed or implied guarantee as to the accuracy or interpretation of the records, conditions and hazards involved and that he has not relied upon any representation of the Owner or Engineer.

1.08 COORDINATION OF WORK WITH OTHERS

- A. The Contractor shall coordinate his work with the various utility companies serving this area. Utilities are located in close proximity to the work or within the work area and adjustments to utility line and service lines are anticipated. Prior to commencement of work the contractor shall contact Arkansas One Call for field location of all utilities. Anticipated utility conflicts and adjustment of utilities shall be coordinated with the appropriate utility company prior to commencement of construction.

1.09 REFERENCE SPECIFICATIONS

- A. Where reference is made in these Specifications to specifications compiled by other agencies, organizations or departments, such reference is made for expediency and standardization, and such specifications (latest edition thereof) referred to are hereby made a part of these Specifications.

1.10 LAYOUT OF THE WORK

- A. The contractor will establish and reference benchmark coordinates of the construction prior to commencement of work. The contractor will be provided a copy of the pertinent survey data. The contractor shall provide all the necessary construction layout work for proper control of the work. The work shall be performed by a competent surveyor experienced in construction layout work and being an Arkansas Registered Land Surveyor. Field set hub or stake elevations set by the contractor shall also be provided to the city.
- B. The City Engineer will review the survey data and establish the finished grades for the project or may elect to proceed with the grades as shown on the plans.

1.11 USED MATERIALS

- A. No material which has been used by the Contractor for any temporary purpose whatever is to be incorporated in the permanent structure without written consent of the Engineer.

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1.12 MAINTENANCE OF TRAFFIC AND ACCESS TO PRIVATE DRIVES

- A. Ingress and egress to residences shall be maintained at all times. With appropriate notification and approval by the engineer, the roadway or lanes may be temporarily closed for short periods of time. Temporary driveways and access roads shall be provided as necessary. Appropriate barricades, road or lane closure signage and detour signs shall be provided by the contractor to route traffic thru the construction area.

1.13 NOT USED

1.14 BARRICADES, LIGHTS AND WATCHMEN

- A. Where the work is carried on or adjacent to any street, alley or public place, the Contractor shall, at his own cost and expense, furnish and erect such barricades, fences, lights and danger signals, shall provide such watchmen, and shall provide such other precautionary measures for the protection of persons or property and of the work as are necessary.
- B. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise the Contractor shall furnish and maintain at least one light at each barricade and sufficient number of barricades shall be erected to keep vehicles from being driven on or into any work under construction. The Contractor shall furnish watchmen in sufficient numbers to protect the work.
- C. The Contractor will be held responsible for all damage to the work due to failure to barricades, signs, lights, and watchmen to protect it, and whenever evidence is found of such damage the Engineer may order the damaged portion immediately removed and replaced by the Contractor at his cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights, and for providing watchmen, shall not cease until the project shall have been accepted by the Owner.

1.15 FENCES AND DRAINAGE CHANNELS

- A. Boundary fences or other improvements removed to permit the installation of the work shall be replaced in the same location and left in a condition as good or better than that in which they were found except as indicated on the Drawings.
- B. Where surface drainage channels are disturbed or blocked during construction, they shall be restored to a grade that will provide for positive drainage after the work of construction is completed and prevent any ponding of water.

1.16 NOT USED

1.17 MATERIAL STORAGE

- A. Materials delivered to the site of the work in advance of their use shall be stored so as to cause the least inconvenience and in a manner satisfactory to the Engineer.

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1.18 EXISTING UTILITIES AND SERVICE LINES

- A. The Contractor shall be responsible for the protection of all existing utilities or improvements crossed by or adjacent to his operations. The contractor shall be responsible for coordination of the adjustment of utility lines or service lines. The contractor shall meet with Conway Corporation, Center Point Energy, AT&T, and Windstream after initial field marking of the utilities and layout of the construction work to identify required adjustments. The utility companies are responsible for adjustment of their utilities to avoid conflicts with construction. The contractor is responsible for repair of damage to utilities or service lines existing prior to the job or after the required utility adjustment has been completed by the utility company. Where existing utilities or service lines are cut, broken or damaged, the Contractor shall be responsible for payment to the utility company for the utility companies replace or repair of utility lines damaged by the contractors work. The Arkansas One Call service and the Conway Corporation shall be called prior to excavation in an area.

1.19 TESTING, INSPECTION AND CONTROL

- A. Testing and control of all materials used in the work shall be done by an approved commercial laboratory employed and paid directly by the Owner, unless otherwise specified in the Technical Specifications. The Contractor shall furnish, at his own expense, all necessary specimens for testing of the materials, as required by the Engineer.

1.20 BOND

- A. Coincident with the execution of the Contract, the Contractor shall furnish a good and sufficient surety bond in the full amount of the Contract sum, guaranteeing the faithful performance of all covenants, stipulations and agreements of the Contract, the payment of all bids and obligations arising from the execution of the Contract, which bills or obligations might or will in any manner become a claim against the Owner, and guaranteeing the work included in this Contract against faulty materials and/or poor workmanship for one (1) year after the date of completion of Contract.
- B. All provisions of the bond shall be complete and in full accordance with Statutory requirements. The bond shall be executed with the proper sureties through a company licensed and qualified to operate in the state and approved by the Owner. The issuing agent's power of attorney shall be attached to the bond and the bond shall be signed by an agent resident in the state and date of bond shall be the date of execution of the Contract. If at any time during the continuance of the Contract the surety on the Contractor's bond becomes irresponsible the Owner shall have the right to require additional and sufficient sureties which the Contractor shall furnish to the satisfaction of the Owner within ten (10) days after notice to do so. In default thereof, the Contract may be suspended, all payments or money due the Contractor withheld.

1.21 LIGHT AND POWER

- A. The Contractor shall provide, at his own expense, temporary lighting and facilities required for the proper prosecution and inspection of the work.

1.22 NOT USED

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1.23 LEGAL HOLIDAYS

- A. January 1, Memorial Day, July 4, Labor Day, Thanksgiving and December 25 will be considered as being holidays; no other days will be so considered. No engineering observation will be furnished on legal holidays or Sundays, except in an emergency. The Contractor shall observe the legal holidays and Sundays, and no work shall be performed on these days except in an emergency. However, these days shall not be excluded from Contract time.

1.24 PAY ITEM DESCRIPTION

- A. The method of measurement and payment of the various pay items listed in the unit price schedule are described in the technical specifications. All items of work not specifically listed in the unit price schedule shall be considered subsidiary to the items of work listed in the unit price schedule. The contractor shall be responsible for including the cost of items not specifically listed in the various other items of the contract.
- B. Included in the items considered subsidiary to the other items of the contract are compaction, maintenance of traffic, temporary driveways, fence relocation, fence remove and replace, removal of existing drainage pipes and removal of concrete driveways and concrete paving.

1.25 SEQUENCE OF CONSTRUCTION

- A. Sequence of all phases of work shall be such as to provide for the least possible inconvenience to the Owner and Public and to the operation of this facility. Scheduling of work which would interfere with operation shall be coordinated with the Owner. Material and equipment received on the project prior to time of installation shall be stored at such locations designated by the Owner.
- B. The successful Contractor shall furnish a proposed work schedule to the Engineer for review and approval as soon as possible after award of the Contract. This schedule shall show anticipated equipment delivery schedules and times of beginning and completing of the several work tasks.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 011000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, appurtenances and services necessary for and incidental to performing the proper completion of entirety of Work as set forth in the contract documents including but not limited to the plan and specification documents, addenda and contract for the entirety of the project scope area defined, as shown in the Contract Drawings, and as specified herein this Section.

- B. Work under this Section consists of, but is not necessarily limited to the following:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work by Owner or Owner.
 - 5. Work under separate contracts.
 - 6. Future work.
 - 7. Purchase contracts.
 - 8. Owner-furnished products.
 - 9. Contractor-furnished, Owner-installed products.
 - 10. Access to site.
 - 11. Coordination with occupants.
 - 12. Work restrictions.
 - 13. Specification and drawing conventions.
 - 14. Miscellaneous provisions.

- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
 - 3. City of Conway Supplemental information and specifications.

1.2 PROJECT INFORMATION

- A. Project Identification: Markham Street Water Quality Demonstration Project – (CAKT 001)
 - 1. Project Location: Bound by Markham, Garland, Spencer, and Willow (unconstructed) Streets, City of Conway, County of Faulkner, State of Arkansas 72032

- B. Owner: City of Conway, Arkansas and any related affiliates.

- C. Landscape Architect: SWA Group (Prime Design Consultant)

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- D. Entity Reference and Description:
1. Owner Reference - All references in Documents (Specifications and Plans) of "Owner" shall generally refer to or provide meaning towards City of Conway, Arkansas unless otherwise specified.
 2. Client Reference - All references in Documents (Specifications and Plans) of "Client" shall generally refer to or provide meaning towards City of Conway, Arkansas or its designated representative(s), unless otherwise specified.
 3. All references in Documents (Specifications and Plans) of "Owner('s) Representative" or "Client('s) Representative" shall generally mean a Representative of the City of Conway, Arkansas, contracted through City of Conway Arkansas or their approved affiliate herein noted or to be determined at a later date, unless otherwise specified.
 4. All references in Documents (Specifications and Plans) of "Landscape Architect" or "Architect" shall generally refer to or provide meaning towards "Landscape Architect" which is direct reference to SWA Group, Prime Design Consultant for this project, unless otherwise specified, and its contracted sub-consultants.
- E. Landscape Architect's Consultants: The Landscape Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Civil Engineer: Gavin R Smith Civil Engineering, LLC.
 2. Accessibility Consultant: Accessibility Resource Specialists (ARS).
- F. Other Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Geotechnical Consultant:
 - a. Documents prepared include information and documentation in or part of Specification Section (Participatory) - 003119 "Existing Conditions Information".
- G. The Architect or Engineer shall have the authority to specify the sequence of work to be performed for all work specified within the scope of the project.
- H. The Contractor shall provide and maintain access at all times for all business and residential locations during the construction as a non-pay item.
- I. The City of Conway shall not reimburse the Contractor for any water used to perform the work as required in this contract.
- J. The Contractor shall review and understand the requirements for solid waste disposal in the City of Conway.
- K. The use of explosives will not be permitted on this project.
- L. PROPERTY PRESERVATION
1. The Contractor shall be responsible for the preservation and protection of all trees, shrubs, sprinkler systems, fences, and other property owner improvements located within the limits of construction to remain. The destruction or damage of said property owner improvements by the Contractor designated for preservation shall be replaced or repaired at the Contractor's expense.

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M. TRAFFIC CONTROL

1. The Contractor shall route traffic and barricade all roads as required by the City of Conway Traffic and Transportation Department. The information concerning the traffic control requirement can be obtained from the Engineer prior the bid opening. All barricades, signs and traffic control devices required for the project shall be a non-pay item.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The renovation of a residential square block to provide a new water quality and storm water management system intricated into a park setting bordered by Markham, Garland, Spencer and Willow (unconstructed) Streets. All work will be site related and shall generally include the following major elements of scope. Note that this is not a full or exhaustive description of all scope of work.
 - a. Building Demolition Scope.
 - b. Selective Site Demolition, Salvage and Site Clearing Scope.
 - c. Tree Preservation / Mitigation / Maintenance.
 - d. Mass Grading and Excavation Construction.
 - e. Civil and Site Drainage Construction.
 - f. Concrete Pavement Construction.
 - g. Concrete Foundation Construction.
 - h. Salvaged Concrete Pavement Work
 - i. Aggregate Paving Construction.
 - j. Stone Block Masonry Construction.
 - k. Site Electrical and Lighting Work
 - l. Permeable Pavers Construction.
 - m. Gabion Retaining Wall Construction.
 - n. Composite Decking Construction.
 - o. Monumental and Information Signage Scope
 - p. Landscape/Irrigation Construction.
 - q. Furniture Provision/Installation.

1.4 DOCUMENTS

- A. Documents listed in Table of Contents, Section 000110 and List of Drawings Sheets, Sheet Index on plan Sheet L0.0.0 are furnished by Landscape Architect or other consultants, and are part of the contract documents.

1.5 FUTURE WORK

- A. The Contract Documents include requirements that will allow Owner or Owner to carry out future work following completion of this Project; provide for the following future work:
 1. Numerous Scopes including decking, lighting etc. as noted, and in some cases not noted in the documents.

1.6 ACCESS TO SITE

- A. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

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1. Limits: Confine construction operations to area sections in contract documents – Scope of Work Limits.
2. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to limits within contract documents.
3. Private (non-park) Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to such Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
4. Public Roadways and Entrances: Keep public roadways, entrances and other public elements open that are not affected by the Work. Do not use these areas for parking or storage of materials unless contracted otherwise with the City of Conway.

1.7 PROJECT LIMITS

- A. The Contractor shall confine his operations to the limits of the right-of-way and easements furnished by the City of Conway.
- B. The Contractor shall use extreme caution when working adjacent to the yards of property owners so as to minimize the inconvenience to the public caused by the work herein.
- C. When the Contractor is in doubt of the right-of-way or alignment, the Contractor shall request and follow the directions of the Engineer.
- D. Any property corner or right-of-way marker removed or destroyed shall be replaced at the Contractor's expense.

1.8 COORDINATION WITH OCCUPANTS

- A. Public Limited Occupancy of Completed Areas of Construction: Owner reserves the right to allow occupancy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 1. Landscape Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 2. Before limited Public occupancy, any electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 3. On occupancy, Owner will assume responsibility for custodial service for occupied portions of Work.

1.9 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.

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1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in to normal business working hours of 7 a.m. to 6 p.m., Monday through Friday, unless otherwise indicated.
1. Weekend Hours: Saturdays per City of Conway Restrictions and regulations.
 2. Early Morning Hours: Hours per City of Conway Restrictions and regulations.
 3. Hours for Utility Shutdowns: 9 a.m. to 4 p.m., Monday thru Friday only and per City of Conway Restrictions and regulations.
 4. Hours for Noise Activities: 7 a.m. to 6 p.m., Monday thru Friday only and per City of Conway Restrictions and regulations.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Landscape Architect and Owner not less than five (5) days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to neighboring residents.
1. Notify Landscape Architect and Owner not less than five (5) days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Controlled Substances: Use of tobacco products and other controlled substances on the Project Site is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.
- 1.10 SPECIFICATION AND DRAWING CONVENTIONS
- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

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- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations and scheduled on Drawings.

1.11 Special Requirements

- A. Contractor shall assume responsibility for the protection of all crews and shall protect existing property, neighboring property and trees as required during the construction period. Existing surfaces that are to remain shall be properly protected and in the extent of any damage due to construction operations or personnel shall be patched or replaced to original content as approved by Owner.
- B. A Pre-Conditions Photography or Videographer survey shall be conducted by contractor prior to any work or scope occurring and provided to Owner and Landscape Architect.
- C. Contractor shall assume responsibility for the safety of all neighboring pedestrians and passers-bys. Contractor shall also assume responsibility for securing of site and all materials/products during the construction period.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including Substitution Procedures of the Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to administrative and procedural requirements for substitutions.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor, Owner or Client that are not required in order to meet other Project requirements but may offer advantage to Contractor, Owner or Client.

1.3 ACTION SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.

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- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- E. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- F. Substitution Requests: Submit four (4) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner or Client and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

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3. Landscape Architect's Action: If necessary, Landscape Architect will request additional information or documentation for evaluation within five (5) days of receipt of a request for substitution. Landscape Architect will notify Contractor of acceptance or rejection of proposed substitution within (10) ten days of receipt of request, or five (5) days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or Landscape Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Landscape Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than (10) ten days prior to time required for preparation and review of related submittals.
 1. Conditions: Landscape Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Landscape Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - j. Requested substitution provides no or minor (less than 1%) cost additions to contracts.

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- B. Substitutions for Convenience: Submit requests for substitution immediately on discovery of need for change, but not later than (10) ten days prior to time required for preparation and review of related submittals.
1. Conditions: Landscape Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Landscape Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - j. Requested substitution provides no or minor (less than 1%) cost additions to contracts.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including Contract Modification Procedures of the Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Section includes administrative and procedural requirements for handling and processing Contract modifications.
 - a. Section 006000 "Project Forms".
 - b. Section 012500 "Substitution Procedures".

1.2 MINOR CHANGES IN THE WORK

- A. Landscape Architect will issue through Owner (or their designated representative) supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions".

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Landscape Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Landscape Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Requests or when not otherwise specified ten (10) days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Landscape Architect and Client.

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- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner and Client (or their designated representative) and Landscape Architect.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 7. Proposal Request Form: Use form acceptable to Landscape Architect and Client.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change(s) Proposal Request, Landscape Architect will issue a Change Order for signatures of Owner and Owner (or their designated representatives) and Contractor on AIA Document G701.
- B. City of Conway Council is the only body of Owner allowed to authorize any Change Order(s) to this project and any work that shall occur prior to that authorization shall be at contractor's sole responsibility and risk.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Work Change Directive: Landscape Architect may issue a Work Change Directive on AIA Document G714 or EJCDC Document C-940. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including requirements for Project Management and Coordination of the Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - a. General coordination procedures.
 - b. Coordination drawings.
 - c. Requests for Information (RFIs).
 - d. Project meetings.
- C. Each contractor shall participate in coordination requirements. Certain areas of responsibility are/may be assigned to a specific contractor.
- D. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 017300 "Executive Requirements".
 - 3. Section 017700 "Closeout Procedures".

1.2 DEFINITIONS

- A. RFI: Request from Owner, Landscape Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.

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- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- E. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- F. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- G. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Provide copies of list to Architect for distribution to parties as required. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.

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8. Startup and adjustment of systems.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in a contractor generated form as specified in Section 1.6.C below.

1. Landscape Architect will return RFIs submitted to Landscape Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

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

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Electronic Software-generated form by contractor with at minimum the same content as indicated above, acceptable to Landscape Architect and Client.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

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- D. Architect's Representative's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Client's Representative response for each RFI. RFIs received by Architect after 2:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect action may include a request for additional information, in which case Client's Representative time for response will date from time of receipt of additional information.
 3. Architect action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner or Client (or their designated representatives) and Landscape Architect in writing within ten (10) days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly by Friday at 3:00 p.m. Submit log with not less than the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Client's Representative.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Landscape Architect's response was received.
- F. On receipt of Architect's or Owner/Client (or their designated representative) action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Landscape Architect within five (5) days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- 1.6 PROJECT MEETINGS
- A. General: Contractor will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
 2. Agenda: Distribute the agenda to all invited attendees.

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3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Client (or their designated representatives) and Landscape Architect within three (3) days of the meeting.
 4. Representatives or contractor and subcontractors and major suppliers (if needed) attending meeting shall be qualified and authorized to act on behalf of entity each represents.
 5. The Owner and/or Client (or their designated representative(s)) and Landscape Architect will be present.
- B. Preconstruction Conference: Contractor will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Client (or their designated representatives), Landscape Architect and Contractor, but no later than fifteen (15) days after execution of the Agreement.
1. Conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Client and Landscape Architect; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.
 - c. Designation of key personnel and their duties.
 - d. Lines of communications.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Working hours.
 - o. Alternates
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Proposed Sub-Contractors
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
 5. A site visit and walk through shall be a part of the meeting.

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- C. Preinstallation Conferences: Conduct a Preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner and Client (or their designated representatives), and Landscape Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Contractor will schedule and conduct a project closeout conference, at a time convenient to Owner and Client (or their designated representatives), Landscape Architect and Contractor, but no later than thirty (30) days prior to the scheduled date of Substantial Completion.
1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Client along with and Landscape Architect; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

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3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Responsibility for removing temporary facilities and controls.
 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Contractor will conduct progress meetings at established intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Client and Landscape Architect, each contractor, subcontractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.

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- 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
- a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Contract Close-out Meeting
1. A contract close-out meeting will be held upon notification by the contractor that the punch list and any other outstanding item previously discussed has been completed.
 2. Representative of the Owner and Client (or their designated representatives), Landscape Architect and Contractor will be present.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including Progress Documentation of Construction of the Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - a. Startup construction schedule.
 - b. Contractor's construction schedule.
 - c. Construction schedule updating reports.
 - d. Weekly construction reports.
 - e. Material location reports.
 - f. Site condition reports.
 - g. Special reports.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 013300 "Submittal Procedures".
 - 3. Section 014000 "Quality Requirements".

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Client.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

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- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Client or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
 - 3. Four (4) paper copies.
- B. Startup construction schedule.
 - 1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.

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- G. Weekly Construction Reports: Submit weekly.
- H. Site Condition Reports: Submit at time of discovery of differing conditions.
- I. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages, area separations, and interim milestones.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review submittal requirements and procedures.
 - 7. Review time required for review of submittals and re-submittals.
 - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9. Review time required for Project closeout and Owner startup procedures.
 - 10. Review and finalize list of construction activities to be included in schedule.
 - 11. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

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- B. Activities: Treat each area as a separate numbered activity for each main element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Landscape Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and re-submittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Landscape Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 5. Punch List and Final Completion: Include not more than (15) fifteen days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.

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- k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
- 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
- E. Recovery Schedule: When periodic update indicates the Work is 14 fourteen or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- F. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
- 2.2 STARTUP CONSTRUCTION SCHEDULE
- A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven (7) days of date established for the Commencement of Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- 2.3 REPORTS
- A. Weekly Construction Reports: Prepare a weekly construction report recording the following information concerning events at Project site:
- 1. List of subcontractors at Project site and on which days present.
 - 2. List of separate contractors at Project site and on which days present.
 - 3. Approximate count (daily) of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. Temperature Range and general weather conditions, including presence of rain or snow.
 - 7. Accidents.

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8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Work Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Client within two (2) days of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule (1) one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.

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- C. Distribution: Distribute copies of approved schedule to Landscape Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

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SECTION 013300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including requirements for Submittal Procedures, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Submittal schedule.
 - 2. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 013200 "Construction Progress Documentation".
 - 3. Section 017823 "Operation and Maintenance Data".

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Owner or Client (or designated representative) responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Owner or Client (or designated representative) responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

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1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Owner (or designated representative) and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's and Owner/Client (or designated representative) final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Landscape Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Landscape Architect for Contractor's use in preparing submittals.
1. Landscape Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
 - a. Landscape Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD 2016 ".dwg" format.
 - c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner/Client and Landscape Architect.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

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2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect and Owner/Client (or designated representative) reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Client's Representative receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
1. Initial Review: Allow ten (10) business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Landscape Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Re-submittal Review: Allow five (5) business days for review of each re-submittal.
 4. Sequential Review: Where sequential review of submittals by Landscape Architect's consultants, Owner or other parties is indicated, allow fifteen (15) business days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Landscape Architect and to Landscape Architect's consultants, allow (15) business days for review of each submittal. Submittal will be returned to Owner (or designated representative), through Landscape Architect, before being returned to Contractor.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Owner (or designated representative).
 - e. Name of Client (or designated representative).
 - f. Name of Contractor.
 - g. Name of subcontractor.
 - h. Name of supplier.
 - i. Name of manufacturer.
 - j. Submittal number or other unique identifier, including revision identifier.
- 1) Submittal number shall use Specification Section number followed by a space, the designated, sequential number and then a sequential number

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(e.g., 061000 001). Re-submittals shall include an numerical suffix after another space or decimal point (e.g., 061000 001-01).

- k. Number and title of appropriate Specification Section.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Owner or Client observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
- a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Owner or Client (or designated representatives).
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Owner or Landscape Architect (or designated representative) will return without review submittals received from sources other than Contractor.
- a. Transmittal Form for Paper Submittals: Use AIA Document G810 CSI Form 12.1A.
 - b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Landscape Architect.
 - 6) Name of Client's Representative.
 - 7) Name of Contractor.
 - 8) Name of firm or entity that prepared submittal.
 - 9) Names of subcontractor, manufacturer, and supplier.
 - 10) Category and type of submittal.
 - 11) Submittal purpose and description.
 - 12) Specification Section number and title.
 - 13) Specification paragraph number or drawing designation and generic name for each of multiple items.
 - 14) Drawing number and detail references, as appropriate.
 - 15) Indication of full or partial submittal.
 - 16) Transmittal number, numbered consecutively.
 - 17) Submittal and transmittal distribution record.
 - 18) Remarks.
 - 19) Signature of transmitter.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
- 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

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2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a space and then a sequential number (e.g., WSLR 013300-001-00). Re-submittals shall include a numerical suffix after another decimal point or space (e.g., WSLR 013300-001-01).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Client's Representative.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Landscape Architect.
 - d. Name of Client's Representative.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect and Owner/Client (or designated representative) on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- H. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Landscape Architect's and Owner/Client (or designated representative) action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installer's, and authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

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- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Landscape Architect's and Owner/Client (or designated representative) action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Post electronic submittals as PDF electronic files directly to Landscape Architect's FTP site or other management system specifically established for Project.
 - a. Landscape Architect, through Owner/Client (or designated representative), will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. Submit electronic submittals via email as PDF electronic files.
 - a. Landscape Architect, through Owner/Client (or designated representative), will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 3. Submittals: Submit four (4) paper copies of each submittal unless otherwise indicated. Landscape Architect, through Owner/Client (or designated representative), will return two (2) copies.

Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.

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- h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before or concurrent with Samples.
- 6. Submit Product Data in the following format:
 - a. PDF electronic file or.
 - b. Four (4) paper copies of Product Data unless otherwise indicated. Landscape Architect, through Construction Manager, will return two (2) copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Landscape Architect's digital data drawing files is otherwise permitted.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
 - 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Four (4) opaque (bond) copies of each submittal. Landscape Architect, through Owner/Client (or designated representative), will return two (2) copies.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.

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3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Landscape Architect, through Owner/Client (or designated representative), will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three (3) sets of Samples. Landscape Architect and Owner/Client (or designated representative) will retain two (2) Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Location within park space.
 4. Submit product schedule in the following format:
 - a. PDF electronic file.

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- b. Three (3) paper copies of product schedule or list unless otherwise indicated. Landscape Architect, through Owner/Client (or designated representative), will return two (2) copies.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

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- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Client's Representative.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 LANDSCAPE ARCHITECT'S AND OWNER/CLIENT ACTION

- A. Action Submittals: Landscape Architect and Owner/Client (or designated representative) will review each submittal, make marks to indicate corrections or revisions required, and return it. Landscape Architect and Owner/Client (or designated representative) will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:

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- B. Informational Submittals: Landscape Architect and Owner/Client (or designated representative) will review each submittal and will not return it, or will return it if it does not comply with requirements. Landscape Architect and Owner/Client (or designated representative) will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Landscape Architect and Owner/Client (or designated representative).
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for re-submittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Landscape Architect and Owner/Client (or designated representative) without action.

END OF SECTION

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SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including administrative and procedural requirements for Quality Assurance and Quality Control of the Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Quality Assurance reviews and testing
 - 2. Quality Control review, testing and any associated repairs/replacements.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- D. Testing and inspecting services are required to verify compliance with requirements specified or indicated. Testing Laboratory will be contracted directly to the Owner or Client. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and control services required by Landscape Architect, Owner or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Landscape Architect or Client's Representative.

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- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Landscape Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Landscape Architect for a decision before proceeding.

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1.4 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- E. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- F. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- G. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- H. Qualification Data: For Contractor's quality-control personnel.
- I. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Landscape Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Landscape Architect.
- J. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- K. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.

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6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.5 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Client's Representative. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Landscape Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Testing Agency shall prepare and submit certified written reports specified in other Sections. Include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.

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7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representatives making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's and Client's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.7 QUALITY ASSURANCE
- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **Professional Engineer Qualifications:** A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Mockups:** Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Landscape Architect.
 - 2. Notify Client's Representative seven days in advance of dates and times when mockups will be constructed.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Obtain Landscape Architect's and Owner's Representative's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 7. Demolish and remove mockups when directed unless otherwise indicated.

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- K. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.8 QUALITY CONTROL

- A. Owner or Client Responsibilities: Where quality-control services are indicated as Owner's or Client's responsibility, Client/Owner will engage a qualified testing agency to perform these services.
 - 1. Client/Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these testing and inspecting services will be by Client/Owner.
 - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Client are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Client/Owner, unless agreed to in writing by Client/Owner.
 - 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

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- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.9 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Client will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Client.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Client's Representative.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Client's Representative's reference during normal working hours.

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3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Landscape Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Landscape Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Client's Representative. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

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

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

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association (The) www.aluminum.org	(703) 358-2960
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600

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APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
ECA	Electrical Components Association www.ec-central.org	(703)907-8024
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040

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FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
LGSEA	Light Gauge Steel Engineers Association www.arcat.com	(202) 263-4488
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393

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NOMMA	National Ornamental & Miscellaneous Metals Association www.nomma.org	(888) 516-8585
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.cee.uiuc.edu	(217) 333-3929
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Turfgrass Producers International www.turfgrassod.org	(800) 405-8873 (847) 649-5555
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

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IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

- C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999

- D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800

- E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

None at this time.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 014529

TESTING LABORATORY SERVICES

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. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals or public authorities.
- C. Division 02 through 33 Section specifically noting and or requiring test and inspection requirements.

1.2 SUMMARY

A. Work Included:

- 1. Owner will employ and pay for the services of an Independent Testing Laboratory to perform specified testing and services.
- 2. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
- 3. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
- 4. Requirements for Contractor to provide quality-control services required by Landscape Architect, Client's Representative, or authorities having jurisdiction are not limited by provisions of this Section.
- 5. Contractor shall cooperate with the Laboratory to facilitate the execution of its required services.
- 6. Contractor will pay for additional samples and tests required for Contractor's convenience or when initial tests indicate Work does not comply with Contract Documents.
- 7. Certification of products: Respective sections of Specifications.
- 8. Where terms "Inspector" and "Testing Laboratory" are used, they mean and refer respectively to an officially designated and accredited Inspector of the Testing Laboratory and the Testing Laboratory employed by the Owner.

B. Related Work:

- 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.
- 2. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- 3. Divisions 2 through 16, Sections for specific test and inspection requirements.

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1.3 QUALIFICATION OF LABORATORY

- A. Meet "Recommended Requirements for Independent Laboratory Qualifications", published by American Council of Independent Laboratories.
- B. Meet Basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" and ASTM E548.
- C. Authorized to operate in the State in which the project is located.
- D. Testing equipment shall be calibrated at reasonable intervals by devices of accuracy traceable to either:
 - 1. National Bureau of Standards.
 - 2. Accepted values of natural physical constants.

1.4 LABORATORY DUTIES AND RESPONSIBILITIES

- A. Cooperate with Client's Representative , Landscape Architect and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction.
 - 1. Comply with Specifications.
 - 2. Ascertain compliance or non-compliance of materials with requirements of Contract Documents and indicate status of compliance on test reports.
 - 3. Furnish Architect with written evaluation of proposed concrete design mixes, and other materials, submitted by the Contractor for evaluation.
- C. Notify Client's Representative, Landscape Architect and Contractor immediately of observed work or materials which fail to meet the requirements of the Contract Documents.
- D. Submittals: Promptly submit written report of each test and inspection to Client's Representative with copies to the Landscape Architect and Contractor and others specifically designated by the Client's Representative. Each report shall include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Testing Laboratory name, address and telephone number.
 - 4. Name and signature of Laboratory inspector.
 - 5. Date and time of sampling or inspection.
 - 6. Record of temperature and weather conditions.
 - 7. Date of tests.
 - 8. Identification of products and Specification section.
 - 9. Location of sample or test in the Project.
 - 10. Type of inspection or test.
 - 11. Results of tests and compliance or non-compliance with Contract Documents.
 - 12. Interpretation of test reports, when requested by Architect.
- E. Perform additional tests as required by Landscape Architect or Client's Representative.

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1.5 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the Work.
 - 3. Perform any duties of the Contractor.
- B. Work will be checked as it progresses, but failure to detect any defective work or materials shall not, in any way, prevent later rejection when such defect is discovered.

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Laboratory personnel, provide access to Work and to Manufacturer's operations.
- B. Secure and deliver to the Laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
- C. Furnish the Laboratory with proposed concrete design mixes, and other material mixes which require evaluation by the Testing Laboratory, a minimum of 14 days prior to use on the project.
- D. Furnish copies of Project's test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For safe storage and curing of test samples.
- F. Notify Laboratory, Client's Representative and Landscape Architect 24 hours in advance of operations to allow for Laboratory assignment of personnel and scheduling of tests.
 - 1. When tests or inspections cannot be performed after such notice, reimburse Laboratory for personnel and travel expenses incurred due to Contractor's negligence.
 - 2. Make arrangements with Laboratory and pay for additional samples and tests required for Contractor's convenience.
 - 3. Make arrangements with Laboratory and pay for additional samples and tests required when initial tests indicate non-compliance with Contract Documents, including load tests.
 - 4. Pay the Testing Laboratory for such tests or inspections as are performed exclusively for the Contractor's convenience, or beyond scope requirements of general conditions.

PART 2 - PRODUCTS

- 2.1 Refer to each Specification Section for Testing and Inspection Requirements.

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PART 3 - EXECUTION

3.1 Refer to each Specification Section for Testing and Inspection Requirements.

END OF SECTION

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SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including requirements for temporary facilities, support facilities and security and protection facilities, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Temporary utilities.
 - 2. Temporary support facilities
 - 3. Temporary security and protection facilities.
 - 4. Pandemic Control facilities and requirements.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 011000 "Summary of Work".
 - 3. Section 013300 "Submittal Procedures".
 - 4. Section 015639 "Temporary Tree and Plant Protection"
 - 5. Section 017300 "Execution Requirements".
 - 6. Section 017419 "Construction Waste Management and Disposal".

1.2 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner (or representative), Client (or representative), Design Team, Testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Refer to City of Conway Bid and Contract Information provided by owner.
- C. Water Service: Refer to City of Conway Bid and Contract Information provided by owner.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.

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- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- H. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- I. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- J. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- K. Construction staging and site access plan is required for each entry.
 - 1. Show access, construction lay down/storage, proposed temporary access roads, parking, (etc.) that will be needed for contractors' operations.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

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- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural and Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines Arkansas Accessibility Standards (2012).

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement: Comply with Section 321313 "Landscape Architectural Concrete Paving" for all required temporary site concrete.
- B. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases (stanchions) with sand bags or other approved weighted element for supporting posts not set as in-grade posts per details.
 - 1. Screening of perimeter fences as required by Owner or Client (or designated representatives).
- C. Sanitation facilities: Chemical type toilet facilities to be provided at each work site.
- D. Water: Contractors option to truck, provide site water containers or provide connections for construction water needs. Water connections, taps to mains, meters, transportation storage and use of water shall be at contractor's expense.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner (or designated representative, Client (or designated representative) Design Team (temporary needs only), Construction Manager (if any), and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of ten (10) individuals. Provide electrical power service and 120-V ac duplex receptacles, with no less than one receptacle on each wall. Furnish room with conference table, chairs, and square tack and marker boards.
 - 3. Drinking water and private toilet.
 - 4. Coffee machine and supplies.
 - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 62 to 78 deg F (20 to 22 deg C).

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6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

C. Storage and Fabrication Sheds: Provide sheds or containers sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from temporary and new building(s).

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

2.4 COVID-19 OR SIMILAR PANDEMIC EQUIPMENT(S)

A. Cleansing/Disinfecting Equipment: Contractor shall provide or enforce provisions for any equipment related to perform scope of work safely for public, Owner and related agencies, design team, third party agencies/contractors and general contractor/sub-contractor work force as required, at minimum, to meet all local, state and federal health agency and governmental codes and regulations currently active at time of work.

B. Personal Protection Equipment: Contractor shall provide or enforce provisions of any personal protective equipment required for contractor(s) and sub-contractor(s) to perform scope of work safely as required, at minimum, to meet all local, state and federal health agency and governmental codes and regulations currently active at time of work.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

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

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

3.2 PROJECT SIGN

A. The work as specified in this section includes labor, materials, and equipment necessary to erect and maintain a project sign at locations indicated on the plans or directed by the Engineer.

B. Measurement and payment for project signs shall be per each installed. Payment will be for the installation and maintenance of any items of work, materials, equipment, supplies or related items required to perform and complete the requirements of this section.

C. All paint used shall be rated for outdoor use. The frame for the sign shall be made with 2" x 4" Pressure Treated Southern Yellow Pine and the sign shall be made from 3/4" exterior grade plywood.

D. The Contractor shall furnish, erect, and maintain, for the duration of the project, project signs at locations shown on the plans or as directed by the City of Conway Engineer. The signs shall be built in accordance with the following details.

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3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

- B. Water Service:
 - 1. Install water service and distribution piping in sizes and pressures or provide temporary storage or water trucks adequate for construction use.
 - 2. The Contractor shall be required to furnish a water meter for metering all water used on this project. The Contractor shall pay for all water used on this project directly to the City of Conway Water Department when the job is completed and before final acceptance by the Engineering Department.
 - 3. During Conway stage 2 water restrictions, the contractor may not be allowed to obtain water from fire hydrants along the project, but rather be directed to obtain water from specified locations within the City of Conway.
 - 4. Permit will be required to use City of Conway water during stage 1, 2, or 3 water restrictions and shall be provided as needed.

- C. Sanitary Facilities: Provide temporary toilets, wash facilities and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Scheduled cleaning and maintenance of toilet facilities shall not be less than twice weekly and shall be cleaned not more than 24 hours prior to weekends.

- D. Heating and Cooling: Provide temporary heating and cooling if required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

- E. Electric Power Service: Contractor supplied power via generators can be used however comply with Work Hours as designated in Section 011000 "Summary of Work".

- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.

- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install minimum of one telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.

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2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's offices.
 - f. Engineers' offices.
 - g. Owner's and Client's office.
 - h. Principal subcontractors' field and home offices.
- H. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.4 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations, maintaining sidewalk operations where construction is adjacent to existing sidewalks and safe for public use. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
 2. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 3. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
 4. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 5. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."
- C. Parking: Utilize available street parking or provide temporary parking areas for construction personnel off site where possible.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- E. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
 1. Provide temporary, directional signs for construction personnel, trail users and visitors.
 2. Maintain and touchup signs so they are legible at all times.

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- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements and Section 017419 "Construction Waste Management".
- G. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 TRAFFIC CONTROLS

- A. Comply with requirements of authorities having jurisdiction, specifically City of Conway and as noted below.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
 - 3. Provide lighted barricades and signage for routing public around unsafe, unsecure conditions, obstacles and/or open trenches if outside construction fence or scope areas to divert pedestrian and vehicular traffic safely around noted obstructions as required.
 - 4. The work as specified in this section includes such signs, flagmen, flares, torches, or light as deemed necessary for public safety.
 - 5. No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section.
 - 6. All signs and barricades shall be constructed, painted and maintained in accordance with the applicable requirements on pages BC-1 through BC-12 and The Arkansas Manual on Uniform Traffic Control Devices.
 - 7. The Contractor shall contact the City of Conway Engineer to coordinate all signs and barricades and will be required to provide standard barricades, markers, beacons, warning signs, etc., as listed below:

a.	"Observe Warning Signs"	R20-3
b.	"Road Work Ahead	CW20-1D
c.	"Right Lane Closed Ahead	CW20-5
d.	"Barricade (w/flasher)	Type III
e.	"Barricade (w/flasher)	Type I
f.	Cones (18" min. ht.)	None
g.	"End Road Work"	G20-2a
- B. The Contractor shall provide and maintain such other signs as may be deemed necessary by the Engineer or the Traffic Division of Public Works and Transportation of the City of Conway.
- C. The Contractor shall provide, construct, and maintain barricades and signs as shown on the plans or as directed by the Engineer. The Contractor shall provide Class "D" barricades on both sides of each street entering the project.
- D. The Contractor's particular attention is directed to the necessity of providing and maintaining a sufficient number of lights or flares at barricades and points of danger; for the protection of vehicular or pedestrian traffic. Lights and flares shall be placed in number and spacing as directed by the Engineer and shall be maintained between sunset and sunrise.
- E. Traffic control devices shall not be placed or changed during peak traffic hours of 6-9am and 4-7pm unless otherwise approved by the Engineer.
- F. The Contractor shall provide in writing, names, addresses and emergency phone numbers to the Engineering Department.

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- G. The Contractor shall maintain a minimum of the barricades as indicated on the plans and place the barricades according to the phases of construction sheet in the plans according to the phasing of the project.

3.6 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 1 Section "Summary."
- C. Temporary Erosion and Sedimentation Control: Comply with authorities having jurisdiction. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Inspect, repair, and maintain erosion and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection".
- F. Site Enclosure Fence: When excavation begins, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Client's Representative with one set of keys.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting. Lighted barriers, fencing with safety fence covering and detour signage is required whenever trail use is rerouted from existing trail alignment.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

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- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.7 STORAGE AND STOCKPILING OF CONSTRUCTION MATERIALS

- A. The Contractor shall utilize the existing right-of-way, easements or project scope area to stockpile equipment and materials for the construction of the project.
- B. If additional space is required outside of the provided areas noted herein, the contractor shall obtain the permission of the neighboring or nearby property owner(s).
- C. The Contractor shall have the property owner(s) fill out a "Temporary Stockpile of Construction Materials and Access on Private Property" form, and this form shall be turned in to the Department of Public Works and Transportation prior to the contractor being allowed to stockpile equipment or materials on any property outside of the provided right-of-way and easements including City of Conway owned property.
- D. The contractor will restore the property used to stockpile material and/or equipment to a condition that is equal or better than what it was prior to construction unless otherwise agreed upon by the property owner.
- E. Any material left on the private property must meet all of the City of Conway's current ordinances and comply with any federal and state requirements.
- F. No measurement or payment will be made for this item.

3.8 DUST, MOISTURE AND MOLD CONTROL

- A. Contractor's Dust Control Plan: Avoid the generation of excessive dust from Work or related operations on and off site. As needed or as directed by Landscape Architect or City of Conway Engineer, the Contractor shall sprinkle areas where dusty conditions create a nuisance or hazard within the limits of this project.
- B. Contractor's Moisture-Protection Plan:
1. Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
 2. All open trenches, earthen cuts, excavations, general earthwork or otherwise exposure of sub-grade shall be covered accordingly to provide protection of existing select fill and sub-grade conditions to not affect soil moisture increases thus affecting heaving or movement of soil and thus affecting potential damage to existing conditions and elements to remain. Protection measures shall be applied at any potential for rainy or other moisture (snow, ice) potentials and maintained during weather events until all water and moisture has concluded and surface drainage been diverted.

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3. Contractor will be solely responsible for damage repair or replacement if determined cause was unprotected moisture barriers.
- C. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- D. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard, replace, or clean stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- E. No separate measurement and payment will be made for Dust, Moisture and Mold Control.

3.9 COVID-19 OR SIMILAR PANDEMIC SAFETY MEASURES

- A. Supervision: Enforce strict discipline in provision and use of temporary cleansing and disinfecting facilities and/or equipment that adheres, at minimum, to all local, state or federal codes, mandates or other requirements for the protection of all parties involved in this project or subject to exposure from this project.
- B. Contractor shall be responsible for maintaining such equipment required and for adhering to regulations even if altered, adjusted, enacted or instituted during the scope of the work.
- C. Maintenance: Maintain facilities in good operating condition until removal.

3.10 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

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- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Client reserves right to take possession of Project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION

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SECTION 015639

TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Temporary Tree and Plant Protection, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Protecting and maintaining existing trees and vegetation to remain not specifically designated for removal.
 - 2. Protection shall be extended to trees and/or vegetation located within or directly adjacent to the Project Site, whether the tree trunk and/or vegetation are located within the designated Limits of Work or not as indicated on the document sheets.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 024119 "Selective Demolition"
 - 3. Section 024119.13 "Selective Site Demolition"
 - 4. Section 312219 "Landscape and Fine Grading"
 - 5. Section 328400 "Site Irrigation Systems"
 - 6. Section 329200 "Lawns and Grasses"
 - 7. Section 329300 "Trees, Shrubs, Vines and Groundcovers"

1.2 DEFINITIONS AND APPLICABLE STANDARDS

A. References:

- 1. USDA – United States Department of Agriculture.
- 2. ASTM – American Society for Testing & Materials.
- 3. ANSI – American National Standards Institute.
- 4. ISA – International Society of Arboriculture.

B. Definitions:

- 1. Tree – A woody perennial plant which usually has (but not limited to) a single dominant trunk and has a mature height of fifteen-feet (15') or more and has a trunk diameter (caliper) of three-inches (3") or more when measured at twelve-inches (12") above the finished grade.

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2. Drip-line – The outermost extent of the tree's foliated canopy, which encompasses the tree leaves or fronds, trunk, branches, roots, and soil. In no case shall a drip line encompass an area under a tree canopy, which is less than ten-feet (10') in diameter. Since each tree is unique in size, scale, and form, the delineated drip-line of each tree shall be refined at the discretion of the Landscape Architect.
3. Injury – Bruising, scarring, tearing, gouging, or breaking of roots, branches, or trunk(s), soil compaction around or within the drip-line, or contamination around the drip-line which results in the decline to the health of the tree.
4. Root Zone – The soil volume surrounding a plant containing the roots.
5. Tree Protection Zone (TPZ) – The area designated by protection methods noted herein that classify an area of protection for trees or vegetation from construction activities.

C. Reference Standards:

1. American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300), American National Standards Institute, Latest Edition.
2. American National Standard for Tree Care Operations (ANSI Z133), American National Standards Institute, Latest Edition.
3. Tree Pruning Guidelines, International Society of Arboriculture, 1995 Edition.
4. Pruning Standards for Shade Trees, National Arborists Association, Latest Edition.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Contractor shall provide site photographs or videotape, sufficiently detailed and described, of existing conditions of trees and vegetation, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing, tree pruning, or tree protection. Submit photographs or videotape to the Landscape Architect prior to commencement of Work.
- H. Preliminary layout of fence protection system shall be laid out with staking on approval by Landscape Architect.

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- I. Product Data: Submit complete and legible materials list of items to be provided for Work described herein this Section.
- J. Product Data and Sample of fence mesh materials listed in contract documents.
- K. Submit complete detailed schedule and description of Work to be done within drip-line, (if any), including list of equipment to be used.
 - 1. A Certified Arborist may propose pruning of trees or other vegetation not a part of Contractor scope for prevention of tree health decline for approved work occurring within dripline. The Certified Arborist shall have a minimum of five (5) year's post-certification experience performing pruning and observation work for projects of comparable size with trees of similar size and nature.

1.4 QUALITY ASSURANCE AND CONTROL

- A. Pruning and remedial work shall be done under the direct supervision of an Arborist certified by the International Society of Arborists (ISA); or Arborist who is a member in good standing in the American Society of Consulting Arborists, in compliance with ISA and ANSI Standards. Arborist shall be on Site continuously while existing trees or roots are being pruned or remedial work is being performed.

1.5 PRE-INSTALLATION MEETING

- A. Shall not occur without Submittals approved by the Contractor and accepted by the Project Landscape Architect, Client and Owner.
- B. Shall convene a minimum of two weeks before starting work of this section.
- C. Required Attendees:
 - 1. Contractor.
 - 2. Any other subcontractors associated with demolition and tree/vegetation protection Work.
 - 3. Landscape Architect.
 - 4. Owner or Owner's Project Manager or Representative.
 - 5. Client or Client's Project Manager or Representative
 - 6. City entity Building Department Representative or Inspector.
 - 7. Project Arborist, if any.
- D. The Contractor shall make arrangements for the meeting and notify the parties required to attend.
- E. Agenda shall include:
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 2. Review protective measures system and detail requirements (drawings, specifications, and other contract documents).
 - 3. Review associated submittals.
 - 4. Review and finalize construction schedule related to site work and verify availability of materials, personnel, equipment and facilities needed to make progress and avoid delays.
 - 5. Review required inspection material usage procedures.

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6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
7. Tour site, inspect and discuss conditions necessary to complete the work of this section.

1.6 PROJECT SITE CONDITIONS

- A. Contractor shall become acquainted with existing site conditions, verifying quantities and locations of all protected trees and vegetation, and other information as may be necessary. Notify the Landscape Architect of unsatisfactory conditions, in writing, prior to commencement of Work.
- B. Tree Flagging: Prior to commencement of Work, Contractor shall flag existing trees and vegetation to be removed per the plan documents. Adequately flag tree trunks with bright-colored tape (neon colors preferred). Verify flagged trees and vegetation with the Landscape Architect prior to removal or protection device setup. No paint marking of vegetation is allowed.
- C. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during tree-pruning or tree-protection operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways, if required, by authorities having jurisdiction.
- D. Locate all utilities prior to any Work, and perform Work in a manner which will avoid possible damage. Notify utility locator service for area where Project is located before site clearing where applicable. Notify the Landscape Architect if conflicts exist.
- E. Improvements on Adjoining Property: Authority for performing indicated removal and alteration Work on property adjoining Owner's property shall be obtained by the adjoining property Owner(s) prior to commencement of Work.
- F. Protect existing Work and Work of other trades: Damage to existing construction caused by Work of this Section shall be promptly repaired and/or replaced at the expense of the Contractor.
- G. Environmental Requirements: Perform actual pruning operations (if needed) during those seasons suitable for the specific tree type, in accordance with locally acceptable horticultural practices.

1.7 GUARANTEE

- A. Contractor shall Guarantee that plants covered under the Provisions of this Section shall be protected from damage due to construction operations from start of construction until the date of Final Acceptance.
- B. Requirements of the guarantee shall apply if failure of the Contractor to take specified precautions and Work within restrictions of this Section contributes to the destruction, decline, or injury to a tree or plant materials to remain, in the judgment of the Landscape Architect.

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- C. If a tree designated to be protected accordingly is destroyed or injured so that in the judgment of the Landscape Architect or third-party reviewer, it should be replaced, it shall be removed at the expense of the Contractor. Contractor shall pay compensation to the Owner or Client where the tree or plant material was located at the rate as specified herein this Section (see Compensation).

1.8 COMPENSATION

- A. Contractor shall replace existing plant material designated to remain that dies or sustained injury from the result of the Contractor's negligence to provide adequate required protection, pruning, or maintenance during the course of construction operations. Replacement shall equate or match material removed
- B. Trees: Contractor shall thoroughly remove damaged tree, including trunk, branches, and roots, at no cost to the Owner or Owner, and at the direction of the Landscape Architect.
 - 1. Contractor shall furnish and install per requirements in Section 329300 "Trees, Shrubs, Vines and Groundcovers", with an equal size tree (in height, spread, and caliper), and of the same form, species, and in the same quantity as those tree(s) that were damaged, at the direction of the Landscape Architect. Compensation shall include the actual cost of the item prepared for procurement; transportation or delivery of boxed item to the site; unloading, planting and staking; maintenance, including watering, fertilizing, pruning, pest control, and other care to bring replacement to same general condition of the original item. Maintenance terms shall be substantial completion or one calendar year from date of acceptance.
- C. Other Plant Material (other than Trees): Contractor shall replace other vegetation (other than trees) that died or sustained injury from the result of the Contractor's negligence to provide adequate required vegetation protection, pruning, or maintenance during the course of construction operations. Compensation shall be awarded to the Owner as follows:
 - 1. Contractor shall thoroughly remove damaged vegetation at no cost to the Owner or Owner, and at the direction of the Landscape Architect.
 - 2. Contractor shall furnish and install per requirements in Section 329300 – Trees, Shrubs, Vines and Groundcovers, with equal size plant material as those which were damaged (as applicable) of the same form, species, and in the same quantity as vegetation that was damaged, at the direction of the Landscape Architect.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All signs, fencing, and mulch shall be constructed and maintained in accordance with the applicable requirements in the Companion Publication to ANSI A300 Part 5, Managing Trees During Construction, released by the International Society of Arboriculture.
- B. Fencing should be sturdy and highly visible to discourage entrance and disturbance of the area within the Tree Protection Zone (TPZ). Fencing shall be made of chain-link, wire mesh, or wood and should meet or exceed local ordinances.
- C. When mulch is required, only organic mulch, such as wood chips, will be allowed.

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2.2 TREE PROTECTION MATERIALS

- A. Temporary Barricade for Protection of Existing Vegetation (for temporary uses only):
1. Fabric: Utility (snow) type fencing, minimum four-feet (4'-0") high, consisting of a vinyl meshed fabric, extended in a bright orange color and approved by the Landscape Architect.
 2. Posts: Metal sufficient in gauge (as appropriate) and size to support the fabric material in a taut and plumb condition. Posts shall be subject to approval by the Landscape Architect. Refer to contract documents.
 3. Wire- 12-1/2 gauge Shaffield wire, spaced per drawings.
- B. Chain Link Fencing:
1. 6' fencing, 2" square galvanized chain link with galvanized posts and continuous tension wire, top and bottom. Minimum wire size 14 gauge galvanized.
 2. Set 2" diameter posts in soil with adequate size and embedment for support through construction. Provide terminal and anchor posts for support at size and frequency required.
 3. Provide stantions for 2" posts where required on hardscape surfaces.
- C. Mulch: Where available, Contractor shall stockpile and reuse shredded wood chips produced from on-site tree removals and remedial work, if chips are disease free and acceptable to the Landscape Architect. Where on-site chips are not available, Contractor shall provide Shredded Wood Mulch as specified in Section 329400 "Landscape Planting Accessories".
- D. Screening Fabric: Woven polyethylene product with min 80% density to 100% for visual impeding however with wind allowance. All edges shall be hemmed and tie-ins shall be grommated. Dark Green in color. Minimum one (1) year warranty on product.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide erosion-control measures as needed to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
1. Standard State of Arkansas Environmental Regulations apply including all Stormwater Pollution Prevention measures for site over five (5) acres.
- B. Locate and clearly flag trees and vegetation to be removed or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.

3.2 GENERAL

- A. The Contractor shall provide, construct, and maintain fencing, signs, and mulch for all trees in the construction area not designated for removal or as directed herein the contract documents or by Architect.
- B. No parking or storing of equipment and/or materials is allowed within the Tree Protection Zone.

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- C. Fencing may be removed only to prepare the development site for final landscaping activities once major construction is complete.

3.3 TREE AND VEGETATION PROTECTION

- A. Protect existing trees and other vegetation indicated to remain in place against the following:
 - 1. Storage or parking of automobiles or other vehicles.
 - 2. Stockpiling of building materials, refuse, or excavated materials.
 - 3. Use of trees as support posts, power posts, or sign posts, anchorage for ropes, guy wires, or power lines, or other similar functions.
 - 4. Dumping of poisonous materials on or around plant roots, trunks, branches, or foliage. Such materials include, but are not limited to, paint, petroleum products, dirty water, or other deleterious materials.
 - 5. Cutting, breaking, or shinning of roots caused by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by the Landscape Architect.
 - 6. Damage by skinning or bruising of bark on trunks or branches, caused by maneuvering vehicles or stacking material or equipment too close to the plant.
 - 7. Compaction of the soil within the drip-line of the plants due to movement of trucks or grading machines, pedestrian or vehicular traffic, storage of equipment or materials.
 - 8. Excessive water or heat from equipment or utility line construction.
 - 9. Damage to root system from flooding, erosion, and excessive wetting and drying resulting from watering and other operations.
- B. Prior to commencement of construction activities, the Contractor shall erect and maintain a temporary fenced (chain link) barricade around the drip-line of individual trees, around perimeter drip-line of groups of trees, or around other vegetation to remain at distance specified in contract drawings or approved by Landscape Architect.
 - 1. Prevent damage to roots during installation of barricade posts. Space posts approximately 6'-0" on-center (O.C.) and securely attach fabric.
 - 2. Barricades top wire shall be installed plumb, taut, and sturdy to prevent unauthorized access around drip-line of trees and protected vegetation. Repair sagging or damaged barricades immediately.
 - 3. During the course of construction, relocation of the barricade may be required to facilitate construction. Contractor shall relocate barricade as directed by the Landscape Architect at no additional expense to the Owner.
 - 4. Remove barricade when construction operations are complete or when directed by the Landscape Architect.
- C. Irrigation: Contractor shall supply fresh potable water in adequate amounts and rates of application as required to maintain the health of protected plant material throughout the duration of the construction operations. Contractor shall maintain a watering schedule and document dates and duration of irrigation applications.
 - 1. Provide supplemental watering and dust control as needed and requested by arborist or Landscape Architect review at no additional cost to the owner.
- D. Do not excavate within drip line of trees, unless approved, in writing, by the Landscape Architect.
- E. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

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1. Cover exposed roots with burlap and water regularly.
 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- F. Protect root systems of existing trees and vegetation from damage due to chemically injurious materials in solution caused by run-off or spillage during mixing or placement of construction materials, and drainage of stored materials.
- G. Protect root systems from flooding, erosion, excessive wetting or drying resulting from de-watering or other operations.
- H. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Landscape Architect.
1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified Arborist.

3.4 SIGNAGE

- A. All sections of fencing shall be clearly marked with signs stating that the area is within a Tree Protection Zone and that no one is allowed to disturb this area. Signs should contain contact information for the contractor and clearly state any consequences that are associated with violations. Text on the signs should be in all languages commonly spoken on the site. See figure 1 below.



Figure 1. Example of TPZ signage

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3.5 TRUNK PROTECTION

- A. When trees are so close to construction activities that the trunk or buttress roots may become mechanically damaged, those parts shall be protected by installing 2-inch thick wood planks, such as 2x4s or 2x6s, around the trunk on a closed-cell foam pad. The planks shall be bound in place with straps or wire, no fasteners shall be allowed to be driven into the tree. See figure 2.

3.6 SOIL AND ROOT PROTECTION WITHIN TPZ

- A. If the Engineer determines that traffic cannot be kept outside of the TPZ for the entire duration of construction, actions shall be taken to disperse the vehicular load and protect the roots with one of the four options below.
 - 1. Apply 6 to 12 inches of wood chip mulch to the area.
 - 2. Lay ¾-inch thick plywood or 4x4 inch wood beams over a 4+ inch thick layer of wood chip mulch.
 - 3. Apply 4 to 6 inches of gravel over a taut, staked geotextile fabric.
 - 4. Place commercial logging or road mats on top of a 4 to 6-inch thick wood chip mulch layer.
 - 5. Stone, geotextile, and mulch exceeding 4 inches thick shall be removed from the TPZ once the threat of soil and root damage has passed.

3.7 ROOT PRUNING

- A. Prior to mechanical excavation, any roots over one-inch diameter outside the TPZ that would be severed by excavation shall be pruned and not torn or crushed. Exposed roots are to be pruned with loppers, hand saws, or small chain saws. The final root cuts shall result in a flat surface with the adjacent bark firmly attached.
- B. Tree wound treatments are to be applied to cut roots of Oak trees within 15 minutes. They are susceptible to the Oak Wilt disease fungus which is prevalent Feb 1st through June 1st. Exposed roots should be covered with soil as soon as possible.

3.8 PRUNING AND REMEDIAL WORK

- A. Pruning and remedial work shall be done under continuous supervision of the approved Arborist, according to approved submittals, and per ANSI A300 Pruning Standards.
- B. Provide pruning, cabling and bracing, irrigation, pest and disease control and other remedial treatments as recommended by the approved Arborist, required to assure the long-term health of the trees and existing vegetation, and the safety of persons and property.
- C. Salvage trees 18" diameter and smaller for shredding of wood material to mulch. Mulch to be used on site for tree protection and temporary access, if needed.

3.9 BORING

- A. When construction plans call for boring under a tree, the bore hole shall not go directly beneath the trunk and shall be a minimum of 3 feet deep, preferably deeper. The following guidelines shall be used. See figure 4.

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MINIMUM DISTANCE REQUIREMENTS FOR BORING

Tree Diameter	Minimum Offset Distance from Trunk face (feet)	Minimum Length of Bore Hole (centered on trunk) (feet)
2" or less	1	2
3"-4"	2	3
5"-9"	5	5
10"-14"	10	10
15"-19"	12	15
20" and larger	15	20

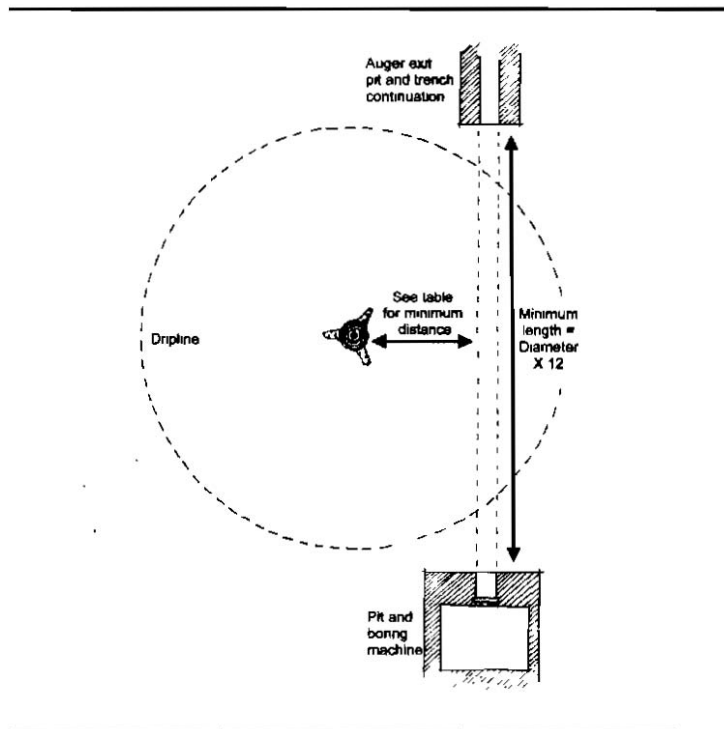


Figure 4. Boring example

3.10 MAINTENANCE

- A. Keep areas within tree protection barricades free from weeds, trash, and debris. Do not use herbicides.
- B. Maintain mulch layer and protective devices throughout entire period of construction.

END OF SECTION

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SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including administrative and procedural requirements for selection of products of use in Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Product delivery, storage and handling
 - 2. Manufacturers' standard warranties on products
 - 3. Special warranties
 - 4. Comparable products.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 012500 "Substitution Procedures".
 - 3. Section 014200 "References".

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

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1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Landscape Architect's Action: If necessary, Landscape Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Landscape Architect will notify Contractor of approval or rejection of proposed comparable product request within ten (10) days of receipt of request, or five (5) days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
 - b. Use product specified if Landscape Architect does not issue a decision on use of a comparable product request within time allocated.
- H. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Landscape Architect will determine which products shall be used.

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1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

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

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

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner or Client.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner or Client.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

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PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Client reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Landscape Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

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5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Landscape Architect's sample", provide a product that complies with requirements and matches Landscape Architect's sample. Landscape Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Landscape Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Landscape Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Landscape Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Landscape Architect may return requests without action, except to record noncompliance with these requirements:
 1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of landscape architects or architects and owners, if requested.
 5. Samples, if requested.
- B. Conditions for Irrigation Equipment Consideration: Landscape Architect will only consider Contractor's request for comparable product when the following conditions occur for any irrigation products. Products specified herein are District and Agency requirements to maintain uniform standards throughout. If the following conditions do not occur, Landscape Architect may return requests without action, except to record noncompliance with these requirements:
 1. Product is no longer manufactured – Provide comparable product from same manufacture specified and if not applicable from another approved manufacture meeting all minimum conditions of said product.
 2. Manufacturer is no longer a business entity - Provide comparable product from another approved manufacture meeting all minimum conditions of said product.
 3. Part or related Part will not meet intent of design or condition - Provide comparable product from same manufacture specified and if not applicable from another approved manufacture meeting all minimum conditions of said product.
 4. Refer to Section 2.2. for Comparable Products requirements.

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PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 017300

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, including general administrative and procedural requirements governing execution of said Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
- C. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- D. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 011000 "Summary of Work".
 - 3. Section 013100 "Project Management and Coordination".
 - 4. Section 013300 "Submittal Procedures".
 - 5. Section 017329 "Cutting and Patching".
 - 6. Section 017419 "Construction Waste Management".
 - 7. Section 013100 "Project Management and Coordination."

1.2 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.

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- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Qualification Data: For professional engineer.
- H. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.
- I. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- J. Recycling Receipts: Submit copy of receipts issued by recycling facilities, licensed to accept various recycling materials (non-hazardous materials) as noted in Section 017419 "Construction Waste management" for recycling disposal.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including specialty trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Landscape Architect for the visual and functional performance of in-place materials.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.

- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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

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

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Owner's Representative according to requirements in Section 013100 "Project Management and Coordination".

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3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Landscape Architect promptly.
- B. General: Engage a surveyor or professional engineer to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Landscape Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Landscape Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Landscape Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Landscape Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

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- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level, unless noted otherwise.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Landscape Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING: Refer to Section 017329 "Cutting and Patching".

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3.7 UNKNOWN UTILITIES PROCEDURES

- A. If unknown and/or uncharted utilities are encountered during excavation or grading, promptly notify the Owner's Representative.
- B. If it is determined that such utility has been abandoned or decommissioned, properly cap line with like material, cap and as approved by Landscape Architect or remove line if deemed appropriate.
- C. If such unknown utilities are encountered and work is continued so as to damage utilities, contractor shall repair damage at no cost to Owner.
- D. Change required in work done to such discovery of utilities, or unknown obstructions will be compensated for in accordance with provisions of the general conditions.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 95 deg F .
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management".

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- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions.

END OF SECTION

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SECTION 017329

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required, to make a complete Cutting and Patching installation of various materials, installations or assemblies as required, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Procedural requirements for cutting and patching or existing Work.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 024119 "Selective Demolition".
 - 3. Section 024119.13 "Selective Site Demolition"
 - 4. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.

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- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Qualification Data: For professional engineer, if needed.
- H. Cutting and Patching Plan: Submit plan describing procedures at least ten (10) days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

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

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- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.
- C. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

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- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 017419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to Manage and Dispose of all Construction Waste accordingly, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 024119 "Selective Demolition".
 - 3. Section 024119.13 "Selective Site Demolition".

1.2 DEFINITIONS

- A. Construction Waste: Improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

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1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of fifty percent (50%) percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Concrete.
- b. Concrete reinforcing steel.
- c. Brick.
- d. Concrete masonry units.
- e. Plywood and oriented strand board.
- f. Structural and miscellaneous steel.
- g. Piping.
- h. Sprinklers.
- i. Copper wiring.
- j. Electrical devices.
- k. Switchgear and panel boards.
- l. Tree and shrub removal/trimming debris.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Metals.
- d. Piping.
- e. Electrical conduit.
- f. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.4 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.

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- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Waste Management Plan: Submit plan within (7) seven days of date established for commencement of the Work.
- H. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- I. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- J. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- K. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with hauling and disposal regulations of authorities having jurisdiction.
 - 2. The Contractor shall dispose of all refuse at a Arkansas Commission on Environmental Quality (TCEQ) approved landfill, other than the City of Conway landfill.
 - 3. A list of all landfills having a TCEQ permit is available at the Arlington Office of TCEQ. The North Central Arkansas Council of Governments (NCTCOG) has prepared, for sale, a list of all landfills in the NCTCOG region.
 - 4. Alternately, the Contractor may arrange with a Commercial waste firm to simply supply a roll-off bin for disposal purposes. Several private regional landfills are available in the NCTCOG area. The contractor shall determine which method best fits the project requirements as required herein.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

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5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
1. Distribute waste management plan to everyone concerned within (5) five days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

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- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvage items for Owner's (or representative) sale, use or reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner (or representative) or other designated location.
 4. Transport items to Owner's storage area off-site designated by Owner (or representative).
 5. Protect items from damage during transport and storage.
- C. Plumbing Fixtures: Separate by type and size.
- D. Lighting Fixtures: Separate lamps by type and protect from breakage.
- E. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panel boards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

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- a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.
- 3.4 RECYCLING DEMOLITION WASTE
- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 1. Crush concrete and screen to comply with requirements of reuse or recycle facility or as prescribed by documents as satisfactory for sub-base use.
 - B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
 2. Clean, stack and shrink wrap undamaged, whole masonry units on wood pallets.
 - C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
 - D. Metals: Separate metals by type.
 1. Remove and dispose of bolts, nuts, washers, and other rough hardware.
 - E. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
 - F. Conduit: Reduce conduit to straight lengths and store by type and size.
- 3.5 RECYCLING CONSTRUCTION WASTE
- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- 3.6 DISPOSAL OF WASTE
- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

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1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

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SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to Close-out the project and provide Final Documentation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 017300 "Execution Requirements".
 - 3. Section 017839 "Project Record Documents".

1.2 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.

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- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: For cleaning agents.
- H. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- I. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit to Client's Representative a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Client's Representative. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Client's Representative's signature for receipt of submittals.
 - 5. Submit changeover information related to Owner's and Client's occupancy, use, operation, and maintenance.

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- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Client of pending insurance changeover requirements.
 2. Complete startup and testing of systems and equipment.
 3. Perform preventive maintenance on equipment used prior to Substantial Completion.
 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 5. Advise Client and Owner of changeover of utilities.
 6. Participate with Client's Representative and Owner in conducting inspection and walkthrough with local emergency responders.
 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 8. Complete final cleaning requirements, including touchup painting.
 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request to Client's Representative for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Client's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Client's Representative will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by others that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Landscape Architect's Substantial Completion form and inspection list of items to be completed or corrected (punch list), endorsed and dated by Landscape Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request to Client's Representative for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Client's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Client's Representative will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

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1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order.
 2. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Landscape Architect.
 - d. Name of Contractor.
 - e. Page number.
 3. Submit list to Client's Representative of incomplete items in one of the following formats:
 - a. MS Excel electronic file. Client's Representative will return annotated file.
 - b. PDF electronic file. Client's Representative will return annotated file.
 - c. Three (3) paper copies. Client's Representative will return two (2) copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Client's Representative for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Client's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

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1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove labels that are not permanent.
 - g. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - h. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

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- a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

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SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Operation and maintenance Data collection and submission, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Section 013300 "Submittal Procedures".

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.

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- E. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit to Owner (or representative) or Client (or representative) reviewed manual content formatted and organized as required by this Section.
1. Owner (or representative) or Client (or representative) will comment on whether content of operations and maintenance submittals are acceptable.
 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- F. Format: Submit operations and maintenance manuals in the following format:
1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner (or representative) or Client (or representative).
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Three (3) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Client's Representative will return one (1) copy.
- G. Initial Manual Submittal: Submit to Owner (or representative) or Client (or representative) a draft copy of each manual at least fifteen (15) days before commencing demonstration and training. Owner (or representative) or Client (or representative) will comment on whether general scope and content of manual are acceptable.
- H. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion. Owner (or representative) or Client (or representative) will return copy with comments.
1. Correct or revise each manual to comply with Owner (or representative) or Client (or representative) comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Owner (or representative) or Client (or representative) comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

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- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Name and Address of Client.
 - 5. Date of submittal.
 - 6. Name and contact information for Contractor.
 - 7. Name and contact information for Client's Representative.
 - 8. Name and contact information for Landscape Architect.
 - 9. Name and contact information for Commissioning Authority.
 - 10. Names and contact information for major consultants to the Landscape Architect that designed the systems contained in the manuals.
 - 11. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

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2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

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- B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.

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- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

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- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."
- G. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

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MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
CITY OF CONWAY, ARKANSAS

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Project Record Document Development and submission, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Section 017300 "Execution Requirements".
 - 2. Section 017700 "Closeout Procedures".
 - 3. Section 017823 "Operation and Maintenance Data".

1.2 CLOSEOUT SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- E. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:

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- 1) Submit one paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one of file prints.
 - 3) Submit record digital data files and one set of plots.
 - 4) Owner's or Client's Representative will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
- b. Final Submittal:
- 1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- F. Record Specifications: Submit three paper copies and one annotated PDF electronic files of Project's Specifications, including addenda and contract modifications to Client's Representative.
- G. Record Product Data: Submit three paper copies and one annotated PDF electronic files and directories of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- H. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy and one annotated PDF electronic files and directories of each submittal.
- I. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:

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- a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Client's Representative. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Format: DWG, Version 2007 or later, Microsoft Windows operating system.
 3. Format: Annotated PDF electronic file with comment function enabled.
 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 5. Refer instances of uncertainty to Landscape Architect and Construction Manager for resolution.
 6. Landscape Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 01 33 00 "Submittal Procedures" for requirements related to use of Landscape Architect's digital data files.
 - b. Landscape Architect will provide data file layer information. Record markups in separate layers.
- C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Landscape Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 2. Consult Landscape Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

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- D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Landscape Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Specifications to Client's Representative as annotated PDF electronic file.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Product Data to Client's Representative as annotated PDF electronic file.
1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

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2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals to Client's Representative as PDF electronic file.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Landscape Architect, Client (or representative), Owner (or representative) and others for reference during normal working hours.

END OF SECTION

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SECTION 017900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make complete Demonstration and Training instructions of all systems as required by corresponding technical sections of specifications, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and providing the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. All technical sections of specifications as part of Scope of Work.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- D. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- E. Submit recordings of the training in digital file format on compact discs (CDs) or other method preferred by Owner for record.

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1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Landscape Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.

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- f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
3. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
4. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
5. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
6. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

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3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use. If an allowance is not included in Part 1, insert a list of systems, subsystems, and equipment that require demonstration and training along with corresponding length of instruction time required. See Evaluations.

END OF SECTION

PROJECT MANUAL

**MARKHAM STREET WATER QUALITY
DEMONSTRATION PROJECT**

CONWAY, ARKANSAS

DOCUMENTS FOR BID/PERMIT
(ISSUE FOR BID/PERMIT)

VOLUME 2

Sections 02-33

swa

LANDSCAPE ARCHITECT
2001 IRVING BOULEVARD, SUITE 157
DALLAS, TX 75207

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SECTION 024119

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site

1.4 INFORMATIONAL SUBMITTALS

- A. Engineering Survey: Submit engineering survey of condition of building.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of selective demolition activities with starting and ending dates for each activity.
- D. Predemolition photographs or video.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

1.5 CLOSEOUT SUBMITTALS

- A. Inventory of items that have been removed and salvaged.

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1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.
- G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

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- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 5. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Landscape Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

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3.6 CLEANING

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.
- C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 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 "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

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1.5 PRECONSTRUCTION TESTING

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

1.6 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Galvanized Reinforcing Bars: Grade 60, deformed bars, ASTM A 767/A 767M, zinc coated after fabrication and bending.
- D. Epoxy-Coated Reinforcing Bars: Grade 60, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- E. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- F. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

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- G. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from galvanized-steel wire into flat sheets.
- H. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.
- I. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

- 1. Portland Cement: ASTM C 150/C 150M, Type I, gray.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

- 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
- 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330/C 330M, 1-inch (25-mm) nominal maximum aggregate size.

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

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

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

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

2.5 FIBER REINFORCEMENT

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

B. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

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- B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.
- C. Flexible PVC Waterstops: CE CRD-C 572\ for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- D. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
- E. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- C. Sheet Vapor Retarder: ASTM E 1745, Class C. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
- D. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating.
- H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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- I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use plasticizing 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.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Slump Limit: 4 inches plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 - 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 - 6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 - 7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd.
- B. Suspended Slabs: Lightweight concrete.
 - 1. Minimum Compressive Strength: 3000 psi at 28 days.
 - 2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft. plus or minus 3 lb/cu. ft. as determined by ASTM C 567/C 567M.
 - 3. Slump Limit: 4 inches plus or minus 1 inch.
 - 4. Air Content: 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch.
 - 5. Air Content: 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch or less.
 - 6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

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7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

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1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 WATERSTOP INSTALLATION

- A. Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces.

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- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 - 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. 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. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated
- C. Surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated

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2. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch
 - E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
 - F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- 3.10 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 ACI 301 for hot-weather protection during curing.
 - B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
 - C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
 - D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 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 not less than seven days. Immediately repair any holes or tears during 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 subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

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3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.12 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION

SECTION 040513

SITE MASONRY MORTARING AND GROUTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete Site Masonry Mortaring and Grouting installation, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Masonry Mortaring and Grouting materials, necessary for and as part of connecting the installation of Concrete Unit Masonry installation and Precast Architectural Concrete, as indicated on the Contract Drawings.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 044223 "Stone Blocks, Boulders and Slabs"

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM – American Society for Testing and Materials.
 - 2. ANSI – American National Standards Institute.
 - 3. UBC - Uniform Building Code.
- B. Definitions:
 - 1. CMU – Concrete Masonry Unit.
 - 2. pcf – pounds per cubic foot/feet (measurement).
 - 3. psi – pounds per square inch (measurement).

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.

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- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
 - D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
 - E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
 - F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
 - G. Provide one full set of color options from selected manufacturer for grout color review and approval.
 - H. Product/Material Data.
 - 1. Provide Mortar and Grout mix designs for Owner's review and the Owner's Testing Laboratory approval at least seven (7) days before Concrete Unit Masonry, Precast Architectural Concrete, or Stone Masonry Veneer Assemblies placement commences.
 - 2. Certificates: Show Mortar and Grout cement conforms to specified requirements.
 - I. Material Samples:
 - 1. To be reviewed as part of the Field-Constructed Mock-Ups.
 - J. Scaled Shop Drawings: Not Required.
 - K. Field-Constructed Mock-ups:
 - 1. Provide accordingly per requirements under Sections 042213 "Site Concrete Unit Masonry", 044300 "Site Stone Masonry Veneer", 093019 "Site Exterior Tiling" and 096341 "Site Stone Paving"
 - L. Qualification Data: Meet and Submit accordingly per requirements under Sections 042213 "Site Concrete Unit Masonry", 044300 "Site Stone Masonry Veneer", 093019 "Site Exterior Tiling" and 096341 "Site Stone Paving".
- 1.4 QUALITY ASSURANCE AND CONTROL
- A. Installer Qualifications: Engage an experienced Installer with experience in successfully demonstrating the installation of Masonry Mortaring and Grouting Work similar in material, design, and extent to that indicated for this Project, with a record of successful performance, and with sufficient production capacity to produce required units without causing delay in the Work.
 - B. Source Quality Control:
 - 1. Masonry Mortaring and Grouting materials will be tested by the Owner's Testing Laboratory, as follows:

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2. When full stresses are used in design for concrete masonry, Grout shall be tested for each 5,000-sq. ft. of wall area, but not less than one test per Scope, to show compliance with the compressive strength required.

1.5 DELIVERY, STORAGE AND HANDLING.

- A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft and damage.
- B. Do not bring cementitious or other material to the site if it has become lumpy, caked, hardened or air slaked from absorption of moisture.
- C. Deliver manufactured materials in original, unopened packages or containers with manufacturer's labels intact and legible.
- D. Store materials off ground and under cover, away from damp surfaces and inclement weather.
- E. Deliver and install materials so as to not delay Work, and install only after preparations for installation have been completed.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.
- B. Field Measurements: Perform accordingly per requirements under Sections 042213 "Site Concrete Unit Masonry", 044300 "Site Stone Masonry Veneer", 093019 "Site Exterior Tiling" and 096341 "Site Stone Paving"
- C. Perform installation operations only when weather is suitable in accordance with locally accepted practices.
- D. Grades and Levels: Perform accordingly per requirements under Sections 042213 "Site Concrete Unit Masonry", 044300 "Site Stone Masonry Veneer", 093019 "Site Exterior Tiling" and 096341 "Site Stone Paving".
- E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 SUBSTITUTIONS

- A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

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- B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.
- C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.
- D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type V.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Sand: ASTM C144. For joints less than 1/4-inch, use aggregate graded with one-hundred percent (100%) passing a No. 16 sieve.
- D. Water: Suitable for drinking, clean, and free of harmful amounts of acid, alkalis, salts, or organic materials.
- E. Admixtures:
 - 1. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - a. Products & Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1) *Accelguard 80*, Euclid Chemical Co.
 - 2) *Morset; Grace*, W.R. Grace & Co., Construction Products Division.
 - 3) Or equal, as approved by the Landscape Architect.
 - 2. Latex Additive (water emulsion) described below, serving as replacement for part of or all gaging water, of type specifically recommended by latex additive manufacturer for use with job-mixed Portland cement and aggregate and not containing a retarder.
 - a. Latex Additive: Styrene butadiene rubber.
 - b. Latex Additive: Acrylic resin.
- F. Color Pigments: Where required, when integrally colored mortar and grout is used, use natural or synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. not to exceed five-percent (5%) of the weight of masonry cement or ten-percent (10%) of the weight of Portland cement in the Mortar. Use only pigments with record of satisfactory performance in Stone Masonry Veneer mortars.
 - 1. Color to match Unit Masonry or existing on-site elements of similar appearance or construction.

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2. Products & Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. True Tone Mortar Colors, Davis Colors.
 - b. Centurion Pigments, Lafarge Corporation.
 - c. SGS Mortar Colors, Solomon Grind-Chem Services, Inc.
 - d. Or equal, as approved by the Landscap4e Architect.

2.2 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride.
 2. Mixing: Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer, unless otherwise indicated. Discard mortar when it has reached initial set.
 3. Comply with ASTM C270 and ICBO Report #ER-5403 for Type S Mortar.
 4. Mortar shall be mixed as follows, with a total mixing time not less than ten (10) minutes.
 - a. Place approximately half of required water and sand into mixer while running.
 - b. Add cement and remainder of sand and water into mixer in that order and mix for a period of at least two (2) minutes.
 - c. Add lime and continue mixing as long as needed to secure a uniform mass.
 - d. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.
 - e. Mix proprietary mortar in accordance with Manufacturer's instructions.
 5. Use and place mortar in final position within 2-1/2-hours after mixing.
 6. Type S Mortars for general Unit Masonry: Products & Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. *Mac High* Absorbent Brick Mortar Polymer Modified (H.A.B. Poly) Type S, Orco Blended Products, Inc.
 - b. or equal, as approved by the Landscape Architect.
 7. Veneer Bonding Mortars for Stone Masonry Veneer Assembly: Products & Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. VBM Poly300, Orco Blended Products, Inc.

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b. or equal, as approved by the Landscape Architect.

2.3 GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type V.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregate: ASTM C404.
- D. Water: Suitable for drinking, clean, and free of harmful amounts of acid, alkalis, salts, or organic materials.
- E. Admixtures: When required, use only non-chloride based accelerators. Do not use antifreeze substances.

2.4 GROUT MIXES

- A. General:
 - 1. Minimum Compressive Strength: 2,000 PSI.
 - 2. Materials for Grout shall be measured in suitable calibrated devices. After the addition of water, all materials shall be mixed for at least three (3) minutes in a drum type batch mixer. Mixing equipment and procedures shall produce Grout with the uniformity required for concrete by ASTM C94.
 - 3. Colors: Submit Manufacturer's standard color range for selection by Landscape Architect.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to installation of Masonry Mortaring and Grouting within Sections 042213 "Site Concrete Unit Masonry", 044300 "Site Stone Masonry Veneer", 093019 "Site Exterior Tiling" and 096341 "Site Stone Paving".

END OF SECTION

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SECTION 044223

STONE BLOCKS, BOULDERS AND SLABS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete Site Stone Slabs, Blocks and Boulder Installations, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Stone material selection (field, quarry or stone yard).
 - 2. Stone fabrication and finishing.
 - 3. Layout, alignment and elevation establishment.
 - 4. Machine placement of stone.
 - 5. Hand placement of stone.
- C. Related Sections:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 055013 "Site Miscellaneous Metal Fabrications".
 - 3. Section 321323 "Cast in Place Concrete for Landscape Elements".

1.2 SUBMITTALS:

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.

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- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Stone Samples for Verification: Sets for each color, grade, finish, and variety of stone required; not less than 12 inches square. Include two (2) or more samples in each set showing the full range of variations in appearance characteristics expected in completed Work.
- H. Forms: Submit data with complete illustrations and/or descriptions for the following:
 - 1. Stone: Source, color, and general character and sizes.
 - 2. Shop Drawings: Provide Plan, Elevation and Sections as needed to convey actual sizes of each type, finish or size of each material specified on a scaled, legible drawing of minimum 8.5" x 11" size per drawing.
 - 3. Field Selection: Field Selection of actual stones will not occur until submittals obtain approvals.

1.3 QUALITY ASSURANCE AND CONTROL

- A. Contractor shall have a minimum of ten (10) years similar successful rockwork installation and stone project experience.
- B. Supplier shall be capable of supplying stone in the quantities and sizes shown and quarried from a single area of quarry such that all stone for any use shall match each other.
- C. Filed Selection shall occur upon approval of submittals and selected products will be photographed noting existing conditions prior to loading, haul off or excavation/extraction.

D. MOCKUPS

- 1. Provide only for Limestone Ribbon Wall System as described in Contract Drawings or at min One (1) full size unit of wall system with finishes required on all sides to receive finishes.
- 2. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- 3. Build mockups of oversized stone walls demonstrating typical joints, texture, color, and standard of workmanship.
- 4. Locate mockups in the locations indicated, or if not indicated, as directed by Landscape Architect or General Contractor
- 5. Notify Landscape Architect 7 days in advance of the dates and times when mockups will be constructed.
- 6. Mockup shall include the various wall depth conditions in a minimum 15' wide by 5' high mockup.
- 7. Maintain mockups during construction in an undisturbed condition as a standard for judging completed work.
 - a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations.
 - b. Approved mockups may become part of the completed work if undisturbed at time of substantial completion.

- 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING: Store materials well protected from inclement weather, and admixture of foreign material.

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PART 2 - PRODUCTS

2.1 STONE SOURCES

- A. Varieties and Sources: Subject to compliance with requirements, provide stone varieties as approved through the job-site mock-up and as specified in the finish schedule on the drawings.

2.2 STONE: GENERAL

- A. Reference Contract Drawings for stone size, finish, layout and jointing, and material schedules.
- B. Provide stone that is free of cracks, seams, and starts impairing structural integrity or function.
- C. Provide stone from a single quarry for each variety of stone required.
 - 1. Provide matched blocks extracted from contiguous locations in a single bed of quarry stratum unless stone from blocks randomly selected for aesthetic effect is approved by Architect.
- D. Quarry stone in a manner to ensure as-quarried block orientations yield finished stone with required characteristics.
- E. Classification: Granite Building Stone Standard: ASTM C 615.

2.3 STONE SLABS AND BLOCKS:

- A. Stone shall be comprised from natural stone blocks or slabs to match character, shape, size and finishes as noted on contract documents.
 - 1. Neither breadth nor thickness of any piece shall be less than one-third (1/3) its length. Gradations as hereinafter designated shall govern the on-site distribution.
 - 2. Stones shall be free from soil and organic matter and each load shall be reasonably graded from the smallest to the largest size specified. Stones smaller than the smallest size specified shall not exceed the amount of the smallest size of each load.
 - 3. Control of gradation will be visual inspection. The Owner reserves the right of rejection based upon approved samples.
 - 4. Refer to drawings for stone sizes, shapes, finishes and quantities.

2.4 STONE FABRICATION:

- A. General: Shop fabricate stone slabs, blocks and boulders (if required) in sizes and shapes required to comply with requirements indicated, including details on Contract Drawings and Shop Drawings.

2.5 STONE BASE FOUNDATION:

- A. Concrete Sub-Slab Conditions: Per Section or 321323 "Cast-In Place Concrete for Landscape Elements" and details in the Contract Documents.
- B. Compacted Aggregate Sub-Base Conditions: Arkansas Department of Transportation specification: #57 Limestone Aggregate, Type 2 Base Material. Compact to 95% density.

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2.6 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color, white, or a blend to produce mortar color indicated.
 - 1. Low-Alkali Cement: Portland cement for use with granite shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Masonry Cement: ASTM C 91.
 - 1. For pigmented mortars, use premixed, colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.
 - 1. For pigmented mortars, use colored portland cement-lime mix of formulation required to produce color indicated or, if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 10 percent of portland cement by weight for mineral oxides nor 2 percent for carbon black.
- E. Aggregate: ASTM C 144 and as indicated below:
 - 1. For joints narrower than 1/4 inch use aggregate graded with 100 percent passing No. 16 sieve.
 - 2. For pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
 - 3. Colored-Mortar Aggregates: Natural, colored sand or ground marble, granite, or other sound stone as approved.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in stone masonry mortars.
- G. Latex additive (water emulsion) described below, serving as replacement for part of or all gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate and not containing a retarder.
 - 1. Latex Additive: Laticrete product as approved.
- H. Water: Potable.
- I. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Colored Masonry Cement:
 - a. Brixment-in-Color; Essroc Materials, Inc.
 - b. Centurion Colorbond; Lafarge Corporation.
 - c. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.
 - d. Flamingo Color Masonry Cement; Riverton Corporation.

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2. Colored Portland Cement-Lime Mix:
 - a. Color Mortar Blend; Glen-Gery Corporation.
 - b. Centurion Colorbond PL; Lafarge Corporation.
 - c. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
 - d. Riverton Portland Cement Lime Custom Color; Riverton Corporation.

3. Mortar Pigments:
 - a. True Tone Mortar Colors; Davis Colors.
 - b. Centurion Pigments; Lafarge Corporation.
 - c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

4. Cold-Weather Admixture:
 - a. Accelguard 80; Euclid Chemical Co.
 - b. Morset; Grace: W.R. Grace & Co.; Construction Products Division.

2.7 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated. Do not use calcium chloride.
 2. Mixing: Combine and thoroughly mix cementitious materials, liquids, and aggregates in a mechanical batch mixer, unless otherwise indicated. Discard mortar when it has reached initial set.

- B. Latex-modified Portland Cement Setting Mortar: Proportion and mix Portland cement, aggregate, and latex additive to comply with written instructions of latex additive manufacturer.

- C. Cement-Paste Bond Coat: Mix bond coat to a consistency similar to that of thick cream and consisting of either neat cement and water or cement, sand, and water.
 1. For latex-modified Portland cement setting mortar, substitute latex admixture for part of or all water according to latex additive manufacturer's written instructions.

2.8 STONE SEALANT

- A. Penetrating Sealant:
 1. General: Penetrating Sealant shall be an invisible, water-based Penetrating Sealant, used to protect exterior Unit Paving installations. Sealant shall be a clear, non-flammable, UV-stabilized, non-yellowing solution which cures to reduce staining, soiling, discoloration, efflorescence, and acts as a invisible water-repellant coating, formulated to impart water repellence and dirt reduction to Unit Paving surfaces with no change in the surface appearance. Sealant shall react with carbon dioxide, and atmospheric moisture to form a penetrating water, dirt and mildew repellent barrier within 24 hours. Moisture absorption rate shall be low to reduce visible surface changes for up to ten (10) years.

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2. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. SLX100, Prosoco, Inc.
 - b. or equal, as approved by the Landscape Architect.
3. Provide sealer mock-up for final sealer approval on all colors of selected stone prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.

3.2 LAYOUT: Layout all areas on approved rough grade for limits of stone installation. Proceed no further without approval of the Landscape Architect.

3.3 PREPARATION

- A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Clean stone surfaces that have become dirty or stained by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.4 INSTALLATION TOLERANCES

- A. Variation in Line: For position shown in plan for edges of paving and ramps, steps, changes in color or finish, and continuous joint lines, do not exceed 1/8 inch in 96 inches, 1/4 inch in 20 feet, or 3/8 inch maximum.
- B. Variation in Surface Plane of Flooring: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum from level or slope indicated.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch or one-fourth of the nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent units.

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3.5 INSTALLING STONE WITH MORTAR BED

- A. Saturate concrete with clean water several hours before placing any setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply cement-paste slush coat over surface of concrete about 15 minutes before placing setting bed. Limit area of slush coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for cement-paste slush coat.
- C. Apply mortar setting bed over cement-paste slush coat immediately after slush coat has been applied. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of stone to finished grades indicated.
- D. Mix and place only as much mortar setting bed as can be covered with stone before initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set before placing stone.
- E. Place stone before initial set of cement occurs. Immediately before placing stone on setting bed, apply uniform 1/16-inch thick, slurry bond coat to bed or to back of each stone unit with a flat trowel.
- F. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.

3.6 MACHINE PLACED BLOCKS/BOULDERS/SLABS:

- A. Stone Block/Boulders/Slabs shall be placed upon an approved sub-grade bed or sub-slab/footing (and slope, if required) so as to produce a well-keyed mass of rock with the least practicable amount of void spaces. Rocks shall be placed aligned or on axis at noted/dimensioned locations and oriented as shown on drawings.
- B. Use approved shims as required to align and level stone as required.
- C. Blocks, Boulders and Slabs shall be set under observation of the landscape architect. All necessary leveling and adjustments shall be a part of this work.
- D. Clean limestone blocks/slabs by light washing to remove excess soil and construction dust unless otherwise noted (moss or vegetation surfacing).

3.7 GROUTING STONE

- A. Grout stone joints to comply with ANSI A108.10 and manufacturer's written instructions.
- B. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining stone and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free from drying cracks.
- C. Cure grout by maintaining in a damp condition for 7 days, except as otherwise recommended by latex additive manufacturer.

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3.8 ADJUSTING AND CLEANING

- A. Remove and replace stone of the following description:
 - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Landscape Architect.
 - 2. Defective joints.
 - 3. Stone and joints not matching approved samples and mockups.
 - 4. Stone not complying with other requirements indicated herein including but not limited to structural and finishing requirements.
- B. Replace in a manner that results in stone matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean stone as work progresses. Remove mortar fins and smears before tooling joints.
- D. Clean stone after setting and grouting are complete. Use procedures recommended by stone fabricator for types of application and materials.

3.9 PROTECTION

- A. Prohibit traffic from coming in contact or vicinity of stone installations.
- B. Protect stone during construction with non-staining kraft paper and additional materials of a protective quality (plywood, barricades, etc.) that are non-damaging in application or non-staining with weather exposures. Where adjoining areas require construction work access, cover stone with a minimum of 3/4-inch untreated plywood over non-staining kraft paper.

END OF SECTION

SECTION 055013

SITE MISCELLANEOUS METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Unit Paving Edge Retainers
- 2. Miscellaneous Structural Steel
- 3. Miscellaneous Retention Steel Plates and Angles
- 4. Bearing or Leveling Plates

- B. Products furnished, but not installed, under this Section:

- 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

- C. Related Sections:

- 1. Section 044223 "Stone Blocks, Boulders and Slabs".
- 2. Section 321313 "Landscape Architectural Concrete Paving".
- 3. Section 321323 "Cast-in-Place Concrete for Landscape Elements".

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.

- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.

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- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: For the following:
 - 1. Miscellaneous structural steel
 - 2. Prefabricated building elements.
 - 3. Paint products.
- H. Shop Drawings: Show fabrication and installation details for all metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- I. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- J. Welding certificates.
- K. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

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- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products complying with the Landscape Architects requirements for steel.
- B. Unless otherwise specified by the structural engineer, provide steel complying with the following:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Tubing: ASTM A 500, cold-formed steel tubing.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use.
- B. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- C. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty exterior loading applications.

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- E. Concrete: Comply with requirements in Division 03 Section "Landscape Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

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- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 UNIT PAVER RETAINERS

- A. Fabricate retainers from steel angles or plates of sizes indicated and for attachment to concrete framing or slabs. Provide slotted holes as indicated on the drawings for noted field adjustments.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in retainers at expansion and control joints. Make open joint approximately 1/2 inch larger than expansion or control joint to each side of joint.
- B. Galvanize retainers after all holes, slots or punches have been applied to unit.
- C. Furnish wedge-type concrete inserts, complete with fasteners, to attach retainers to cast-in-place concrete.

2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with zinc-rich primer as indicated.

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- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.

3.2 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

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- G. Install pipe or bent steel columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
 - 1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are to be identified and addressed as required immediately to lessen oxidation or decommission of metals.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

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SECTION 055214

SITE GUARD AND HAND RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete metal Pipe and Tube Railing assemblies and installations, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Steel pipe, bar and tube railings.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 055013 "Site Miscellaneous Metal Fabrications"
 - 3. Section 062013 "Site Finish Carpentry"
 - 4. Section 321323 "Cast-In-Place Concrete for Landscape Features"

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
 - 2. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
 - 3. Stainless Steel: 60 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 75 lb./ ft. applied in any direction.
 - b. Concentrated load of 200 lb. applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lb. applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.

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- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- F. Wind Loading:
 - 1. Guardrail Height: 3 to 4 feet – per Contract Drawing details.
 - 2. Wind Exposure Category: B.
 - 3. Design Wind Speed: 105 mph (169 kph).

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- H. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- I. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes on stainless steel.
- J. Samples for Verification: For each type of exposed finish required.

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1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, mesh, welded wire and balusters.
2. Fittings and brackets.
3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of finishing connecting members at intersections.

- K. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer testing agency.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and step systems and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to those listed within the Contract Drawings and Finish or Materials Schedules or approved equal by landscape Architect.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed)
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316L.

2.5 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
 - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
 - 3. Aluminum Railings: Type 304 stainless-steel fasteners.
 - 4. Stainless-Steel Railings: Type 304 stainless-steel fasteners.

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- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 METALLIC-COATED-STEEL, WELDED-WIRE

- A. Metallic-Coated-Steel, Welded-Wire: Refer to details in Contract Drawings for references to unit and component type(s), size(s), connection(s), and finish(es).
- B. Metallic-Coated-Steel Wire: Welded-wire fabric, hot-dip galvanized after fabrication. Weight of zinc coating shall be not less than 1.0 oz./sq. ft. (305 g/sq. m).

2.7 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum and stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting".
- F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

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1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- G. Shop Primer for Galvanized Steel: Water based galvanized metal primer complying with MPI#134.
- H. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
1. Products: Subject to compliance with requirements, provide one approved by Landscape Architect submitted by contractor.
- I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- J. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or non-welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.

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4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form changes in direction as follows:
 1. As detailed.
 2. Or approved by submittal shop drawings.
- L. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.10 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

- D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below:

1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Railings Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Railings: SSPC-SP 3, "Power Tool Cleaning."

- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

- G. Shop-Painted Finish: Comply with Section 099100 "Painting."

1. Color: As selected by Architect from manufacturer's full range.

- H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.

1. Color selected by Architect from manufacturer's full range.

2.11 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines, or blend into finish.

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- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 180-Grit Polished Finish: Oil-ground, uniform, directionally textured finish.
- D. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
- E. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.
- F. Directional Satin Finish: No. 4.
- G. Dull Satin Finish: No. 6.
- H. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.12 METALLIC-COATED-STEEL FINISHES

- A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.
- B. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a **zinc-phosphate** conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- C. Powder Coating: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat finish consisting of zinc-rich epoxy prime coat and TGIC polyester topcoat to a minimum dry film thickness of 2 mils (0.05 mm). Comply with coating manufacturer's written instructions to achieve a minimum total dry film thickness of 4 mils (0.10 mm).
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.
 - 2. Comply with surface finish testing requirements in ASTM F2408.
- D. High-Performance Coating: Apply epoxy primer, polyurethane intermediate coat, and polyurethane topcoat to prepared surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine wood framing systems and assemblies to receive anchors, to verify that locations of concealed structures have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

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3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS IN GRADE/CONCRETE

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post.
- D. Leave anchorage joint exposed with anchoring material flush with adjacent surface.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

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1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and per details.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and per details.

C. Attach railings to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

A. Clean railing systems by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

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MARKHAM STREET WATER QUALITY DEMONSTRATION PROJECT
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SECTION 062013

SITE FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Site Finish Carpentry installation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Site carpentry and framing of wood Decking, including wooden members (posts, beams, joists, planks, blocking, etc) and similar items.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 055013 "Site Miscellaneous Metal Fabrication"
 - 3. Section 321323 "Cast-in-Place Concrete for Landscape Features".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. ALSC: American Lumber Standard Committee
 - 2. NLGA: National Lumber Grades Authority.
 - 3. SPIB: The Southern Pine Inspection Bureau.
 - 4. WWPA: Western Wood Products Association.
 - 5. WRCLA: Western Red Cedar Lumber Association
 - 6. FSC – Forest Stewardship Council.
- B. Definitions:
 - 1. S4S: Surfaced Four (4) Sides and smooth.
 - 2. PTWF: Pressure-Treated Douglas fir.
 - 3. PTSP: Pressure-Treated Southern Yellow Pine
 - 4. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater width.
 - 5. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
 - 6. Timber: Lumber of 5 inches nominal or greater in least dimension.

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C. References:

1. ASTM – American Society for Testing and Materials.
2. ANSI – American National Standards Institute.
3. UBC – Uniform Building Code.
4. NFPA – National Forest Products Association, National Design Specifications.
5. NFPA – National Fire Protection Association.
6. NEPA – National Fire Protection Association.
7. ALSC – USDA American Lumber Standards Committee.
8. WCLI – West Coast Lumber Inspection Bureau, Standard Grading and Dressing Rules.
9. WWPA – Western Wood Products Association, Grading Rules for Western Lumber.
10. FSC – Forest Stewardship Council.

D. Applicable Standards:

1. Unless noted otherwise latest edition, issue or revision applies.
2. PS (Product Standards) as referred herein by specification number.
3. West Coast Lumber Inspection Bureau Standard Grading and Dressing Rules.
4. Federal Specifications as referred to herein by number.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: Manufacturer's current catalogue cuts and specifications for the following items:
1. Wood Fastener System
 2. Wood Adhesives.
 3. Pedestal systems, if any.
 4. For metal framing anchors, include installation instructions.

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H. Scaled Shop Drawings:

1. Provide enlarged and scaled plans, elevations, sections, details, as required, for decks showing supports, openings, framing, supports, connections and hardware with miscellaneous metal fabrication details for review by the Landscape Architect and Structural Engineer, indicating dimensioned fabrication and setting/layout of each type of dimensional wood material and their connections and /or joints layouts.
2. Engineered Shop Drawings shall be provided and sealed by a currently licensed engineer in the State of Texas.
3. Provide calculation(s) on shop drawings or under separate cover, sealed by licensed engineer, depicting loads as required by the structural engineer.
4. Materials List: Indicate type of member, location, grade, specie, size, length and quantity on the drawings.

I. Material Certificates:

1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

J. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

K. Samples: two (2) of each specified wood in dimensions and finish provided, 12 inch length. Apply sealer or stain for acceptance.

L. Submittals Coordination:

1. Shop drawings and layout drawings to coordinate cutting, notching and boring holes for piping, wiring and other items attached to or concealed in the carpentry work.

1.4 MOCK-UP

A. Mock-up to be constructed according to specifications and design details.

1. Decking: Provide minimum 4' square fabrication of each item to match design details, include edge angles, fascia and fastening system, fasteners, hardware, critical connections and wood jointing in the mockup.
2. Final Mock-Up is to include approved sealer application, if any, for final approval prior to installation.
3. In-place constructed mock-up is allowable with contractor understanding of possible schedule impacts of work pending approvals and acceptance that some work may be required to be removed if not meeting intent or requirements.

1.5 QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications: Engage an experienced Installer with experience in successfully demonstrating the fabrication, installation, and completion of Site Finish Carpentry Work similar in material, design, and extent to that indicated for this Project, with a record of successful performance, and with sufficient production capacity to produce required units without causing delay in the Work.

B. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

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- C. Single-Source Responsibility: Obtain each color, type, and variety of Site Finish Carpentry lumber, joint materials, and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.
- D. Pre-installation Conference:
 - 1. Before installing Work as indicated herein this Section, conduct a Pre-installation Conference at the Project Site with the Landscape Architect to review requirements and design objectives, including a review of textures, colors, finishes, layouts, and other design intents of the Work. Conference shall be held prior to erecting the Field-Constructed Mock-up Samples.
 - 2. Notify participants in writing at least ten (10) working days prior to Conference.

1.6 DELIVERY, STORAGE AND HANDLING.

- A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft and damage.
- B. Deliver manufactured materials in original, unopened packages or containers with manufacturer's labels intact and legible.
- C. Store materials off ground and under cover, away from damp surfaces and inclement weather. Protect materials during storage and construction against soilage or contamination from earth and other materials.
 - 1. Wrap lumber materials in plastic or use other packaging materials that will prevent rust marks from steel strapping used in shipping.
 - 2. Deliver and unload materials at the Project Site in such a manner that no damage occurs to the products or materials.
 - 3. Store lumber and timber in neat stacks at the site. Stack so that it may be readily inspected.
 - 4. Pile structural timber neatly on skids above ground with spacers to allow free air circulation.
 - 5. Protect from termites, decay, rain and excessive sun.
- D. Deliver and install materials so as to not delay Work, and install only after preparation for installation have been completed.
- E. Handling:
 - 1. Handle lumber and timber in a manner that will avoid injury or breakage.
 - 2. Handle treated timber with rope slings. Do not use can't hooks, peaveys, or other sharp instruments in handling treated timber. Undue injury in handling will be cause for rejection.

1.7 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.

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- B. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities.
- D. Grades and Levels: Establish and maintain required levels and grade elevations. Review installation procedures and coordinate Work herein this Section with other Work affected.
- E. Excavation of Foundations: When conditions detrimental to adequate installation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.
- F. Perform installation operations only when weather is suitable in accordance with locally accepted practices.
- G. Sequence and Scheduling:
 - 1. Verify and obtain location and size of rough openings, bracing and blocking required to accommodate the work of other sections into the carpentry work.
 - 2. Layout: Furnish layouts for foundation bolts and framing anchors in concrete.
 - 3. Adjustments: Determine foundation adjustments required in framing to obtain required levels and alignments.
- H. Construction Site Observations: Landscape Architect may observe installation of Site Carpentry Work at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Site Carpentry Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Work immediately from Project site. Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber: Comply with DOC PS 20 and with applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by ALSC's Board of Review. Provide lumber graded by an agency certified by ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each item with grade stamp of grading agency.
 - 2. For items that are exposed to view in the completed Work, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 DIMENSION LUMBER

- A. Exposed Lumber: Rough sawn or sanded wood to be used for decking. Provide material hand selected to meet grades noted. Select for finish appearance and for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.

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B. General:

1. Use only lumber conforming to grades and dress sizes permitted within the applicable grading rules.
2. Lumber shall be new, uniformly sized unless otherwise noted on the Contract Drawings.
3. Mark each piece of lumber for use in structural framing with the grade and trade mark of a lumber grading organization.
4. Lumber shall be certified by the Forest Stewardship Council (FSC).
5. Maximum moisture Content: Boards and Dimension Lumber – eighteen percent (18%), Posts and Timbers – fifteen percent (15%).

2.3 LUMBER

A. Dimension Lumber: Select Structural grade any of the following species:

1. Select grade Pressure Treated Douglas Fir (PTWF).
 - a. Use preservatives conforming to UBC
2. Mixed Pressure Treated southern pine; SPIB.
 - a. Use preservatives conforming to UBC
3. Redwood; RIS.

B. Boards:

1. Select grade Pressure Treated Douglas Fir (PTWF).
 - a. Use preservatives conforming to UBC
2. Pressure Treated Southern yellow pine, B & B finish; SPIB.
 - a. Use preservatives conforming to UBC
3. Western red cedar, Clear Heart or Grade A; NLGA, WCLIB, or WWPA.

2.4 POSTS

A. Dimension Lumber Posts: No. 2 grade and any of the following species:

1. Select grade Pressure Treated Douglas Fir (PTWF).
 - a. Use preservatives conforming to UBC
2. Western woods; WCLIB or WWPA.

B. Timber Posts: Southern pine; No. 2, SPIB. Structural / Framing Lumber:

C. Appearance Grade, Select Lumber:

1. Decking: Provide appearance grade, select clear #1 free of heart, re-sawn (per approved texture) lumber for all exposed wood. Lumber members shall be straight and true, with no bends, curves, excessive gouges, chips, or cracks.

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- a. Type: Refer to Drawings and alternates list.

2.5 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.
1. Treatment with CCA shall include post-treatment fixation process.
- C. Preservative Chemicals: Acceptable to authorities having jurisdiction.
1. Do not use chemicals containing arsenic or chromium.
- D. After treatment, redry to 19 percent maximum moisture content.
- E. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
1. For items indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
- F. Application: Treat all wood unless otherwise indicated.

2.6 ACCESSORIES

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
1. For Pressure or Preservative treated wood, use stainless steel fasteners unless otherwise indicated.
2. Use fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or ASTM F 2329 unless otherwise indicated.
3. Use hot dip galvanized metal hardware attachments where hardware fasteners are indicated.
- B. Wood Screws: ASME B18.6.1.
- C. Lag Screws: ASME B18.2.1.
- D. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.
- E. Builders Rough Hardware: As needed, all new materials, of standard manufacture as designated on the Contract Documents or specified herein, or subject to prior acceptance by the Landscape Architect.
1. Nails: Common wire nails conforming to Federal Specification FF-N105B and according to the nailing schedule. Use galvanized nails for all exterior exposed nailing.

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2. Bolts, Lag Screws, Wood Screws, Washers: Carbon steel conforming to Federal Specifications FF-B-561C, FF-B-575C, FF-B-0584D and/or FF-S-111C. Items exposed to the weather shall be hot-dipped galvanized, all other items shall be unfinished unless otherwise shown on the Contract Drawings.
 3. Decorative Hardware (Washers, Brackets, etc.): Malleable Iron, sized to fit.
- F. Brackets, Hangers and Framing Clips (where non-custom manufactured products are indicated):
1. Deck Structure: Pressure Treated Joists and posts with noted connectors as per contract documents.
 2. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Simpson Strong Tie Co., ph. (415) 562-7775.
 - b. Teco Products, ph. (301) 654-8288.
 - c. Or equal, as approved by the Landscape Architect.
- G. Finishing Hardware for Deck Planks:
1. Blind Decking System:
 - a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Preferred - CAMO EDGE SCREW Hidden Deck Fastener System, by CAMO, www.camofasteners.com.
 - a) Deck Holes Plugs: IPE Wood Plugs
 - b) Edge Head Screws: 1 7/8" T-15 Star Drive by CAMO
 - c) Glue for plugs: Exterior grade water resistant wood glue.
 - 2) IPE CLIP Hidden Deck Fastener System, by Deck Wise, ph. 866-427-2547.
 - a) Deck Holes Plugs: IPE Wood Plugs
 - b) Stainless Steel Trim Head Screws: As recommended by Deck Wise
 - c) Adhesives for Deck Boards: Exterior grade Liquid Nails or equivalent construction adhesive as recommended by EB-TY.
 - d) Glue for plugs: Exterior grade water resistant wood glue or as recommended by Deck Wise.
 - 3) EBE004 Hidden Deck Fastener System, EB-TY, ph. (800)438-3289.
 - a) Deck Holes Plugs: #IPLUG01, EB-TY.
 - b) Stainless Steel Trim Head Screws: SWAN Secure, #7 x 2 1/4", EB-TY.
 - c) Adhesives for Deck Boards: Exterior grade Liquid Nails or equivalent construction adhesive as recommended by EB-TY.
 - d) Glue for plugs: Exterior grade water resistant wood glue or as recommended by EB-TY.
 - 4) Or equal, as approved by the Landscape Architect.
 2. Deck Screws: As needed, Trim head, square drive, countersink shank, color to match lumber in length to securely anchor Deck Planks to structural lumber.

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- a. Provide stainless steel screws.
 - b. All screws are to be recessed and plugged with matching wood
- H. Cast-in-Place Concrete Footings or Slabs: Refer to Section 321323 – Cast-in-Place Concrete for Landscape Features.
- I. Steel or Other Structural Members: Conform to applicable UBC and ASTM standards, as acceptable to Landscape Architect.
- 1. Steel, Galvanized Finish, primed and painted per Section 099113 – Exterior Painting and Staining. Refer to details in contract plan documents.
- J. Premixed Preservative Material for Jobsite Treatment: Not Used.
- K. Moisture Content: All lumber after treatment shall be either air or kiln dried so that material at time of shipment does not exceed 18% moisture content.
- 2.7 FINISHING
- A. Finishing for Wood Decking: Per Drawings, apply Penetrating Wood Sealer to all finished surfaces. Penetrating Wood Sealer shall be an oil-based Sealer, specifically formulated for dense exterior hardwoods, providing 99% ultraviolet protection via transoxide pigments. Sealer formula shall include a high-grade mildecide for mold and mildew protection. Sealer shall be a one-coat application, providing a natural transparent tone to wood once applied.
- B. Finishing for Composite Decking: Per Manufacturer, provide any surface or end cut sealers as required in format and application per manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine grades, substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Field verify the location and elevations of all existing trees and soil elevations prior to commencing construction. Notify Landscape Architect of all conditions differing from those shown on the drawings.

3.2 PREPARATION

- A. Concrete Footings: Install per Structural and design drawings. See Division 3, Section "Site Concrete" for footing specifications.
- B. Clean substrates of projections and substances detrimental to application.

3.3 GENERAL REQUIREMENTS

- A. All decking work shall be true to line and grade as indicated on the Drawings.
- B. Tolerance: Vertical and horizontal members shall be plumb and finished grade of fence shall match finished grade of ground plane.

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- C. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view. Make tight connections between members. Install fasteners in face slightly recessed without splitting wood; do not countersink nail heads unless otherwise indicated.
- D. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
- E. Workmanship:
 - 1. Workmanship shall be first class throughout. All lumber shall be accurately cut to a close fit and shall have even bearing over the entire contact surfaces.
 - 2. All joints shall be square and tight unless otherwise shown. No shimming will be permitted in making joints. Work shall be free of hammer marks, dents, or other disfiguration.
- F. Hardware to be seated flush unless otherwise shown and surface screws to be slightly recessed

3.4 INSTALLATION

- A. General:
 - 1. Set exterior carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit framing or structural carpentry to other construction; scribe and cope as needed for accurate fit.
 - 2. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction" unless otherwise indicated.
 - 3. Install metal framing anchors to comply with manufacturer's written instructions.
 - 4. Do not splice structural members between supports unless otherwise indicated.
 - 5. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 6. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - 7. Secure guardrail connections to framing with noted anchors such that concealment behind fascia or decorative members occurs.
- B. Cutting and Fitting:
 - 1. Cutting: Accurately cut and frame all lumber to a close fit, with even bearing over all contact surfaces.
 - 2. Fitting: Form all joints square and tight unless otherwise shown. Do not use shims when making joints.
 - 3. Apply copper naphthenate field treatment to comply with AWPA M4, to cut surfaces of preservative-treated lumber.
- C. Nails, Screws and Bolts:
 - 1. Nails: Seat flush. Countersink all finishing nails to 1/16 in. below finish surface.
 - 2. Screws:
 - a. Drill holes for screws and lag screws same diameter as inner shank (bolt size minus depth of thread).
 - b. Use size of drill to fit manufacturers dowel for first row of deck per manufacturer's requirements.

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- c. Unless noted otherwise, countersink screws until heads are flush with finish surface.
- 3. Bolts:
 - a. Pre-drill holes for countersunk bolts with a bit 1/16 in. larger than the accompanying washer, and to a depth, which allows bolt, and washer head to be secured flush with finish surface. Counter sink depth 1" as required for wood plug success.
 - b. Where bolts are not countersunk, bore hole to accept bolt only. Tighten bolt and washers flush to finish surface without compressing wood.
- D. Washers:
 - 1. Cut Washers: Fit all bolts 5/8 in. in diameter or less with cut washers.
 - 2. Cast Washers: Fit all bolts and lag screws over 5/8 in. in diameter with cast or malleable iron washers, unless otherwise shown on the Drawings.
- E. Blind Fastening System for Decking: Install according to manufacturer's recommendations with stainless fasteners. Allow for shrinkage and swelling during construction and spacing of product.
- 3.5 FINISHING
 - A. Edge Treatment: Edges of seat decks, benches, handrails, planter caps and other exposed or leading corners are to be eased (1/8" radius).
 - B. Surfaces: All bench and seat deck tops and handrails are to be sanded smooth before application of finish coats.
- 3.6 ADJUSTING: Turn up and make tight all nuts, bolts, and lag screws at time of installation and again at the completion of the work, to ensure that shrinkage has been overcome and fastenings are tight.
- 3.7 FIELD QUALITY CONTROL
 - A. Workmanship: Workmanship shall be first class throughout, and free of hammer marks, dents or other disfigurements. Unless otherwise specified, lumber shall not show saw marks.

END OF SECTION

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SECTION 067300

SITE COMPOSITE DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Site Composite Decking installation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Composite Decking, fascia and trim along with step or stria tread and riser atop wood or other framing systems and related requirements of said system.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 055013 "Site Miscellaneous Metal Fabrication"
 - 3. Section 062013 "Site Finish Carpentry"

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
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 - 4. WWPA: Western Wood Products Association.
 - 5. WRCLA: Western Red Cedar Lumber Association
 - 6. FSC – Forest Stewardship Council.
- B. Definitions:
 - 1. S4S: Surfaced Four (4) Sides and smooth.
 - 2. PTWF: Pressure-Treated Douglas fir.
 - 3. PTSP: Pressure-Treated Southern Yellow Pine
 - 4. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater width.
 - 5. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
 - 6. Timber: Lumber of 5 inches nominal or greater in least dimension.

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C. References:

1. ASTM – American Society for Testing and Materials.
2. ANSI – American National Standards Institute.
3. UBC – Uniform Building Code.
4. NFPA – National Fire Protection Association.
5. ASTM D-7032-04: Standard Specification for Establishing Performance Ratings for Wood-Plastic Composite Deck Boards and Guardrail Systems (Guards or Handrails), ASTM International.
6. ASTM D-7031-04: Standard Guide for Evaluating Mechanical and Physical Properties of Wood-Plastic Composite Products, ASTM International
7. ASTM E-84-01: Test Method for Surface Burning Characteristics of Building Materials, ASTM International.
8. ASTM D 570: Water Absorption of Plastics
9. ASTM D 1761: Mechanical Fasteners in Wood
10. ASTM D -1413-99: Test method for Wood Preservatives by Laboratory Soil-block Cultures
11. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

D. Applicable Standards:

1. Unless noted otherwise latest edition, issue or revision applies.
2. PS (Product Standards) as referred herein by specification number.
3. West Coast Lumber Inspection Bureau Standard Grading and Dressing Rules.
4. Federal Specifications as referred to herein by number.

1.3 DESIGN/PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Deck: Uniform Load – 100lb/sq.ft.
2. Tread of Stairs: Concentrated Load: 750 lbf/sq.ft., and 1/8" max. deflection with a concentrated load of 300 lbf on area of 4 sq. in.

B. Fire-Test Response Characteristics per ASTM E-84.

1.4 SUBMITTALS

A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.

B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.

C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.

D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.

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- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
 - F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
 - G. Product Data: Manufacturer's current catalogue cuts and specifications for the following items:
 - 1. Composite Decking – For each size, profile, surfacing style to be used
 - 2. Fastener System(s)
 - 3. Wood Adhesive(s).
 - 4. Pedestal systems, if any.
 - 5. For metal framing anchors, include installation instructions.
 - H. Evaluation Reports: For the following, from ICC-ES:
 - 1. Preservative – Treated wood products.
 - 2. Composite Decking.
 - 3. Decking Fastener(s).
 - 4. Wood Fastener System(s)
 - 5. Wood Adhesive(s).
 - 6. Metal Framing Anchor(s).
 - 7. Pedestal systems, if any.
 - 8. For metal framing anchors, include installation instructions.
 - I. Scaled Shop Drawings:
 - 1. Provide enlarged and scaled plans, elevations, sections, details, as required, for decks showing layout, cuts, patterns, openings, miscellaneous supports, connections and hardware with miscellaneous metal fabrication details for review by the Landscape Architect and Structural Engineer, indicating dimensioned fabrication and setting/layout of each type of composite material and their connections and /or joints layouts.
 - 2. Provide calculation(s) on shop drawings or under separate cover, sealed by licensed engineer, depicting loads as required by the structural engineer.
 - 3. Materials List: Indicate type of member, location, grade, specie, size, length and quantity on the drawings.
 - J. Samples: Two (2) of each specified composite material of all various dimensions, profiles, colors and finishes specified in minimum 12-inch lengths. Apply sealer or stain for acceptance if secondary to manufacturer applied finishes.
 - K. Submittals Coordination:
 - 1. Shop drawings and layout drawings to coordinate cutting, notching and boring holes for piping, wiring and other items attached to or concealed in the carpentry work.
- 1.5 MOCK-UP
- A. Mock-up to be constructed according to specifications and design details.
 - 1. Decking: Provide minimum ten square foot fabrication of each item to match design details, include all edge angles, fastening system, fasteners, critical connections and jointing in the mockup.

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2. Final Mock-up is to include approved sealer application if separate from manufacture applied materials for final approval prior to installation.
3. In-place constructed mock-up is allowable with contractor understanding of possible schedule impacts of work pending approvals and acceptance that some work may be required to be removed if not meeting intent or requirements.

1.6 QUALITY ASSURANCE AND CONTROL

- A. Installer Qualifications: Engage an experienced Installer with experience in successfully demonstrating the fabrication, installation, and completion of Site Composite Decking Work similar in material, design, and extent to that indicated for this Project, with a record of successful performance, and with sufficient production capacity to produce required units without causing delay in the Work.
- B. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.
- C. Single-Source Responsibility: Obtain each color, type, and variety of Site Composite Decking materials, joint materials, and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.
- D. Pre-installation Conference:
 1. Before installing Work as indicated herein this Section, conduct a Pre-installation Conference at the Project Site with the Landscape Architect to review requirements and design objectives, including a review of textures, colors, finishes, layouts, and other design intents of the Work. Conference shall be held prior to erecting the Field-Constructed Mock-up Samples.
 2. Notify participants in writing at least ten (10) working days prior to Conference.

1.7 DELIVERY, STORAGE AND HANDLING.

- A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft and damage.
- B. Deliver manufactured materials in original, unopened packages or containers with manufacturer's labels intact and legible.
- C. Store materials off ground and under cover, away from damp surfaces and inclement weather. Protect materials during storage and construction against soilage or contamination from earth and other materials.
 1. Wrap materials in plastic or use other packaging materials that will prevent rust marks from steel strapping used in shipping or weather-related markings.
 2. Deliver and unload materials at the Project Site in such a manner that no damage occurs to the products or materials.
 3. Store all materials in a flat and level surface such that they do not warp or twist.
 4. Store decking and trim materials in neat stacks at the site. Stack so that it may be readily inspected.
 5. Place materials neatly on skids above ground with spacers to allow free air circulation.
 6. Materials to be covered in manufactures wrap or other materials to limit weather and sun exposure. Protect from insects, rain and excessive sun.
 7. Refer to manufacturers for any other storage requirements.

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- D. Deliver and install materials so as to not delay Work, and install only after preparation for installation have been completed.
- E. Handling:
 - 1. Handle composite materials in a manner that will avoid injury or breakage.
 - 2. Handle composite materials with rope slings or similar. Do not use cant hooks, peaveys, or other sharp instruments in handling materials. Undue injury in handling will be cause for rejection.

1.8 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.
- B. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities.
- D. Grades and Levels: Establish and maintain required levels and grade elevations. Review installation procedures and coordinate Work herein this Section with other Work affected.
- E. Perform installation operations only when weather is suitable in accordance with locally accepted practices.
- F. Sequence and Scheduling:
 - 1. Verify and obtain location and size of rough openings, bracing and blocking required to accommodate the work of other sections into the carpentry work.
 - 2. Layout: Furnish layouts for foundation bolts and framing anchors in concrete.
 - 3. Adjustments: Determine foundation adjustments required in framing to obtain required levels and alignments.
- G. Construction Site Observations: Landscape Architect may observe installation of Site Composite Decking Work at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Work immediately from Project site. Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.9 Warranty

- A. Provide manufactures warranty against rot, decay, splitting, checking, splintering, fungal damage, and termite damage for a period of ten (10) years for a commercial installation. In addition, provide the color and pattern fade and staining Warranty (against food staining) and fading beyond 5 Delta E (CIE units) for a period of ten (10) years for a commercial installation.

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PART 2 - PRODUCTS

2.1 WOOD LUMBER, GENERAL

- A. Lumber: Refer to Section 062013 "Site Finish Carpentry".

2.2 MANUFACTURERS

- A. Contract Documents are based on products supplied by; Trex Company, Inc., 160 Exeter Dr., Winchester, VA 22603.
- B. Alternate manufacturers, if requested by contractor will be required to meet or exceed the selected manufacturers finish design including shape and size, color and material in every way for consideration.

2.3 WOOD-PLASTIC COMPOSITE LUMBER;

- A. Material Description: Composite Decking consisting of recycled Linear Low Density Polyethylene (LLDPE) and recycled wood. The product is extruded into shapes and sizes as follows:

1. Trex Transcend Decking Boards; 0.875" x 5.5" (1" x 6" nominal) – Grooved Edge
2. Trex Transcend Fascia Boards; 0.56" x 7.25" (3/4" x 8" nominal) or 0.56" x 11.375" (3/4" x 12" nominal).
3. Lengths – 12 feet
4. Color – As specified in Contract Drawings.

- B. Physical and Mechanical Properties as follows:

Test	Test Method	Value	
Flame spread	ASTM E 84	85	
Thermal Expansion	ASTM D 1037	1.9 x 10 ⁻⁵ inch/inch/degreeF	
Moisture Absorption	ASTM D 1037	< 1.2%	
Screw Withdrawal	ASTM D1761	388 lbs/in	
Nail Hold	ASTM D1761	35 lbf/in of penetration	
Fungus Resistance	ASTM D1413	Rating - no decay	
Termite Resistance	AWPAE1-72	Rating = 9.7	
		Ultimate (Typical)Values *	Design Values
Compression Parallel	ASTM D198	1588 psi	540 psi
Compression Perpendicular	ASTM D143	1437 psi	540 psi
Bending Strength	ASTM D198	3280 psi	500 psi
Shear Strength	ASTM D143	1761 psi	360 psi
Modulus of Elasticity	ASTM D4761	400,000psi	200,000 psi
Modulus of Rupture	ASTM D4761	3750 psi	500 psi

* Ultimate strength values are not meant for design analysis. Design values are for temperatures up to 130F (54C)

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2.4 ACCESSORIES

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
1. Use stainless steel fasteners unless otherwise indicated.
 2. Use hot dip galvanized metal hardware attachments where hardware fasteners are indicated.
- B. Wood Screws: ASME B18.6.1.
- C. Stainless-Steel Bolts: Refer to Section 062013 "Site Finish Carpentry".
- D. Builders Rough Hardware: Refer to Section 062013 "Site Finish Carpentry".
- E. Brackets, Hangers and Framing Clips (where non-custom manufactured products are indicated): Refer to Section 062013 "Site Finish Carpentry".
- F. Finishing Hardware for Deck Planks:
1. Blind Decking System:
 - a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Preferred – Trex Universal Hideway Hidden Fasteners
 - 2) Preferred - CAMO EDGE SCREW Hidden Deck Fastener System, by CAMO, www.camofasteners.com.
 - a) Deck Holes Plugs: IPE Wood Plugs
 - b) Edge Head Screws: 1 7/8" T-15 Star Drive by CAMO
 - c) Glue for plugs: Exterior grade water resistant wood glue.
 - 3) IPE CLIP Hidden Deck Fastener System, by Deck Wise, ph. 866-427-2547.
 - a) Deck Holes Plugs: IPE Wood Plugs
 - b) Stainless Steel Trim Head Screws: As recommended by Deck Wise
 - c) Adhesives for Deck Boards: Exterior grade Liquid Nails or equivalent construction adhesive as recommended by EB-TY.
 - d) Glue for plugs: Exterior grade water resistant wood glue or as recommended by Deck Wise.
 - 4) EBE004 Hidden Deck Fastener System, EB-TY, ph. (800)438-3289.
 - a) Deck Holes Plugs: #IPLUG01, EB-TY.
 - b) Stainless Steel Trim Head Screws: SWAN Secure, #7 x 2 1/4", EB-TY.
 - c) Adhesives for Deck Boards: Exterior grade Liquid Nails or equivalent construction adhesive as recommended by EB-TY.
 - d) Glue for plugs: Exterior grade water resistant wood glue or as recommended by EB-TY.
 - 5) Or equal, as approved by the Landscape Architect.

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2. Deck Screws: Trim head, square drive, countersink shank, color to match lumber in length to securely anchor Deck Planks to structural lumber.
 - a. Provide stainless steel screws.
 - b. All screws are to be recessed and plugged with matching wood
 - G. Cast-in-Place Concrete Footings or Slabs: Refer to Section 321323 – Cast-in-Place Concrete for Landscape Features.
 - H. Steel or Other Structural Members: Refer to Section 062013 “Site Finish Carpentry”.
 - I. Premixed Preservative Material for Jobsite Treatment: Refer to Section 062013 “Site Finish Carpentry”.
- 2.5 DECK PEDESTALS, (if used):
- A. General: Provide adjustable height, leveling deck pedestals to support stone pavers as detailed. System shall be adhered to structural concrete slab system and adjustable to height of 24”.
 - B. Material: High Density Polypropylene conforming to ASTM standards D-746, D 1525-91, and D1706.
 - C. Performance:
 1. Minimum support capacity of 1000 pounds per pedestal.
 2. Wind load tolerances as required per requirements set forth in Wind Report.
 - D. Manufacturers
 1. Bison Screwjack Company (Preferred System)
 2. Buzon
 3. Tile Tech
 4. Westile Screwjack
 5. Or approved equal by Landscape Architect.
- 2.6 FINISHING
- A. Finishing for Composite Decking: Per manufacturer – factory applied.

PART 3 - EXECUTION

- 3.1 EXAMINATION:
- A. Examine grades, substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - C. Field verify the location and elevations of all existing trees and soil elevations prior to commencing construction. Notify Landscape Architect of all conditions differing from those shown on the drawings.

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3.2 PREPARATION

- A. Concrete Footings: Install per Structural and design drawings. See Division 3, Section "Site Concrete" for footing specifications.
- B. Clean substrates of projections and substances detrimental to application.

3.3 GENERAL REQUIREMENTS

- A. All decking work shall be true to line and grade as indicated on the Drawings.
- B. Tolerance: Vertical and horizontal members shall be plumb and finished grade of decking shall match contract drawings.
- C. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view. Make tight connections between members. Install fasteners in face slightly recessed without splitting wood; do not countersink nail heads unless otherwise indicated.
- D. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
- E. Workmanship:
 - 1. Workmanship shall be first class throughout. All composite decking shall be accurately cut to a close or tight fit and shall have even bearing over the entire contact surfaces.
 - 2. All joints shall be square and tight unless otherwise shown. No shimming will be permitted in making joints. Work shall be free of hammer marks, dents, or other disfiguration.
- F. Hardware to be seated flush unless otherwise shown and surface screws to be slightly recessed.

3.4 INSTALLATION

- A. General:
 - 1. Set exterior rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit framing or structural carpentry to other construction; scribe and cope as needed for accurate fit.
 - 2. Provide blocking and framing as indicated and as required to support decking, facing materials, fixtures, specialty items, and trim.
 - 3. Sort and select composite decking so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - 4. Secure decking and fascia to framing with small head diameter wood screws (fascia) or blind fasteners (decking) as specified on contract drawings.
- B. Cutting and Fitting:
 - 1. Cutting: Accurately cut and frame all composite decking and fascia to a close fit, with even bearing over all contact surfaces.
 - 2. Fitting: Form all joints square and tight unless otherwise shown. Do not use shims when making joints.

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C. Nails and Screws:

1. Nails: Seat flush. Countersink all finishing nails to 1/16 in. below finish surface.
2. Screws:
 - a. Drill holes for screws and lag screws same diameter as inner shank (bolt size minus depth of thread).
 - b. Use size of drill to fit manufacturers dowel for first row of deck per manufacturer's requirements.
 - c. Unless noted otherwise, countersink screws until heads are flush with finish surface.

- D. Blind Fastening System for Decking: Install according to manufacturer's recommendations with stainless fasteners. Allow for shrinkage and swelling during construction and spacing of product.

3.5 FINISHING

- A. Edge Treatment: Edges of seat decks, benches, guardrails, handrails, planter caps and other exposed or leading corners are to be eased (1/8" radius).
- B. Surfaces: All bench and seat deck tops and guardrail/handrails are to be sanded flush and smooth at joints.

- 3.6 ADJUSTING: Turn up and make tight all nuts, bolts, and lag screws at time of installation and again at the completion of the work, to insure that shrinkage has been overcome and fastenings are tight.

3.7 PROTECTION

- A. Replace all missing accessories at no cost to Owner.
- B. Wrappings: Provide protective covering on decking surfaces if other work is to occur in the area substantial enough to insure no denting, scratching, marring, staining or other damage occurs to the exposed finishes or surfaces. Do not remove protective covering or wrappings from furnishings until instructed by Landscape Architect.
- C. Provide additional protection or barricades to insure no work occurs on or around decking if no protective measures are provided.
- D. Repair or replace damaged decking, fascia or other finished elements at no additional cost to the owner.

3.8 CLEAN UP

- A. Keep all areas of work clean, neat and orderly at all times.
- B. Clean up and remove all stains, packing, protective measures and debris from the entire work or on any surfaces prior to Final Acceptance.

END OF SECTION

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SECTION 129300

SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Site and Street Furnishing installations, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing or installing the following:
 - 1. Trash and Waste Receptacle(s).
 - 2. Pet Waste Receptacle(s).
 - 3. Tables and Chairs (movable).
 - 4. Bicycle Rack(s).
- C. Related Documents: The following Documents contain requirements of Work that relate to this Section:
 - 1. Section 321313 "Landscape Architectural Cement Concrete Paving".
 - 2. Section 321323 "Cast-In-Place Concrete for Landscape Elements".

1.2 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.

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- G. Product/Material Data. Submit available product/material literature (including color charts) supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.
- H. Product Data: Submit manufacturer's current literature of the following items:
1. Color, finish and size for each type of furnishing.
 2. Installation instructions and recommendations for general maintenance.
 3. Color chips using same material as the manufactured product showing texture, color and configuration.
- I. Samples:
1. Verifying Photo or actual sample of element if locally available (100 miles driving from jobsite). Required for each furnishing.
 2. Material Color Chips and Samples: Required for each furnishing. Chip to be constructed using same material as the manufactured product and shall illustrate texture, color and configuration.
- J. Shop Drawings: Installation and anchorage details for all manufactured items listed below.
1. Items:
 - a. Trash and Waste Receptacle(s).
 - b. Bike Rack(s).
 2. Show plans, elevations, with dimensions, details of inserts, and reinforcements, setting methods, shims dowels or anchorage needed to install the item and comply with details on the drawings.
 3. Provide detail and dimensioned drainage and irrigation access details for pots. Shop drawing to be coordinated with pot interior and paving exterior to illustrate necessary construction coordination for drainage and irrigation.

1.3 QUALITY ASSURANCE AND CONTROL

- A. All materials and Work shall be in accordance with the State Codes and Specifications and other criteria herein specified.
- B. Single-Source Responsibility: Obtain furnishing Units from each respective single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.
- C. Substitutions: Unit(s) to be considered equal to those specified herein this Section shall be reviewed and approved by the Landscape Architect, in writing, prior to the Bid Date. No substitutions shall be allowed after the Bid Date.

1.4 COORDINATION

- A. Contractor shall coordinate the installation of all furnishings in this Section with all other related Work of this Contract.

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- B. Contractor shall be responsible for verifying the dimensions and required hardware of the furnishings prior to commencing installation Work.
- C. Coordinating furnishing footings with utility locations. Note potential conflicts to the Landscape Architect.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Labeling: Furnish all materials in manufacturer's unopened, original containers, bearing original labels showing quantity, description and name of manufacturer.
- B. Delivery: Deliver and unload at the site on pallets and bound in such a manner that no damage occurs to the product.
- C. Storage: Store products in a manner which will preclude all damages. Damaged materials will be rejected. Remove all damaged materials from the job site immediately, and replace at no cost to Owner.
- D. Handling: Furnish suitable equipment to locate all site furnishing materials carefully and efficiently. Lift materials using lifting inserts provided by manufacturer where applicable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS: Refer to Contract Drawings. Alternate manufactures if requested by contractor will be required to meet or exceed the selected manufactures finish design including shape and size, color and material in every way for consideration.

2.2 CONDITION: All products are to be new and in first class condition.

2.3 WARRANTY

- A. Manufacturer's Warranty: Contractor shall arrange manufacturer's warranty to the effect that all manufactured products shall carry a minimum one year manufactures warranty which shall be transferred to the owner at time of acceptance. The warranty period shall commence on the date of acceptance of the installation. Early delivery shall not limit the installed warranty period.
- B. Contractors Warranty: Contractor shall warrant all workmanship in addition to the manufacturer's warranty for a period of one year from the date of acceptance.

2.4 CONCRETE FOOTINGS: Reference details in Contract Documents for requirements.

2.5 ANCHORS

- A. Non-corrosive, stainless or galvanized as approved. Embed in epoxy grout or provide expansion anchors.

2.6 TRASH/WASTE RECEPTACLE(S): Per manufacturer/specification/product number noted in Contract Drawings.

2.7 PET WASTE RECEPTACLE(S): Per manufacturer/specification/product number noted in Contract Drawings.

2.8 TABLES AND CHAIRS: Per manufacturer/specification/product number noted in Contract Drawings.

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- 2.9 BICYCLE STORAGE RACK(S): Per manufacturer/specification/product number noted in Contract Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED ACCORDINGLY BY THE LANDSCAPE ARCHITECT.
- B. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.

3.2 GENERAL

- A. Acceptance: Area will be accepted when furnishings are permanently installed in accepted positions.
- B. Locations: Layout each item for approval in the general location as shown on the Drawings. Review with the Owner's Representative or Landscape Architect to confirm exact installation locations prior to final installation.
- C. Special Precautions: Guard against staining or damaging of existing pavements and plantings where site furnishings are to be installed.
- D. Paint exposed installation hardware to match furnishing color.
- E. Shim all furnishings to level.
- F. Acceptance: Do not install site and street furnishings prior to acceptance by Landscape Architect of area to receive such materials.
- G. Special Precautions: Guard against staining or damaging of existing pavements and plantings where site furnishings are to be installed.

3.3 CONCRETE PADS AND FOOTINGS

- A. Layout: Accurately layout all pads and footings as called for in the Drawings.
- B. Installation: Excavate and form as required and fill for pads and footings as specified in 32 13 23 "Cast-In-Place Concrete for landscape Features".

3.4 TRASH/WASTE RECEPTACLE

- A. Place and anchor per manufacturer's requirements in approved locations/alignment.
- B. Protect in place until work is accepted.
- C. Clean.

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3.5 PET WASTE RECEPTACLE

- A. Place and anchor per manufacturer's requirements in approved locations/alignment.
- B. Protect in place until work is accepted.
- C. Clean.

3.6 TABLES/CHAIRS

- A. Place in approved locations/alignment.
- B. Protect in place until work is accepted.

3.7 BICYCLE STORAGE RACKS

- A. Place and anchor per manufacturer's requirements in approved locations/alignment.
- B. Protect in place until work is accepted.
- C. Provide additional dressing and facing and any needed surfacing as requested (if any) to produce desired face appearance.
- D. Clean.

3.8 REPLACEMENTS

- A. Replace all products, materials and workmanship found to be defective through the end of the warranty period.

3.9 TOUCH-UP

- A. Provide Owner with manufactures touch-up paint (1 pint minimum) for each painted furnishing. Supply literature necessary for ordering touch-up paint at a later date.

3.10 DEMONSTRATION

- A. Demonstrate the operation and maintenance of all equipment to the Owner. Submit final copy of all maintenance manuals at the time of demonstration.

3.11 PROTECTION

- A. Maintain locked lids until acceptance by Landscape Architect. Replace all missing accessories at no cost to Owner.
- B. Wrappings: Do not remove protective wrappings from furnishings until instructed by Landscape Architect.
- C. Provide additional protection, coverings or barricades to insure work is not damaged and repair or replace damaged goods at no additional cost to the owner.

3.12 CLEAN UP

- A. Keep all areas of work clean, neat and orderly at all times.

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- B. Clean up and remove all stains, packing and debris from the entire work or on any furnishing area prior to Final Acceptance.

END OF SECTION

SECTION 22 11 13

FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes water-distribution piping and related components outside the building for water service.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

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- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- F. NSF Compliance:
 - 1. Comply with NSF 14 for plastic potable-water-service piping.
 - 2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.7 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Hard Copper Tube: ASTM B 88, Type K water tube, drawn temper.
 - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
 - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

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1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 2. Gaskets: AWWA C111, rubber.
- E. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
1. Grooved-End, Ductile-Iron Pipe Appurtenances:
- F. PE, Fire-Service Pipe: ASTM F 714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG Class 150.
1. Molded PE Fittings: ASTM D 3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.
- G. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket, and with spigot end.
1. Comply with UL 1285 for fire-service mains if indicated.
 2. PVC Fabricated Fittings: AWWA C900, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Gaskets: AWWA C111, rubber.
 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.2 JOINING MATERIALS

- A. Refer to Section 330500 "Common Work Results for Utilities" for commonly used joining materials.
- B. Brazing Filler Metals: AWS A5.8, BCuP Series.
- C. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
- D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:

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1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
 - a. Standard: AWWA C219.

2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

- 1.
2. Nonrising-Stem, Metal-Seated Gate Valves:
 - a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
 - 1) Standard: AWWA C500.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.
3. Nonrising-Stem, Resilient-Seated Gate Valves:
 - a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - 1) Standard: AWWA C509.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.
4. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
 - a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
 - 1) Standard: AWWA C509.
 - 2) Minimum Pressure Rating: 250 psig.
 - 3) End Connections: Push on or mechanical joint.
 - 4) Interior Coating: Complying with AWWA C550.
5. OS&Y, Rising-Stem, Metal-Seated Gate Valves:
 - a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.
 - 1) Standard: AWWA C500.
 - 2) Minimum Pressure Rating: 200 psig.
 - 3) End Connections: Flanged.
6. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
 - a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

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- 1) Standard: AWWA C509.
- 2) Minimum Pressure Rating: 200 psig.
- 3) End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:

1. UL/FMG, Nonrising-Stem Gate Valves:

- a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.

- 1) Standards: UL 262 and FMG approved.
- 2) Minimum Pressure Rating: 175 psig.
- 3) End Connections: Flanged.

2. OS&Y, Rising-Stem Gate Valves:

- a. Description: Iron body and bonnet and bronze seating material.

- 1) Standards: UL 262 and FMG approved.
- 2) Minimum Pressure Rating: 175 psig.
- 3) End Connections: Flanged.

C. Bronze Gate Valves:

1. OS&Y, Rising-Stem Gate Valves:

- a. Description: Bronze body and bonnet and bronze stem.

- 1) Standards: UL 262 and FMG approved.
- 2) Minimum Pressure Rating: 175 psig.
- 3) End Connections: Threaded.

2. Nonrising-Stem Gate Valves:

- a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

- 1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.

- a. Standard: MSS SP-60.
- b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
- c. Valve: AWWA, cast-iron, nonrising-stem, metal seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

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1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
- C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 CORPORATION VALVES

- A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
 3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.7 WATER METERS

- A. Water meters will be furnished by utility company.
- B. Retain one of two paragraphs and associated subparagraphs below. Verify type of meter required with utility company and authorities having jurisdiction.
- C. Displacement-Type Water Meters:
1. Description: With bronze main case.
 - a. Standard: AWWA C700.
 - b. Registration: Flow in cubic feet/sec.
- D. Compound-Type Water Meters:
1. Description:
 - a. Standard: AWWA C702.
 - b. Registration: Flow in cubic feet/sec.

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2.8 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:
1. Standard: AWWA C511.
 2. Operation: Continuous-pressure applications.
 3. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
 4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
 5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 6. Configuration: Designed for horizontal, straight through flow.
 7. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.
- B. Double-Check, Backflow-Prevention Assemblies:
1. Standard: AWWA C510.
 2. Operation: Continuous-pressure applications, unless otherwise indicated.
 3. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
 4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA
 5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
 6. Configuration: Designed for horizontal, straight through flow.
 7. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

2.9 WATER METER BOXES

- A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" in cover; and with slotted, open-bottom base section of length to fit over service piping.
1. Option: Base section may be cast-iron, PVC, clay, or other pipe.
- B. Description: Cast-iron body and double cover for disc-type water meter, with lettering "WATER METER" in top cover; and with separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
- C. Description: Polymer-concrete body and cover for disc-type water meter, with lettering "WATER" in cover; and with slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches.

2.10 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
 2. Manhole: ASTM A 48/A 48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.
 - a. Dimension: 24-inch minimum diameter, unless otherwise indicated.

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3. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
 - a. Dimension: 24-inch minimum diameter, unless otherwise indicated.
4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.11 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Standard: AWWA C502.
 - b. Pressure Rating: 150 psig minimum
 - c. Retain subparagraph and associated subparagraphs below for UL/FMG, dry-barrel fire hydrants.
2. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
 - a. Standards: UL 246, FMG approved.
 - b. Pressure Rating: 150 psig minimum.
 - c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
 - e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
 - f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

B. Wet-Barrel Fire Hydrants:

1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550.
 - a. Standard: AWWA C503.
 - b. Pressure Rating: 150 psig minimum.
2. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet.
 - a. Standards: UL 246 and FMG approved.
 - b. Pressure Rating: 150 psig minimum.
 - c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
 - d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
 - e. Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.
 - f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

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2.12 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:

1. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- high brass sleeve; and round escutcheon plate.
 - a. Standard: UL 405.
 - b. Connections: Two NPS 2-1/2 inlets and one NPS 4 outlet.
 - c. Connections: Three NPS 2-1/2 inlets and one NPS 6 outlet.
 - d. Connections: Six NPS 2-1/2 inlets and one NPS 6 outlet.
 - e. Inlet Alignment: Inline, horizontal.
 - f. Finish Including Sleeve: Polished bronze.
 - g. Escutcheon Plate Marking: "STANDPIPE."

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.
- D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be soft copper tube; wrought-copper, solder-joint fittings; and brazed joints.
- F. Underground water-service piping NPS 4 and NPS 6 shall be any of the following:
 1. Soft copper tube, ASTM B 88, Type K wrought-copper, solder-joint fittings; and brazed joints.
 2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 3. NPS 4 and NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 molded fittings; and gasketed joints.
- G. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 shall be same as underground water-service piping.
- H. Aboveground Water-Service Piping shall be hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

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- I. Aboveground water-service piping NPS 4 and NPS 6 shall be any of the following:
 - 1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
 - 2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

- J. Underground Fire-Service-Main Piping NPS 4 to NPS 8 shall be any of the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 2. PE, Class 150, fire-service pipe; molded PE fittings; and heat-fusion joints.
 - 3. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC Class 150 fabricated or molded fittings; and gasketed joints.
 - 4. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

- K. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 8 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

- L. Underground Combined Water-Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be any of the following:
 - 1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 2. PVC, AWWA Class 150 pipe listed for fire-protection service; PVC fabricated or molded fittings of same class as pipe; and gasketed joints.

- M. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 10 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

- A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, metal seated gate valves with valve box.
 - 2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
 - 3. Use the following for valves in vaults and aboveground:
 - a. Gate Valves, NPS 2 and Smaller: Bronze, rising stem.
 - b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, metal seated.

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3.4 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. Make connections larger than NPS 2 with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- D. Make connections NPS 2 and smaller with drilling machine according to the following:
 - 1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
 - 2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
 - 3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
 - 4. Install corporation valves into service-saddle assemblies.
 - 5. Install manifold for multiple taps in water main.
 - 6. Install curb valve in water-service piping with head pointing up and with service box.
- E. Comply with NFPA 24 for fire-service-main piping materials and installation.
 - 1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
- G. Install PE pipe according to ASTM D 2774 and ASTM F 645.
- H. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- I. Bury piping with depth of cover over top at least 12 inches below level of maximum frost penetration.
- J. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
 - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- K. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

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3.5 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
 2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
 3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
 4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
 5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
 6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.6 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
1. Concrete thrust blocks.
 2. Locking mechanical joints.
 3. Set-screw mechanical retainer glands.
 4. Bolted flanged joints.
 5. Heat-fused joints.
 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
 3. Fire-Service-Main Piping: According to NFPA 24.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- C. MSS Valves: Install as component of connected piping system.
- D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

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3.8 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.
- B. Water Meters: Install displacement-type water meters, NPS 2 and smaller, in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets and valved bypass around meters unless prohibited by authorities having jurisdiction.
- C. Water Meters: Install compound-type water meters, NPS 3 and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.9 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.
- B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.
- C. Do not install bypass piping around backflow preventers.
- D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.10 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

3.11 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.

3.12 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.
- C. AWWA Fire Hydrants: Comply with AWWA M17.
- D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.13 CONNECTIONS

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- A. Connect water-distribution piping to utility water main. Use tapping sleeve and tapping valve.

3.14 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- C. Prepare reports of testing activities.

3.15 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping.
- B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel.

3.16 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
 - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging and disinfecting activities.

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END OF SECTION

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SECTION 265613

SITE LANDSCAPE LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete Exterior Site Lighting installation, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Exterior luminaries (bollards, pathway, pole mounted, ground mounted up-lights, step lights and tree mounted down-lights) with lamps and ballasts.
 - 2. Exterior railing luminaries
 - 3. Luminaire-mounted photoelectric relays.
 - 4. Poles and accessories.
 - 5. Luminaire lowering devices.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Division 26 - Electrical.
 - 3. Section 321323 "Cast-in-Place Concrete for Landscape Features".
 - 4. Section 329300 "Trees, Shrubs, Groundcovers and Vines".

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. HID: High-intensity discharge.
- D. LER: Luminaire efficacy rating.
- E. Luminaire: Complete lighting fixture, including ballast housing if provided.
- F. Pole: Luminaire support structure, including tower used for large area illumination.
- G. Standard: Same definition as "Pole" above.

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1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
 - 2. Details of attaching luminaires and accessories.
 - 3. Details of installation and construction.
 - 4. Luminaire materials.
 - 5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.
 - a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
 - b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - 6. Photoelectric relays.
 - 7. Ballasts, including energy-efficiency data.
 - 8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
 - 9. Materials, dimensions, and finishes of poles.
 - 10. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
 - 11. Anchor bolts for poles.
 - 12. Manufactured pole foundations.

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- H. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
 - 3. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundations and soil conditions on which they are based.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
 - I. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.
 - J. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.
 - K. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.
 - L. Field quality-control reports.
 - M. Warranty: Sample of special warranty.
- 1.4 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For luminaries and poles to include in emergency, operation, and 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. Lamps: One for every 10 of each type and rating installed. Furnish at least one of each type.
 - 2. Glass and Plastic Lenses, Covers, and Other Optical Parts: Furnish at least one of each type.
 - 3. Ballasts: Furnish at least one of each type.
- 1.6 QUALITY ASSURANCE AND CONTROL
- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.
 - 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 IEEE C2, "National Electrical Safety Code."

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- E. Comply with NFPA 70.

1.7 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

- A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.
- B. Live Load: Single load of 500 lbf distributed as stated in AASHTO LTS-4-M.
- C. Ice Load: Load of 3 lbs/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.
- D. Wind Load: Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4-M.
 - 1. Basic wind speed for calculating wind load for poles exceeding 49.2 feet in height is 100 mph.
 - a. Wind Importance Factor: 1.0
 - b. Minimum Design Life: 50 years
 - c. Velocity Conversion Factors: 1.0
 - 2. Basic wind speed for calculating wind load for poles 50 feet high or less is 100 mph.
 - a. Wind Importance Factor: 1.0
 - b. Minimum Design Life: 25 years
 - c. Velocity Conversion Factors: 1.0

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Handle wood poles so they will not be damaged. Do not use pointed tools that can indent pole surface more than 1/4 inch deep. Do not apply tools to section of pole to be installed below ground line.
- D. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.
- E. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
 - 1. Warranty Period for Luminaires: Five (5) years from date of Substantial Completion.
 - 2. Warranty Period for Metal Corrosion: Five (5) years from date of Substantial Completion.
 - 3. Warranty Period for Color Retention: Five (5) years from date of Substantial Completion.

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4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINARIES:

- A. Refer to fixture schedule in contract documents.
- B. Refer to Appendix A, this section, for product cut sheets.

2.2 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.3 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
 1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
 2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
 3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.
- B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

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- J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
- K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
- M. Factory-Applied Finish for Steel luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As selected from manufacturer's standard catalog of colors.
 - b. Color: As selected by Landscape Architect from manufacturer's full range.
- N. Factory-Applied Finish for Aluminum luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
 3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
 4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
- O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp and ballast characteristics:
 - a. "USES ONLY" and include specific lamp type.
 - b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
 - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.

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- d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.
- e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
- f. CCT and CRI for all luminaires.

2.4 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
- B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
 - 1. Relay with locking-type receptacle shall comply with ANSI C136.10.
 - 2. Adjustable window slide for adjusting on-off set points.

2.5 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

- A. Structural Characteristics: Comply with AASHTO LTS-4-M.
 - 1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
 - 2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
- B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 - 1. Materials: Shall not cause galvanic action at contact points.
 - 2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
 - 3. Anchor-Bolt Template: Plywood or steel.
- D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches with cover secured by stainless-steel captive screws.
- E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Section 32 13 23 "Cast-in-Place Concrete for Landscape Features".
- F. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.
- G. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

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2.6 STEEL POLES

- A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.
 - 1. Shape: Round, tapered
 - 2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.
- B. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- C. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
- D. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
- E. Platform for Lamp and Ballast Servicing: Factory fabricated of steel with finish matching that of pole.
- F. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.
- G. Galvanized Finish: After fabrication, hot-dip galvanize complying with ASTM A 123/A 123M.
- H. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."
 - 2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
 - 3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
 - a. Color: As indicated by manufacturer's designations.

2.7 POLE ACCESSORIES

- A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.
- B. Transformer Type Base: Same material and color as pole. Coordinate dimensions to suit pole's base flange and accept indicated accessories.

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PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Fasten luminaire to indicated structural supports.
 - 1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.
- C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

- A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings: Refer to documents for center-point of pole layout and site reference.
 - 1. Fire Hydrants and Storm Drainage Piping: 60 inches
 - 2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet
 - 3. Trees: 15 feet
- C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."
- D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 - 1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
 - 2. Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
 - 3. Install base covers unless otherwise indicated.
 - 4. Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

3.3 CORROSION PREVENTION

- A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

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3.4 GROUNDING

- A. Ground metal poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole unless otherwise indicated.
 - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
 - 1. Install grounding electrode for each pole.
 - 2. Install grounding conductor and conductor protector.
 - 3. Ground metallic components of pole accessories and foundations.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
 - 1. Verify operation of photoelectric controls.
- C. Illumination Tests:
 - 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
 - a. IESNA LM-5, "Photometric Measurements of Area and Sports Lighting Installations."
 - b. IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
 - c. IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
 - d. IESNA LM-64, "Photometric Measurements of Parking Areas."
 - e. IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

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

END OF SECTION

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SECTION 311000

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 PREINSTALLATION MEETINGS

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

1.3 MATERIAL OWNERSHIP

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

1.4 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

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PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.
- C. Protect existing site improvements to remain from damage during construction.
 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

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1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 1. Grind down stumps and remove roots larger than 3 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 2. Use only hand methods or air spade for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth indicated on Drawings in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

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

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

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

END OF SECTION

SECTION 31 13 16

SELECTIVE TREE TRIMMING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required, to complete Selective Tree Trimming Work, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and completing the following:
 - 1. Includes the pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
 - 2. Contractor shall, protect trees and plants indicated on the drawings to remain in location from all damage during construction. Do not injure trunks, branches or roots of trees and plants to remain.
 - 3. Perform cutting and pruning only as approved and as directed by the Owner's Project Representative or Landscape Architect.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 015639 "Temporary Tree and Plant Protection".
 - 3. Section 024119 "Selective Site Demolition".
 - 4. Section 311000 "Site Clearing".
 - 5. Section 312000 "Earth Moving".
 - 6. Section 329113 "Soil Preparation".
 - 7. Section 329300 "Trees, Shrubs, Vines and Groundcovers".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. USDA – United States Department of Agriculture.
 - 2. ASTM – American Society for Testing & Materials.
 - 3. ANSI – American National Standards Institute.
 - 4. ISA – International Society of Arboriculture.
- B. Definitions:
 - 1. Arborist or Certified Arborist: As referenced here in all "arborists" or "certified arborists" shall be at minimum an ISA Certified Arborist or and ASCA Registered Consulting Arborist unless other specified.
 - 2. Caliper: Diameter of a trunk in inches measured by a diameter tape at 4'-6" above the ground or DBH (diameter at breast height). (Standard as defined by the ISA – International Society for Arboriculture).

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3. Drip-line: The outermost extent of the tree's foliated canopy, which encompasses the tree leaves or fronds, trunk, branches, roots, and soil. In no case shall a drip line encompass an area under a tree canopy, which is less than ten-feet (10') in diameter. Since each tree is unique in size, scale, and form, the delineated drip-line of each tree shall be refined at the discretion of the Landscape Architect.
 4. Injury: Bruising, scarring, tearing, gouging, or breaking of roots, branches, or trunk(s), soil compaction around or within the drip-line, or contamination around the drip-line which results in the decline to the health of the tree.
 5. Root Zone: The soil volume surrounding a plant containing the roots.
 6. Tree: A woody perennial plant which usually has (but not limited to) a single dominant trunk and has a mature height of fifteen-feet (15') or more and has a trunk diameter (caliper) of three-inches (3") or more when measured at twelve-inches (12") above the finished grade.
 7. Tree Protection Zone (TPZ): Area surrounding individual trees or groups of trees to be protected during construction, and defined under Section 015639 "Temporary Tree and Plant Protection" or by local jurisdiction, whichever is greater.
 - a. Note that a particular tree/plant sensitivity or tolerance to construction disturbance may require a larger TPZ area than the area based on the required calculations. This is to ensure that both the feeder and structural support roots are undamaged to maintain the integrity of the tree. Landscape Architect shall define at time of Preinstallation meeting or upon observation of tree protection fence layout per Section 015639 "Temporary tree and plant Protection".
 8. Vegetation: Trees, shrubs, groundcovers, grass and other plants.
- C. Reference Standards:
1. American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300), American National Standards Institute, Latest Edition.
 2. American National Standard for Tree Care Operations (ANSI Z133), American National Standards Institute, Latest Edition.
 3. Tree Pruning Guidelines, International Society of Arboriculture, 1995 Edition.
 4. Pruning Standards for Shade Trees, National Arborists Association, Latest Edition.
 5. ANSI Z60.1 "American Standard for Nurse Stock".
 6. ANSI A300 "Tree Pruning Standards".

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Client and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.

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- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: For each type of product indicated herein this section.
- H. Existing Tree and Plant Inventory and Condition Report: Documentation of existing trees and plantings by a certified arborist for the vegetation indicated to remain, which establishes preconstruction conditions and plant health. Arborist should also verify that none of the trees marked for protection are a potential hazard tree per ISA - International Society for Arboriculture standards.
 - 1. Include detailed photographs or videotape.
 - 2. Include notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
 - 3. Indicate specimen trees and shrubs recommended for protection by the arborist that may not have been included in the tree protection plan.
- I. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction. Include description of pruning to be performed and maintenance following pruning.
- J. Tree Protection Plan: A tree protection and removal plan(s) have been prepared for this project and are part of Contract Drawings.
 - 1. It represents the trees and plants to be removed or protected and their related tree protection zones.
 - 2. Tree protection zones indicated are considered minimums; provide additional protection measures as necessary to protect the short and long-term health of each individual tree and as indicated by the arborist's review of site conditions and any additional recommendations.
 - 3. Arborist should provide supplementary information to the plan based on field review prior to construction. In particular, mark-ups must include an indication of locations where pruning of branches or roots outside of tree protection zones is necessary to avoid damage during construction or for the health of the tree – AND – locations for each type of tree protection fence footing (post driven, flange foot, etc.) based on location of tree protection fence in relationship to each specific tree or groups of trees root and canopy structures.
- K. Qualification Data: For tree service firm and arborist.
- L. Certification: From arborist or Landscape Architect that adequate tree protection is in place before construction begins and certifying that trees indicated to remain have been protected during construction according to the tree protection plan and recognized standards and trees were promptly and properly treated and repaired when damaged.
- M. Maintenance Recommendations: From a certified arborist, for the care and protection of trees affected by construction during and after completing the Work. Written maintenance recommendations should be provided to the Owner and the Maintenance Contractor prior to the end of construction.

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1.4 QUALITY ASSURANCE AND CONTROL

- A. Arborist Qualifications: An arborist certified by ISA-International Society of Arboriculture.
- B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.
- C. Tree Pruning Standard: Comply with ANSI A300 Pruning Standards.
- D. "Protect Your Trees From Oak Wilt": Wisconsin Department of Natural Resources Forestry Division Publication PUB-FR-127 2009 for Oak Tree protection information.

1.5 PRE-INSTALLATION CONFERENCE

- A. Review methods and procedures related to tree access, tree trimmer insertion, tree trimming techniques, tree trimming debris removal and clean-up prior to tree trimming scope and operations.
 - 1. Enforcing requirements for protection zones.
 - 2. Arborist's responsibilities.
 - 3. Field quality control.
- B. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - 1. General Contractor's superintendent.
 - 2. Tree Trimming Contractor superintendent.
 - 3. Tree Trimming crew (if possible)
 - 4. Landscape Architect
 - 5. Owner and Client Representative(s)
- C. Conduct conference at Project site.
- D. Construction schedule. Verify availability of materials, personnel, and equipment needed to make progress and avoid delays.

1.6 PROJECT SITE CONDITIONS

- A. Traffic Control: Maintain access for vehicular, bicycle, and pedestrian traffic as required for other construction activities. Access to the surrounding buildings shall also be unobstructed and maintained at all times to allow for entry and exit of emergency vehicles.
- B. Safety Zones: Establish and maintain required safety zones to protect the public, contractors, structure and utilities to remain and other elements to remain from and within fall zones of trimming operations. Include safety observers/officiates or barricade and fencing to limit access to fall zones as required per OSHA and ISA standards.
- C. Only trim trees during seasons of best management practices based on tree species to be trimmed. Trees subjected to pruning outside optimal seasons shall be monitored for reactions and as such to prevent disease and insect damage.
- D. Do not trim trees during rain, ice or snow or other or adverse weather conditions without means to prevent damage and alter safety of contractors. Conform to requirements specified in Standards whenever tree trimming is required during excessive cold or hot weather.

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- E. Keep Work area clean, and in a safe and workmanlike condition so that rubbish, waste, and debris does not interfere with Work of other trades.
- F. The following practices are prohibited within tree protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water or excessive wetting.
 - 6. Spillage of noxious material while mixing, placing or storing construction materials.
 - 7. Excavation or other digging unless otherwise indicated.
 - 8. Compaction of soil over root systems.
 - 9. Fill in excess of one inch over tree roots.
 - 10. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 - 11. Do not direct vehicle or equipment exhaust toward tree protection zones.
 - 12. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.
- G. Clean up debris resulting from this work at the end of each day's Work.

1.7 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Sequence and Scheduling: Notify contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section.
- B. Tree Trimming Operations shall be scheduled during times or season of optimal pruning related to tree species and such that they do not occur at greatest time of stress to tree from other construction activities. Schedule such that tree trimming operations will limit damage to completed work.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities.
- D. Environmental Conditions: Perform tree trimming operations only when weather and moisture conditions are suitable in accordance with locally-accepted practices and per ANSI Standards.
- E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the completion of Work under this Section for compliance with requirements. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall work to repair or correct and incomplete or rejected trimming immediately as possible. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

PART 2 - PRODUCTS

- A. TOPSOIL: Refer to Section 329113 "Soil Preparation".
- B. ORGANIC MULCH: Refer to Section 329400 "Landscape Planting Accessories".

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- C. TREE PROTECTION ZONE FENCING: Refer to Section 015639 "Temporary Tree and Plant Protection".
- D. TREE PROTECTION ZONE SIGNAGE: Refer to Section 015639 "Temporary Tree and Plant Protection".
- E. FERTILIZERS AND ANTI-DESICCANTS: Refer to Section 329400 "Landscape Planting Accessories".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive Tree Trimming, for compliance with requirements for trimming operations and other conditions affecting performance of such trimming. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion and sedimentation control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree protection zones.
- C. Tree Protection Zones: Examine the site to verify that temporary tree protection fencing and signage measures are in place. Verify that no openings in fencing occur other than for allowed access to these zones for approved scopes to occur in such areas.

3.2 PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag or Tie a 1-inch blue-vinyl tape around each tree trunk at 54 inches above the ground or continuous along perimeter of all plant materials scheduled to remain .
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing materials for the tree trimming operations.
- C. Verify safety measures are in place and ready for tree trimming operations.
- D. Contractors will be responsible for setting up tree maintenance programs to maintain trees and surfaces within construction boundaries for the duration of construction and until tree protection measures are completely removed from the site. This includes watering, pruning, clearance pruning during construction, mowing, and mulching. Coordinate tree maintenance programs with Landscape Architect and Arborists.

3.3 ROOT PRUNING

- A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 - 3. Cover exposed roots with burlap and water regularly.

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4. Backfill as soon as possible with topsoil or planting mixture as outlined in Section 329113 "Soil Preparation". Tamp to settle soil and eliminate voids and air pockets. When the area is approximately one-half filled with topsoil, water thoroughly then place the remaining topsoil required to fill around the exposed roots.
5. Root pruning at edge of tree protection zone: Prune roots 12 inches outside of the protection zone, by cleanly cutting all roots to the depth of required excavation.
6. Preventing Oak wilt: Do not prune, cut or injure Oaks between April 1 and October 1st. If an Oak is wounded during this period, cover the wound immediately with tree wound paint (water-based paint) in a 1" wide band around the circumference of the cut surface. November through March is the preferred period for pruning and tree removal. Refer to Wisconsin Department of Natural Resources Forestry Division Publication PUB-FR-127 2009 for further Oak tree protection requirements.

3.4 CROWN PRUNING

- A. Prune existing trees that are indicated on drawings, and confirmed by the pre-installation meeting.
- B. Trees shall be pruned for safety considerations, such as crown cleaning, limb end weight reduction, and as determined by the pre-installation meeting.
- C. Prune trees to compensate for limb or root loss caused by damage due to construction work. Provide subsequent maintenance during Contract period as directed by Owner or Owner's Representative.
- D. Coordinate all pruning of trees and shrubs and/or repairs to damaged limbs with Landscape Architect.
- E. Representative. Pruning shall be performed by a certified arborist.
- F. Prune branches that are affected by temporary and permanent construction.
- G. Prune branches as follows:
 1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system.
 2. Prune the minimum amount necessary. Do not remove more than ¼ of the live foliage or branches of a mature tree.
 3. Pruning standards: Prune trees according to ANSI A300 Pruning Standards.
 4. Cut branches with sharp pruning instruments; do not chop or break.
- H. Preventing Oak wilt: Do not prune, cut or injure Oaks between April 1 and October 1. If an Oak is wounded during this period, cover the wound immediately with tree wound paint (water-based paint) in a 1" wide band around the circumference of the cut surface November through March is the preferred period for pruning and tree removal. Refer to Wisconsin Department of Natural Resources Forestry Division Publication PUB-FR-127 2009 for further Oak tree protection requirements.
- I. Remove tree branches removed from trimming operations and dispose of off-site.

3.5 FIELD QUALITY CONTROL

- A. Inspections: Engage a certified arborist to direct plant protection measures in the vicinity of trees, shrubs and other vegetation indicated to remain and to prepare inspection reports.

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3.6 REPAIR AND REPLACEMENT

- A. The value of trees destroyed or damaged will be charged against the account of the contractor responsible for the damage in an amount determined by the Owner's certified arborist using the ISA-International Society of Arboriculture, Council of Tree and Landscape Appraiser's Guide for Plant Appraisal, Current Edition. If a replacement tree is provided, the amount charged against the contractor will be reduced by the value of the replacement tree.
- B. Repair trees, shrubs and other vegetation indicated to remain or be relocated that are damaged by construction operations, in accordance with a certified arborist's written instructions and approved by the project Architect/Engineer and DFD Construction Representative.
- C. Submit details of proposed root cutting and tree and shrub repairs.
- D. Have certified arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
- E. Treat damaged trunks, limbs and roots according to certified arborist's written instructions.
- F. Perform repairs within 24 hours. Repair or treat Oak wounds immediately.
- G. Replace vegetation that cannot be repaired and restored to full growth status, as determined by Landscape Architect and Owner (or Owner's representative) at no additional cost to the owner.
- H. Remove and replace trees, shrubs and other vegetation indicated to remain that die or are damaged during construction operations that a certified arborist determines are incapable of restoring to normal growth pattern and approved by the project Architect/Engineer.
- I. Provide new trees of same size and species as those being replaced at a minimum approved Landscape Architect and Owner (or Owner's representative) at no additional cost to the owner and per ANSI Z.60.1 standards.
- J. Plant and maintain as specified in Section 329200 "Trees, Shrubs, Vines and groundcovers".

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove tree trimming debris, tree removal debris, shrub trimmings and shrub removal, displaced trees, trash and debris and legally dispose of them off Owner's property.
- B. Burning of surplus and waste materials is not permitted.

END OF SECTION

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SECTION 312000

EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

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

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

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

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

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

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

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

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

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- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports.

1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- B. Do not commence earth-moving operations until plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 1 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

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- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

2.2 ACCESSORIES

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

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

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1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:

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1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.6 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

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

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course.
- E. Initial Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

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1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use satisfactory soil material.
 3. Under steps and ramps, use engineered fill.
 4. Under building slabs, use engineered fill.
 5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.

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4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 2. Walks: Plus or minus 1 inch.
 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
 2. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 3. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

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

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- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION

SECTION 312219

LANDSCAPE AND FINE GRADING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Finished Grading in Landscape Planting Areas, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Finish grading of pavement areas.
 - 2. Sub-grade and sub-base preparation for pavement areas and site foundations.
 - 3. Finish grading of landscape planting areas.
 - 4. Machinery restrictions.
 - 5. Excavation, filling and backfilling of on-site material.
 - 6. Transporting, spreading and fine grading of stockpiled site soil.
 - 7. Prevention of excessive weed growth.
 - 8. Temporary and surface drainage.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 329113 "Soil Preparation".
 - 3. Section 334300 "Landscape Drainage".

1.2 SITE CONDITIONS

- A. Dust Nuisance: Contractor shall assume full responsibility for alleviation or prevention of dust as a result of Work under this Section.
- B. Excessive rock, dead or declining vegetation, trash, debris, or other items that has accumulated shall be removed from the Project Site by the Contractor, and as directed by the Landscape Architect, prior to completion of Finish Grading operations.
- C. Work under this Section shall be performed only during the period when beneficial and optimum Landscape Grading results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure or cause compaction, landscape grading operations shall be suspended until, in the opinion of the Landscape Architect, the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.
- D. Soil moisture level prior to Landscape Grading shall be no less than 75% of field capacity. The determination of adequate soil moisture for Landscape Grading shall be in the sole judgment of the Landscape Architect.

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1.3 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Complete Finish Grading prior to installation of Sprinkler Irrigation (Refer to Section 328400) in each area graded.
- B. Re-grade, as required, to acceptable Landscape Grades established by Landscape Architect once irrigation system is installed.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required.
- D. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- E. Excavation: When conditions detrimental to adequate Finish Grading operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.
- F. Perform Finish Grading operations only when weather and soil conditions are suitable in accordance with locally accepted practices.
- G. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective work under this Section at any time during progress of Work. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.4 GENERAL PROVISIONS

- A. Finished grading shall be defined as placing and grading of onsite stockpiled soil or additional soil that may be required to establish the required grades for lawns, shrub and groundcover beds.
- B. Additional fill materials shall generally be defined as on-site topsoil as specified herein.
- C. Where practicable and as directed, the use of heavy machinery shall be kept to a minimum in landscape areas. Overly compacted areas from machine access or use during previous construction shall be loosened by ripping soil to relieve compaction, not less than 12 inches deep and 12 inches on center prior to commencing landscape work except no machines are permitted in existing tree protection areas during general construction work.
- D. Work within existing tree zones:
 - 1. No fill and only limited machinery will be permitted under the canopy of existing trees to remain.
 - 2. Work shall be accomplished in tree protection areas with limited machine grading.
 - 3. Care shall be taken in any Post Oak area due to the sensitive nature of their root systems to compaction and soil disturbance.
 - 4. Machines are allowed in tree protection zones only to the extent they are absolutely required. Limit work specifically from machine grading and generally accomplish the majority of grading and soil preparation work with hand labor within the tree protection areas.

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PART 2 - PRODUCTS

2.1 GENERAL FILL

- A. General Qualifications: Fill shall be a clean, dry soil of a loamy character, well drained and well graded with a plasticity index not to exceed 20 or fall below 8. Fill material shall contain no oils, alkalizes, acids, rubbish or other deleterious materials. The pH shall be similar to the on-site topsoil.

2.2 SELECT FILL

- A. General Qualifications: Refer to qualifications and requirements as prescribed by Geotechnical Engineer and subsequent Report (Section 003119.01) for this specific site and Work conditions.

2.3 TOPSOIL

- A. Topsoil material that may be required for finish grading operations shall conform to the requirements included within this Section.

- B. General Qualifications: Topsoil shall be considered acceptable which conforms to the following minimum criteria:

1. Natural, friable, loamy soil, typical of local topsoil which produces heavy vegetative growth, free from subsoil, weeds, sods, stiff clay, stones larger than one (1") inch, toxic substances, debris, or other substances which may be harmful to plant growth. Do not deliver in muddy condition.
2. Acidity/Alkalinity: pH 6.0 to pH 7.5.

- C. Grading Analysis:

1. General Fill Material

- a. Two (2") inch - 100 percent minimum passing.
- b. Number 4 sieve - 90 percent minimum passing.
- c. Number 10 sieve - 80 percent minimum passing.

2. Sand, Silt, and Clay Content (from ASSHTO M146) as required and approved as being similar to existing site soil

- a. Sand 20 to 75 percent
- b. Silt 10 to 60 percent
- c. Clay 5 to 30 percent

3. All topsoil shall be free from all herbicides and insecticides which might adversely affect subsequent growth of turf or plantings or which might otherwise contain materials toxic to humans and pets.

- D. Non-Conforming Material: The Contractor shall not be permitted to use on-site material which does not conform to the above minimum criteria for fine grade operations. At the discretion of the Landscape Architect, such material can either be amended to meet the minimum requirements or shall be removed from the site and replaced with suitable material as specified herein.

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- E. It shall be the Contractor's responsibility to verify that the existing topsoil conforms to these specifications. Topsoil determined to be non-conforming subsequent to the award of a contract shall not be means for extra compensation unless otherwise provided for herein.
 - F. Soil Analysis: Obtain soil analysis of topsoil from the approved accredited agricultural testing laboratory, Wallace Laboratories, El Segundo CA, 310-615-0116., at Owner's cost. Submit results of soil analysis to the Landscape Architect for review.
- 2.4 SAND: Shall be "Sharp Sand" to A.S.T.M. C-33. Sample shall be submitted for approval. Sand shall not be permitted for fill purposes if the depth exceeds two (2") inches to achieve the finished grade.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.

- 3.2 WORKMANSHIP: Work shall be performed by personnel trained and experienced in this work and shall be done under the direction of a superintendent on Contractor's staff.

3.3 EXCAVATION

- A. Make excavations to relative dimensions and elevations indicated on Drawings.
- B. Excavated material determined suitable for use as fills or topsoil may be dispersed or stored on the site in locations as directed. Excavated material unsuitable for fills shall be disposed of, legally, off site.
- C. Where unmarked utility lines or other underground obstructions or piping may be uncovered within the work area, notify the Landscape Architect or the agencies or service utility companies having jurisdiction thereof, and take necessary measures to prevent interruption of service (if live). Should such lines or services be damaged, broken, or interrupted through the Contractor's own negligence, those services shall be repaired immediately and restored by him at his own expense. Abandoned lines, meters, and boxes, obstructions or piping shall be removed, plugged, or capped in accordance with the requirements and approval of the agencies affected, or as directed by the Landscape Architect.
- D. Maintain all excavated areas free from water throughout progress of the work. All surface or subsurface seepage encountered shall be run to temporary sumps located where required or directed. From the sumps, water shall be pumped out and legally disposed of in a manner that will keep the entire site reasonably dry and in an accessible and workable condition at all times.

3.4 FILLING AND GRADING

- A. Where existing valve boxes, water meter pits or related items are found in areas to receive fill for berms, the Contractor shall notify the Owner so that he may make any required adjustments.

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- B. The placement of fills shall be done under the supervision of the Landscape Architect.
- C. All areas to receive fills shall be scarified to a depth of six (6") inches and moisture conditioned as required to obtain the required compaction. Where slopes exceed one vertical to four horizontal the sub-grade shall be plowed, stepped, or benched in such a manner that fills will bond with base material.
- D. Fill material shall be spread in uniform lifts of not more than eight (8") inches uncompacted thickness. Prior to commencing compaction, fills shall be brought to water content that will permit proper compaction by either aerating the material if it is too wet, or spraying the material with water if it is too dry. Thoroughly mix each lift before compaction to assure uniform distribution of water content. Bring all fills to suitable elevations above grade to provide for anticipated settlement and shrinkage thereof.
- E. Fill shall not be dropped on any structure.
- F. No fill or additional soil is to be installed in any protected tree zones or within the canopy or drip line of any existing trees.
- G. No additional runoff into existing tree area or existing tree drip lines beyond the already occurring natural runoff is to be created by fill operations. Advise the Landscape Architect of conditions which will impact runoff into existing tree areas.

3.5 COMPACTION

- A. Where fill is required, compact each layer of fill and scarify sub-grade to not less than eighty-five (85%) percent maximum density in planting areas and as required by the engineer in paving areas.
- B. Perform all compaction using compacting rollers, pneumatic or vibratory compactors, or other equipment and methods approved by the Owner.

3.6 PREPARATION OF SUBGRADE AND SPREADING OF TOPSOIL

- A. The sub-grade soil shall be loosened to a depth of twelve (12") inches and graded to remove all ridges and depressions so that it will be everywhere paralleled to proposed finished grade. All stones over two (2") inches in any dimensions, sticks, rubbish and other extraneous matter shall be removed during this operation. No heavy objects except rollers shall be moved over lawn areas after the sub-grade soil has been prepared before topsoil is spread.
- B. After the sub-grade soil has been prepared, topsoil from the stockpile areas shall be spread evenly therein to depth of six (6") inches by an approved method and the area then rolled with a 200-pound roller. No topsoil shall be spread in a frozen or muddy condition.
- C. On all grass areas, the finished surface of the topsoil shall conform to the finished grade and shall be free from hollows or other inequalities, stones, sticks, and other extraneous matter.

3.7 FINISH GRADING

- A. In areas to receive lawns not within the canopy of existing trees, the Contractor shall till, disc, or otherwise scarify the soil, removing all clods, stones, and related material one-half (1/2") inch or larger. Place and spread any additional material that may be required. Roll completely.
- B. This Contractor shall be responsible for minor adjustments to the finished sub-grade if such treatment is required in the opinion of the Landscape Architect.

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- C. The Contractor may use machinery acceptable to the Landscape Architect to complete most of the work to re-establishing finished grade.
- D. Hand-rake the surface, removing all clods and undesirable material greater than one-half (1/2") inch from ground surface. Fill all low spots and cut irregularities to the acceptance of the Landscape Architect. Roll the entire surface evenly with a 200-pound water ballast roller or other means acceptable.
- E. During the finished grading operations, all swales and additional swales that may be required to drain areas where there are existing plant materials, shall be finished. In general, all grade adjustments shall be made so there are no areas that will have standing water.
- F. To prevent excessive weed growth in the lawn areas, the Contractor should be prepared to immediately install the sod upon the approved, completed and acceptable finished grade.
- G. Finish grade in existing tree areas which are to be graded shall be accomplished by light hand raking to a depth of 1/2" maximum and smoothing the area. No other grading, fill or other leveling is to occur.

END OF SECTION

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SECTION 312319

DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes construction dewatering.

1.2 PREINSTALLATION MEETINGS

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

1.3 FIELD CONDITIONS

- A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide temporary grading to facilitate dewatering and control of surface water.
- B. Protect and maintain temporary erosion and sedimentation controls during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Space well points or wells at intervals required to provide sufficient dewatering.

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2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
 - C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.
- C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION

SECTION 321316

LANDSCAPE ARCHITECTURAL CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work as required to make a complete Site Masonry Mortaring & Grouting installation, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Cast-in-Place Concrete Ramps
 - 2. Cast-in-Place Concrete Curbs and Gutters
 - 3. Cast-in-Place Concrete Sidewalks (non-decorative or non-architectural)
 - 4. Cast-in-Place Concrete Sub-slabs
 - 5. Jointing (Expansion Joints, Contraction Joints, Isolation Joints, Keyway/Construction Joints and/or Architectural Score Joints)
 - 6. Joint Sealants
 - 7. Steel Dowels and Sleeves
 - 8. Compacted Sub-Surface Materials.
 - 9. Concrete Pavement Finishes.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 044213 "Stone Blocks, Boulders and Slabs".
 - 3. Section 055013 "Site Miscellaneous Metal Fabrications".
 - 4. Section 321323 "Cast-in-Place Concrete for Landscape Elements".
 - 5. Section 323236 "Gabion Walls"

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM – American Society for Testing and Materials.
 - 2. ANSI – American National Standards Institute.
 - 3. ACI – American Concrete Institute.
 - 4. PCA – Portland Cement Association.
 - 5. CRSI – Concrete Reinforcing Steel Institute.
 - 6. SWRI – Sealant, Waterproofing & Restoration Institute.
 - 7. UBC – Uniform Building Code.
 - 8. NRMCA – National Ready-Mix Concrete Association.
 - 9. ADAAG – American with Disabilities Act Accessibility Guidelines.

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B. Definitions:

1. Cementitious Materials: Portland Cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
2. Percent Compaction: Per ASTM D1557, percentage of the maximum in-place dry density of the same material, as determined by Geotechnical Engineer.

C. Measurements:

1. PSI: Measurement, in pounds per square foot.
2. CU/FT: Measurement, in cubic-foot.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product/Material Data. Submit available Product/Material data, manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of material and product indicated:
 1. Reinforcement and Forming Accessories.
 2. Cementitious Materials.
 3. Chemical Admixtures.
 4. Jointing Materials and Systems, including Joint Sealants.
 5. Finishing Materials (top-seeding materials, color hardeners, surface retarders, etc.)
 6. Paving Surface Sealants.

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- H. Statement of Mix Design: Prepared by the batch plant servicing the Project, submit for each type or load delivered to Project. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Each Statement of Mix Design shall include following information:
1. Name, address, and telephone number of batch plant preparing Statement of Mix Design.
 2. Date of Mix Design.
 3. Project location.
 4. Contractor requesting load delivery.
 5. Mix Design Number.
 6. Admixtures and Integral Color Admixtures (as required).
 7. Gradations for sand and aggregate.
 8. Material weights, specific gravity, and absolute volumes.
 9. Water/Cementitious Materials Ratio (W/CM Ratio).
 10. Slump.
 11. PSI Rating.
- I. Material Test Reports: Signed and stamped laboratory test reports for evaluation of concrete materials and mix design tests.
- J. Material Samples: Samples of the material items indicated herein this Section shall be furnished for review and approval. Submit two (2) sets of samples that are consistent with the specified products for each item indicated:
1. One (1) pound sample of each seeded aggregate
 2. One (1) pound sample of each aggregate.
 3. One-foot (1'-0") section of each Joint Sealant material.
- K. Scaled Shop Drawings for reinforcement, indicating type, size, layout, spacing, forms, shapes and placement for all concrete scope of Work reinforcing.
- L. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Concrete Paving installations. Include lists of completed projects with project names and addresses, names and addresses of Architects/Landscape Architects, Artists and Owners, and other information specified.
- M. Submittals for Environmental Performance
1. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.
 2. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.
 3. Provide product data stating the location where all products were manufactured and where the raw materials were harvested, extracted or recovered.
 4. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.
 5. For projects using reusable formwork, provide data showing how formwork is reused.
 6. Provide MSDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.
 7. Provide MSDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

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N. Field-Constructed Mock-up Samples:

1. General: Prior to the installation of Work under this Section, Contractor shall erect Field-Constructed Mock-up Samples for each type and pattern of Concrete Paving required for review and approval by the Landscape Architect, to verify selections made under the referee samples obtained by the Landscape Architect.
2. Build Field-Constructed Mock-up Samples to comply with the following requirements, using materials and same base construction including special features for form work, jointing, surface finishes, textures, color(s), and contiguous Work as indicated for the final unit of Work.
 - a. Locate Field-Constructed Mock-up Samples on the Project Site in location(s) as directed by the Owner.
 - b. Notify the Landscape Architect, in writing, at least one (5) days in advance of the dates and times when Field-Constructed Mock-up Samples will be erected.
 - c. Demonstrate quality and range of aesthetic effects and workmanship in the Field-Constructed Mock-up Samples that will be produced in final unit of Work.
 - d. Obtain the Landscape Architect's acceptance of Field-Constructed Mock-up Samples, in writing, before start of installation of Work.
 - e. Retain and maintain Field-Constructed Mock-up Samples during construction in an undisturbed condition as a standard for judging the completed unit of Work.
 - f. When directed by the Owner, Contractor shall demolish and remove Field-Constructed Mock-up Samples from Project Site.
3. Size: Each Field-Constructed Mock-up Sample within this Section shall measure a minimum of three-feet (3'-0") wide x six-feet (6'-0") long to compare the aesthetics of material colors, textures, and finishes.
4. When the Landscape Architect determines that a Field-Constructed Mock-up Sample does not meet acceptable requirements, retain it for reference and cast another Field-Constructed Mock-up Sample (as required) until the Sample is accepted.
5. Accepted Field-Constructed Mock-up Samples will be the standard by which Work under this Section will be evaluated for technical and aesthetic merit. Accepted Field-Constructed Mock-up Samples are the prerequisite to the commencement of Work.

O. Minutes of Pre-Installation Conference, distributed and approved in writing as to the content of the conference by concerned parties in attendance.

1.4 QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications: Engage an experienced Installer who has completed in the last two (2) years at least three (3) concrete paving installations similar in material, design, and extent to that indicated for this Project, and whose work has resulted in construction with a record of successful in-service performance.

B. Applicable Standards of Work:

1. Applicable specifications and recommended practices of American Concrete Institute (ACI), American Society for Testing and Materials (ASTM), The Uniform Building Code, with their individual designations, are to be considered part of this Specification. Refer to "Standards of Construction" under "Definitions & Applicable Standards" Article herein this Section.
2. Design and Control of Concrete Mixture, Thirteenth Edition, Portland Cement Association.
3. Manual of Standard Practice, Concrete Reinforcing Steel Institute (CRSI).
4. Sealants: The Professional's Guide, Sealant, Waterproofing & Restoration Institute (SWRI).

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- C. Single-Source Responsibility: Obtain each color, type, and variety of cementitious materials, aggregates (coarse and fine), chemical admixtures, water source, jointing materials, and other materials, from a single source, with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 to conduct the testing indicated, as documented according to ASTM E548.
- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.
- F. Lines and Levels: To be established by a licensed Surveyor or registered Civil Engineer.

1.5 PREINSTALLATION CONFERENCE

- A. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - 1. Concrete mixture design.
 - 2. Quality control of concrete materials and concrete paving construction practices.
 - 3. Mock-ups Requirements
 - 4. Finishing and Surface intentions and requirements
- B. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - 1. Contractor's superintendent.
 - 2. Independent testing agency responsible for concrete design mixtures.
 - 3. Ready-mix concrete manufacturer.
 - 4. Concrete paving subcontractor.
 - 5. Landscape Architect
 - 6. Owner Representative(s)

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in a timely manner to ensure un-interrupted progress of the Work.
- B. Store materials in a dry and protected location. Protect reinforcing steel and dowels from rusting, deformation, staining, and moisture damage.
- C. Store materials by methods that prevent damage and permit ready access for inspection and identification. Package cement delivered to the Project Site shall be in strong paper or jute bags with brand name and manufacturer's name stamped thereon. Store cement under cover. Remove packaged cement immediately from the Project Site should it become wet or show any signs of caking or deterioration.
- D. Keep surface seeded/finishing materials dry prior to installation, as required.

1.7 PROJECT SITE CONDITIONS

- A. Traffic Control: Maintain access for vehicular, bicycle, and pedestrian traffic as required for other construction activities. Access to the surrounding buildings shall also be unobstructed and maintained at all times to allow for entry and exit of emergency vehicles.

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- B. Establish and maintain required levels and grade elevations. Review installation procedures and coordinate Work herein this Section with other Work affected.
- C. Do not place concrete during rain or adverse weather conditions without means to prevent damage. Conform to requirements specified hereinafter whenever concrete placement is required during cold or hot weather.
- D. Water and Dust Control: Maintain control of concrete dust and water during duration of Contract. Do not permit adjacent planting areas to be contaminated. Clean up debris resulting from this work at the end of each day's work.

1.8 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Sequence and Scheduling: Notify contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place, such as:
 - 1. Irrigation Pipe Sleeves under paving. Refer to Section 328400 – Irrigation Systems.
 - 2. Accessories embedded in the concrete, and for the provision of holes, openings, etc., necessary to the execution of the Work of the trades.
 - 3. Future sleeves under paving.
 - 4. Utility crossings
- B. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- D. Excavation: When conditions detrimental to adequate installation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.
- E. Environmental Conditions: Perform installation operations only when weather and soil conditions are suitable in accordance with locally-accepted practices.
- F. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

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PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, wood, MDO plywood, metal, metal-framed plywood, or other approved panel-type materials, of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.
1. Provide Forms that are full-depth, continuous, straight and free of distortions and defects, and level or sloping along exposed surfaces.
 2. Provide Forms of sufficient strength and durability to hold concrete properly in place and prevent leakage of water from Forms.
 3. Use flexible spring forms, laminated boards, or foam forms to form radius bends, as required.
 4. No wood-textured finish from Forms will be permitted on exposed concrete unless specified as such.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments and finishes of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Steel Reinforcement Bars: Meet ASTM A615, Grade 60 deformed, clean and free of rust, dirt, grease or oils.
1. Provide material manufactured from 80-100% post-consumer recycled-content materials.
- B. Steel Bar Mats: Meet ASTM A184 with ASTM A615, Grade 60 deformed bars; assembled with clips.
1. Provide material manufactured from 80-100% post-consumer recycled-content materials.
- C. Steel Tie Wire: 16-gauge minimum, black annealed, plain cold-drawn steel conforming to ASTM A82, clean, and free of rust, dirt, grease or oils.
- D. Construction/Expansion Joint Dowel Bars & Slip Dowel Sleeves:
1. Slip Dowel Sleeve System: A reusable base and plastic sleeve, manufactured from polypropylene plastic. Encase fifty percent (50%) of each dowel in a plastic sleeve to allow parallel lateral movement of each Dowel. Size of Sleeve to match size of Dowel.
 - a. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Speed Dowel, Greenstreak.
 - 2) or equal (no known equal).
 - b. All dowels shall be held in place prior to pour with dowel chairs
- E. Snap Ties: Snap-off metal of fixed length capable of leaving no metal within 1 1/2 in. of surface or causing fractures, spall, or other defects larger than one (1) in. diameter.
- F. Hook Bolts: ASTM A307, Grade A internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

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- G. Supports for Reinforcement: Lightweight, strong, non-corrosive, durable, and impervious to water. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place, as manufactured from 100% recycled-content plastic or engineered resins from recycled ABS plastic, polycarbonates, and fiberglass.

2.3 CONCRETE MATERIALS

- A. Portland Cement: Meet ASTM C150. Use one (1) brand of cement (single source) throughout the Project, unless otherwise acceptable to the Landscape Architect. Contractor shall verify the cement color with the Landscape Architect. Cement Type as follows:
 - 1. Cement Type: Type I or II
- B. Aggregate: ASTM C 33, uniformly graded, from a single source, gray in color only, with coarse aggregate as follows:
 - 1. Class: 4M.
 - 2. Maximum Aggregate Size: 3/4 inch nominal.
 - 3. Do not use fine or coarse aggregates containing substances that cause spalling.
- C. Water: Per ASTM C1602, from potable domestic source, free from deleterious materials such as oils, acids, and organic matter.

2.4 CHEMICAL ADMIXTURES FOR CONCRETE

- A. General: Admixtures shall be certified by the Manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other Admixtures. Use of Admixtures shall not relieve the Contractor of the designated concrete requirements, including strength.
- B. Air-Entraining Admixture: Meet ASTM C260.
- C. Water-Reducing Admixture: Meet ASTM C494, Type A.
- D. Water-Reducing and Set Retarding Admixture: Meet ASTM C494, Type B and D.
- E. Shrinkage-Reducing Admixture: Meet ASTM C157. Provide at dosage of 2% by weight of cement.
- F. Integral Concrete Coloring Admixture: Provide materials specifically designed for use in ready-mix concrete, from a single source, and shall be like in color and visual appearance. Meet ASTM C979. Refer to Section 32 13 16 "Decorative Concrete Paving".

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 ounces / square yard 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.

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- E. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Clear Waterborne Membrane-Forming Curing Compound which will not affect the final surface color or finish:

2.6 RELATED MATERIALS

- A. Expansion Joint Materials:
 - 1. W.R. Meadows or equal, Ceramar flexible foam expansion joint 1/4 inch
 - 2. Metal keyway with 1/4 inch pull strip and foam expansion material.

2.7 CONCRETE MIXES AND PROPORTIONING

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
 - 1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): 3000 PSI
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches.
 - 4. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
 - 5. Cementitious Materials: Limit cementitious materials to Portland cement only. Fly ash or other Pozzolan is not permitted.
- D. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
 - 1. Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.
 - 2. Air Content: 6.0 percent for 1-inch and 3/4-inch maximum aggregate.
- E. Concrete Mixing
 - 1. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C94.
- B. When air temperature is between 85 deg. F. (30 deg. C.) and 90 deg. F. (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.

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2.9 CONCRETE PAVEMENT SEALANT

A. Penetrating Sealant:

1. General: Penetrating Sealant shall be an invisible, water-based Penetrating Sealant, used to protect exterior Unit Paving installations. Sealant shall be a clear, non-flammable, UV-stabilized, non-yellowing solution which cures to reduce staining, soiling, discoloration, efflorescence, and acts as a invisible water-repellant coating, formulated to impart water repellence and dirt reduction to Unit Paving surfaces with no change in the surface appearance. Sealant shall react with carbon dioxide, and atmospheric moisture to form a penetrating water, dirt and mildew repellent barrier within 24 hours. Moisture absorption rate shall be low to reduce visible surface changes for up to ten (10) years.
2. Sealer shall be applied to all exposed, finished concrete slabs and where designated on contract documents.
3. Products & Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. SLX100, Prosoco, Inc.
 - b. Or equal, as approved by the Landscape Architect.
4. Provide sealer mock-up for final sealer approval on all colors of selected concrete pavements prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.
- C. Examine exposed sub-grades and sub-base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- D. Surface Drainage:
 1. Report in writing conflicts discovered on the site or prior Work done by others, which would prevent positive drainage.
 2. Do not permit finished paving surfaces to vary more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes.
 3. No "birdbaths" or other surface irregularities shall be permitted. Properly correct irregularities.

3.2 PREPARATION

- A. Templates: Use templates for anchor plates, bolts, inserts and/or other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.
- B. Piping and Conduit: Do not embed piping, other than electrical conduit, in structural concrete. Locate conduit to maintain strength of structures at maximum. Verify size, length and location of electrical conduit.

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- C. Aggregate Base Course: Compact base course to thicknesses as shown on Contract Drawings or as indicated per the Geotechnical Report, to the relative compaction density as required per the Geotechnical Report. Aggregate Base Course shall be graded to the lines and levels indicated; no ruts or depressions shall be allowed.
- D. Gravel Fill or Sand Beds: Re-compact disturbed gravel fill or sand beds and bring to correct elevation.

3.3 FORMWORK

- A. Design, construct, erect, shore, brace, and maintain Formwork according to ACI 347 "Guide to Formwork for Concrete."
- B. Contact Landscape Architect after form placement and prior to placement for review and field adjustment to form work.
- C. Formwork shall be consistent with the orientation and pattern indicated on the Contract Drawings. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install Formwork to allow continuous progress of Work and so that Formwork can remain in place at least twenty-four (24)-hours after concrete placement.
- D. Coordinate locations of drainage piping requirements, irrigation piping stub-outs, electrical conduits, or other items scheduled to be embedded into cast concrete.
- E. Check completed Formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in ten- (10) feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in ten-(10) feet.
- F. Coat Formwork with Form Release Agent, as required, to ensure Formwork separates from cast concrete without damage to concrete.
 - 1. Formwork surfaces shall be clean, dry, and free from contaminants (dirt, dust, rust, build-up, and existing form agents) prior to each use of Formwork
 - 2. Prior to each use, Formwork that comes into direct contact with concrete shall be coated with Form Release Agent in accordance with the Manufacturer's written instructions.
 - 3. Apply Form Release Agent in a uniform and even manner by low pressure spray, roller, or clean cloth, in accordance with the Manufacturer's written instructions.
 - 4. Prior to coating new Formwork, apply one (1) or two (2) heavy coats to edges for waterproofing protection.
 - 5. Excess Form Release Agent or dense form surfaces should be removed with a clean cloth.
 - 6. Do not apply Form Release Agent to reinforcing steel.

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.

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- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 CONCRETE PLACEMENT

- A. Preparation: Remove all free water from forms before concrete is deposited. Remove hardened concrete, debris, and foreign materials from interior surfaces of forms, exposed reinforcing, and from surfaces of mixing and conveying equipment.
- B. Sub-Base: Sub-Base shall be free of ruts, holes, ridges, etc. Smooth and compact sub-base to an even plane.
- C. Wetting: Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce absorption and to help maintain concrete workability. Dampen earth sub-grade twenty-four (24) hours before placing concrete, but do not muddy. Re-roll where necessary for smoothness, and remove loose material from compacted sub-base surface prior to placing concrete.
- D. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, dowels/sleeves, and items to be embedded or cast in. Notify other trades to permit installation of their Work.
 - 1. Reinforcement and Forms shall be secured firmly in position such that they will not be displaced during the placement of concrete.
 - 2. Reinforcement Bars, Ties, and Welded Wire Reinforcement shall be completely encased in concrete, at a maximum of two-inches (2") from the edge of the concrete.
 - 3. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- E. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained eighty-five-percent (85%) of its fully hydrated compressive strength.

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- I. Cold-Weather Placement: Comply with ACI 306.1, and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg. F. (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 calcium chloride, salt, or other materials containing anti-freeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

- J. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg. F. (32 deg. C.). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, reinforcement steel, and sub-grade just before placing concrete. Keep sub-grade moisture uniform without standing water, soft spots, or dry areas.

3.6 JOINTS

- A. General: Refer to ACI 302 "Guide for Concrete Floor and Slab Construction" for work under this Article. Construct construction, isolation, expansion, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing 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 (1/2) hour, unless paving terminates at isolation joints.
 - 1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated on the Contract Drawings.
 - 2. Provide tie bars at sides of paving strips where indicated.
 - 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

- C. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, buildings, foundations, walls, other fixed objects, and in other locations as indicated on the Contract Drawings. Provide Expansion Joints at full depth of concrete paving where paving meets the vertical faces of buildings, structures, foundations, walls, etc.
 - 1. Locate expansion joints at maximum intervals of twenty (20) feet, unless otherwise indicated on the Contract Drawings.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Provide Construction Joint Dowel Bars at the spacing distances indicated in the Contract Drawings.
 - 4. Terminate Joint Filler less than 1/2 inch or more than one-inch (1") below finished surface if joint sealant is indicated.

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5. Place top of Joint Filler flush with finished concrete surface if joint sealant is not indicated.
 6. Furnish joint fillers in one (1)-piece lengths. Where more than one (1) length is required, lace or clip joint-filler sections together.
 7. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints and Isolation Joints: Form weakened-plane contraction joints and isolation joints, sectioning concrete into areas as indicated on the Construction Drawings, or at spacing intervals as recommended by the PCA.
1. General Methodology: Contraction Joints shall be placed in Concrete Paving to minimize the occurrence of random cracking on the surface due to drying shrinkage or stress loading and to reduce the width of concrete cracks should they occur. When not indicated on the Contract Drawings, Contraction Joints shall be placed at 24x the thickness of the concrete paving.
 2. Tooled (Grooved) Contraction Joints:
 - a. Form Tooled (Grooved) Joints in fresh concrete after initial floating using a jointer to cut the groove so that a smooth, uniform impression is obtained. Strike joints before and after floating and troweling.
 - b. Perform in a continuous operation to avoid misalignment of joints. Use snap-lines and forms, as required, to achieve consistent lines. Re-form crooked or misaligned joints at no cost to Owner.
 - c. Tooled Radius of Joint Tool
 - 1) Radius: 1/8 inch.
 - d. Depth: Construct depth equal to a minimum of one-fifth (1/5) of the concrete slab thickness.
 3. Saw-Cut Contraction Joints:
 - a. Construct Saw-Cut Contraction Joints with a circular power saw, equipped with a new, shatterproof abrasive or diamond-tipped blade. Cut 3/16-inch-wide joints (maximum width of saw-blade) into concrete surface. Cutting action shall not tear, abrade, spall, shatter, or otherwise damage the surface.
 - b. Saw-cut concrete surface when successful jointing results can be achieved and prior to uncontrolled random contraction cracking of concrete occurs.
 - 1) Early-entry Sawcuts: When used, provide sawcuts into fresh concrete as indicated on the Contract Drawings.
 - c. Perform saw-cut joints cleanly and smoothly, to a constant and equal depth, in a continuous consistent line, with no over-cutting.
 - d. Depth:
 - 1) Contraction Joints: Construct depth equal to a minimum of one-fourth (1/4) of the concrete slab thickness.
 - 2) Isolation Joints: Construct depth equal to the full depth of the concrete thickness.
 - e. Perform in as continuous an operation as possible, to avoid misalignment of joints. Use chalk lines, forms, or templates as required, to achieve consistent lines.

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- f. Use a hand grinder with a 4-inch diamond blade to saw-cut up to vertical edges such as walls, steps, curbs and columns. Do not over-cut into vertical surfaces or adjacent concrete surfaces.
- E. Edging: Tool edges of pavements, gutters, headers, curbs, joints in concrete, and other locations, as required, after initial floating, with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - 1. Radius: as indicated on the Contract Drawings

3.7 CONCRETE FINISHES

A. General:

- 1. Finished pavement surfaces indicated herein this Section shall be "slip-resistant", per the requirements outlined in and per ADAAG 4.5.1.
 - a. The minimum coefficient of friction shall meet or exceed 0.8 on exterior and 0.6 on interior surfaces.
 - b. Pavement surfaces shall have the following finish on all surfaces less than six percent (6%) slope:
 - 1) Medium Broom Textured Finish, or a textured finish as specified which is equivalent to the finished texture of a Medium Broom Textured Finish.
 - c. Pavement surfaces shall have the following finish on all surfaces greater than six percent (6%) slope:
 - 1) Heavy Broom Textured Finish, or a textured finish as specified which is equivalent to the finished texture of a Heavy Broom Textured Finish.
 - d. Color(s) and finish(es) specified herein shall match referee samples and field-constructed mock-up samples as approved by the Landscape Architect.
 - e. Wetting of concrete surfaces during screeding, initial floating, or finishing operations is strictly prohibited.

B. Broom-Textured Finish: Match Referee Sample, as acquired by the Landscape Architect, and the approved Field Constructed Mock-up, to compare for color, texture, finish, and other characteristics relating to aesthetic effects.

- 1. Applications: Refer to the Cast-in-Place Concrete Paving Schedule indicated herein this Section for requirements. Provide in areas as indicated on Contract Drawings.
 - a. All sub-slabs conditions to received stone finishes shall have this finish applied unless designated otherwise.
- 2. Texture:
 - a. Fine-to-Medium-Textured Broom Finish: Provide a fine-to-medium texture finish by striating the freshly-cast float-finished concrete surface with a soft bristle broom, perpendicular to line of traffic, to provide a uniform, consistent, fine-line texture.
 - b. Medium-to-Coarse-Textured Broom Finish: Provide a medium-to-coarse-texture finish by striating the freshly-cast float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic, to provide a uniform, consistent, coarse-line texture.

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3. Provide contraction jointing and edging, as required, in the locations indicated in the Contract Drawings, and of the type(s) indicated herein this Section. Early-entry jointing of concrete may be required to prevent premature cracking of finished surfaces.
 4. After concrete is fully hydrated (approx. 30-days), seal broom texture finished concrete surface with two (2) coats of Sealer as specified herein this Section, per the Manufacturer's latest printed instructions.
 - a. Refer to the Cast-in-Place Concrete Paving Schedule indicated herein this Section for Sealer requirements.
- C. Acid-Etch Textured Finish: Match Referee Sample, as acquired by the Landscape Architect, and the approved Field Constructed Mock-up, to compare for color, texture, finish, and other characteristics relating to aesthetic effects.
1. Applications: Refer to the Cast-in-Place Concrete Paving Schedule indicated herein this Section for requirements. Provide in areas as indicated on Contract Drawings.
 2. Float-finish the concrete surface to provide a uniform, consistent texture.
 3. Provide contraction jointing and edging, as required, in the locations indicated in the Contract Drawings, and of the type(s) indicated herein this Section. Early-entry jointing of concrete may be required to prevent premature cracking of finished surfaces. Do not use curing compounds.
 4. Approximately one (1) to two (2) days after the concrete has been cast, evenly spray-apply a muriatic acid wash (a diluted solution of approximately a 10:1 ratio of water to acid) or a top-cast solution to the concrete surface. Prevailing weather conditions will affect timing and strength of the acid-wash solution, and in cold and rainy conditions, more time may be needed for the concrete to start the hydration process before the acid-wash solution can be applied.
 5. Handle acid and acid wash solution with care to avoid spillage and staining. Protect areas adjacent to the Work from over-spray of the acid solution. Provide neutralizing solution(s) to the acid solution, as needed, to prevent chemicals from damaging or contaminating adjoining planting areas.
 6. After acid has adequately etched the concrete surface, gently flush the surface with fresh water to remove the acid solution. Do not use high pressure washed to apply water or to remove the acid solution from the surface.
 7. After concrete is fully hydrated (approx. 30-days), seal acid etched concrete finished surface with two (2) coats of Sealer as specified herein this Section, per the Manufacturer's latest printed instructions.
 - a. Refer to the Cast-in-Place Concrete Paving Schedule indicated herein this Section for Sealer requirements.
- D. Sandblast Textured Finish: Match Referee Sample, as acquired by the Landscape Architect, and the approved Field Constructed Mock-up, to compare for color, texture, finish, and other characteristics relating to aesthetic effects.
1. Applications: Refer to the Cast-in-Place Concrete Paving Schedule indicated herein this Section for requirements. Provide in areas as indicated on Contract Drawings.
 2. Work shall conform to CAL OSHA /MSDS for application and clean up procedures.
 3. After concrete is fully hydrated (approx. 30-days), provide a sandblast-textured finish to the exposed concrete surfaces, revealing the desired aggregates, with the following surface texture:
 - a. Light Sandblast Texture.
 - b. Medium Sandblast Texture:
 - c. Heavy Sandblast Texture.
 4. Provide jointing in the locations indicated in the Contract Drawings.

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5. Seal sandblast texture finished concrete surface with two (2) coats of Sealer as specified herein this Section, per the Manufacturer's latest printed instructions.
 - a. Refer to the Cast-in-Place Concrete Paving Schedule for Sealer requirements.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

3.9 INSTALLATION OF JOINT SEALANTS

- A. Provide a Joint Sealant that is compatible with the substrate material(s) to which it is being applied. Do not use a Joint Sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the application tool.
- B. Ambient Temperature Criteria: The ambient temperature shall be within the limits of 40d. F. and 90d. F. when the Joint Sealant is being applied.
- C. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of Joint Sealants as applicable to materials, applications and conditions indicated.
- D. Surface Preparation of Joints:
 1. Remove foreign material from joint substrates which could interfere with adhesion of Joint Sealant, including dust, surface dirt, dirt, moisture, water repellents, grease, oil, wax, lacquer, paint, waterproofing, or other foreign matter that would tend to destroy or impair adhesion.
 2. Remove oil and grease with solvent. Surfaces must be wiped dry with clean cloths.
 3. Clean porous surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or acid washing to produce a clean, sound substrate. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints.
 4. Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing.
 5. Clean non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of Joint Sealants.
- E. Sealant Preparation: Do not add liquids, solvents, or powders to the Joint Sealant material (for single-component materials). Where specified, mix multi-component elastomeric Joint Sealants in accordance with manufacturer's instructions.
- F. Primer: Immediately prior to application of the Joint Sealant, clean out loose particles from joints. Where recommended by the sealant manufacturer, apply Primer to joints in accordance with sealant manufacturer's instructions. Do not apply Primer to exposed finish surfaces. Do not allow spillage or migration of Primer onto adjoining surfaces.

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- G. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install Joint Fillers to provide sealant support for optimum performance cross-sectional shapes and depths.
 - a. Do not leave gaps between ends of Joint Fillers.
 - b. Do not stretch, twist, puncture or tear Joint Fillers.
 - c. Remove absorbent Joint Fillers which have become wet prior to sealant application and replace with dry material.
 2. Install Bond Breaker to the back or bottom of the joint cavity (between sealants and joint-fillers, compression seals or back of joints where required), as recommended by the Joint Sealant manufacturer, for each type of joint and sealant used, to prevent "third-side" adhesion of the Joint Sealant to the back of the joint. Carefully apply the Bond Breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the Bond Breaker.
- H. Installation of Joint Sealants:
1. Install Joint Sealant after concrete substrate material has been cast and allowed to cure. Remove protective cap from preformed Joint Filler. Remove any excess Joint Filler material that will inhibit an adequate depth and bond of the Joint Sealant material.
 2. Place masking tape where required along the joint cavity to prevent contact of the Joint Sealant with adjoining surfaces. Remove masking tape within ten (10) minutes after joint has been filled and tooled.
 3. Apply the Joint Sealant in accordance with the manufacturer's printed instructions with an application tool having a nozzle that fits the width of the joint cavity. Install Joint Sealant by proven techniques to contact and solidly full wet joint substrates, completely filling the recesses provided for each joint configuration, providing uniform, optimum performance cross-sectional shapes and depths. Do not allow spillage or migration of Joint Sealant onto adjoining surfaces.
- I. Tooling of Non-Sag Joint Sealants: Tool Non-Sag Joint Sealants to form smooth, uniform beads of configuration indicated, free of wrinkles, streaks, gouges, boils, air holes, etc. and to ensure contact and adhesion of the Joint Sealant with the sides of the joint. Remove excess Joint Sealants from surfaces adjacent to joint. Do not use tooling agents which discolor Joint Sealants or adjacent surfaces or are not approved by Sealant Manufacturer.
- J. Sanding of Joint Sealant: Lightly apply dry sand of type approved, where indicated, to cover freshly-poured elastic Joint Sealant material. When Joint Sealant has hardened, remove excess sand that has not bonded to Joint Sealant.
- K. Protection and Curing:
1. Protect installed Joint Sealants during and after curing period from contact with contaminating substances or from damage.
 2. Cut out and remove damaged or deteriorated Joint Sealers and reseal joints with matching new materials.
 3. Clean off excess Joint Sealants or sealant smears adjacent to joints as Work progresses by methods and with cleaning materials approved by the Sealant Manufacturer.

3.10 REPAIRS AND PROTECTION

- A. Remove in its entirety (from joint to joint) and replace concrete pavement that is broken, cracked, damaged, or defective, or concrete which does not meet requirements of this Section.

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- B. Drill test cores where directed by the Landscape Architect, when necessary, to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least fourteen (14) days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two (2) days before date scheduled for Substantial Completion inspections.

END OF SECTION

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SECTION 321323

CAST-IN-PLACE CONCRETE FOR LANDSCAPE ELEMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Reinforced Cast-in-Place Site Concrete, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following if not designated by structural or civil engineer contract documents:
 - 1. Cast-in-Place Site Concrete for miscellaneous footings or sub-grade foundations
 - 2. Cast-in-Place Site Concrete for stairs
 - 3. Cast-in-Place Concrete Retainer, Header or Edging for pavers, planting and aggregate paving.
 - 4. Jointing (Expansion Joints, Contraction Joints, Isolation Joints, Keyway/Construction Joints and/or Architectural Score Joints).
 - 5. Steel Reinforcement
 - 6. Steel Dowels and Sleeves
 - 7. Compacted Sub-Surface Materials
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 044213 "Site Stone Blocks, Boulders and Slabs".
 - 3. Section 062013 "Site Finish Carpentry".
 - 4. Section 129300 "Site Furnishings".
 - 5. Section 312219 "Landscape and Fine Grading".
 - 6. Section 323316 "Landscape Architectural Cement Concrete Paving".
 - 7. Section 334300 "Landscape Drainage".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM – American Society for Testing and Materials.
 - 2. ANSI – American National Standards Institute.
 - 3. ACI – American Concrete Institute.
 - 4. PCA – Portland Cement Association.
 - 5. CRSI – Concrete Reinforcing Steel Institute.
 - 6. SWRI – Sealant, Waterproofing & Restoration Institute.
 - 7. UBC – Uniform Building Code.
 - 8. NRMCA – National Ready-Mix Concrete Association.
 - 9. ADAAG – American with Disabilities Act Accessibility Guidelines.

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B. Definitions:

1. Cementitious Materials: Portland Cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
2. Percent Compaction: Per ASTM D1557, percentage of the maximum in-place dry density of the same material, as determined by Geotechnical Engineer.

C. Measurements.

1. PSI: Measurement, in pounds per square foot.
2. CU/FT: Measurement, in cubic-foot.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data: Manufacturers' current catalog cuts and specifications for the following:
 1. Expansion joint filler, sealant, backer rod and bond breaker.
 2. Dampproofing material.
 3. Air-entrainment.
 4. Curing Compound.
 5. Joint Sealant: Color chart.
- H. Statement of Mix Design: Prepared by the batch plant servicing the Project, submit for each type or load delivered to Project. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Each Statement of Mix Design shall include following information:
 1. Name, address, and telephone number of batch plant preparing Statement of Mix Design.
 2. Date of Mix Design.
 3. Project location.

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4. Contractor requesting load delivery.
5. Mix Design Number.
6. Admixtures (as required).
7. Integral Color Admixtures (as required).
8. Gradations for sand and aggregate.
9. Material weights, specific gravity, and absolute volumes.
10. Basis of testing, i.e. UBC 2605 D4 and CBC Title 24 2604 D4.
11. Water/Cementitious Materials Ratio (W/CM Ratio).
12. Slump.
13. PSI Rating.

I. Certificates:

1. Reinforcing Steel: Certificate of compliance
2. Concrete Mix Design: Ticket for each batch delivered showing the following:
 - a. Mix identification.
 - b. Weight of cement, aggregate, water, and admixtures, aggregate sizes/proportion, and air entrainment.

J. Material Test Reports: Signed and stamped laboratory test reports for evaluation of concrete materials and mix design tests.

K. Material Samples: Samples of the material items indicated herein this Section shall be furnished for review and approval. Submit two (2) sets of samples that are consistent with the specified products for each item indicated:

1. One (1) pound sample of each aggregate
2. One-foot (1'-0") section of each Joint Sealant material.

L. Scaled Shop Drawings for reinforcement, indicating type, size, layout, spacing, forms, shapes and placement for all concrete scope of Work reinforcing.

1.4 QUALITY ASSURANCE AND CONTROL

A. Installer Qualifications: Engage an experienced Installer who has completed in the last two (2) years at least three (3) concrete installations similar in material, design, and extent to that indicated for this Project, and whose work has resulted in construction with a record of successful in-service performance.

B. Mock-up for exposed finished work: Refer to Contract Documents for Mock-up requirements or at minimum provide one (1) 3 ft. x 3 ft. surface areas (minimum 4" thick) for each type of concrete finish and color to serve as standard of quality for all work. Mock-up shall include all jointing details (and insets) for acceptance.

C. Lines and Levels: To be established by a licensed Surveyor or registered Civil Engineer.

D. Design of Concrete Mix: Employ approved commercial testing laboratory to design concrete mixes as follows:

1. Minimum Compressive Strength at 28 Days:
 - a. Walls and Foundations: 3000 psi if not designated otherwise by structural or civil engineers.

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- 2. Concrete Slump:
 - a. Minimum: Two (2) inches
 - b. Maximum: Four (4) inches
 - c. if not designated otherwise by structural or civil engineers.

- 3. Maximum Water-Cement Ratio:
 - a. Foundations: 6.75 gallons per sack of cement.
 - b. if not designated otherwise by structural or civil engineers.

- E. Colored Concrete: Achieve color by integrally mixing coloring agent with concrete. Refer to finish schedule for concrete finishes and colors.

- F. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

1.5 PRE-INSTALLATION CONFERENCE

- A. Review methods and procedures related to concrete paving, including but not limited to, the following:
 - 1. Concrete mixture design.
 - 2. Quality control of concrete materials and concrete paving construction practices.
 - 3. Mock-ups Requirements
 - 4. Finishing and Surface intentions and requirements

- B. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
 - 1. Contractor's superintendent.
 - 2. Independent testing agency responsible for concrete design mixtures.
 - 3. Ready-mix concrete manufacturer.
 - 4. Concrete paving subcontractor.
 - 5. Landscape Architect
 - 6. Owner and Client Representative(s)

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in a timely manner to ensure un-interrupted progress of the Work.

- B. Store materials in a dry and protected location. Protect reinforcing steel and dowels from rusting, deformation, staining, and moisture damage.

- C. Store materials by methods that prevent damage and permit ready access for inspection and identification. Package cement delivered to the Project Site shall be in strong paper or jute bags with brand name and manufacturer's name stamped thereon. Store cement under cover. Remove packaged cement immediately from the Project Site should it become wet or show any signs of caking or deterioration.

1.7 PROJECT SITE CONDITIONS

- A. Traffic Control: Maintain access for vehicular, bicycle, and pedestrian traffic as required for other construction activities. Access to the surrounding buildings shall also be unobstructed and maintained at all times to allow for entry and exit of emergency vehicles.

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- B. Establish and maintain required levels and grade elevations. Review installation procedures and coordinate Work herein this Section with other Work affected.
- C. Do not place site concrete during rain or adverse weather conditions without means to prevent damage. Conform to requirements specified hereinafter whenever concrete placement is required during cold or hot weather.
- D. Keep Work area clean, and in a safe and workmanlike condition so that rubbish, waste, and debris does not interfere with Work of other trades.
- E. Water and Dust Control: Maintain control of concrete dust and water during duration of Contract. Do not permit adjacent planting areas to be contaminated. Clean up debris resulting from this work at the end of each day's Work.

1.8 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Sequence and Scheduling: Notify contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place, such as:
 - 1. Accessories embedded in the site concrete, and for the provision of holes, openings, etc., necessary to the execution of the Work of the trades.
- B. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- D. Excavation: When conditions detrimental to adequate installation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.
- E. Environmental Conditions: Perform installation operations only when weather and soil conditions are suitable in accordance with locally-accepted practices.
- F. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cement: ASTM C150, Type I or II Portland Cement. Use only one brand and type for entire job.

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B. Aggregate Base for On-grade Slabs:

1. Description: Class II aggregate base shall be free from vegetation matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.

2. Grading Requirements:

<u>Percent Passing</u>	<u>Sieve Size</u>
100	1 in.
90-100	3/4 in.
0- 10	#4
0- 3	#100

3. Quality Requirements:

- a. Minimum "R" value 40
- b. Max. Expansion Pressure; Calif. Test Method No. 301 to be 100 psf
- c. Maximum Plasticity Index 12
- d. Sand Equivalent 20 min

C. Coarse Aggregate:

1. Description: ASTM C33, hard, durable, uncoated, washed, graded, cleaned and screened crushed rock or gravel aggregate for regular weight concrete. Do not use crusher-run stone or bank-run gravel.
2. Grading: Do not use aggregate which has a maximum size exceeding 1/5 of the narrowest dimension between sides of forms of the member for which the concrete is to be used, nor larger than 3/4 of the minimum clear spacing between reinforcing bars. Do not use coarse aggregate which exceeds 3/4 in. for paving.
3. All aggregate is to be gray in color. Mixed color aggregate is not permitted. All aggregate is to be sourced from a single supplier throughout the entirety of the job.

D. Fine Aggregate:

1. Description: ASTM C33, clean, hard and durable sand. Do not use sand coated with injurious amounts of silt, loam, clay or other deleterious matter.
2. Grading Requirements:

<u>Percent Passing</u>	<u>Sieve Size</u>
45-70	#16
15-30	#50
3- 8	#100

- E. Water: Clean, potable concrete mixing water free from injurious amounts of salts, oils, acids, alkalis, organic materials or other deleterious matter. As available from Owner. Transport as required.

- F. Air Entrainment: ASTM C260.

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2.2 MIXTURE COMPONENTS

A. Coloring Agent:

1. Type: Commercially pure mineral pigments.
2. Percentage: Maximum 10% of the cement content by weight.
3. Product: CHROMIX Admixtures as produced by L.M. Scofield Co.,
4. Or approved equal

B. Color: Refer to finish schedule in contract drawings for any coloring or aggregate required.

2.3 ACCESSORIES

A. Reinforcements:

1. Reinforcing Bars: ASTM A615 Grade 40, or 60 deformed billet-steel bars, clean and free from rust, scale, or coating that will reduce bond.
2. Smooth Dowels for Expansion Joints: ASTM A615, Grade 40 smooth, billet-steel bars, shop painted with iron-oxide zinc-chromate primer.
3. Tie Wires: 18 ga. min. black annealed.
4. Snap Ties: Snap-off metal of fixed length capable of leaving no metal within 1 1/2 in. of surface nor causing fractures, spall or other defects larger than one (1) in. diameter.

B. Expansion Joint Materials:

1. Premolded Joint Filler: ASTM D1751, non-extruding and bituminous type resilient filler, compatible with sealant, and having a "guide strip" removable depth gauge.
2. Joint Sealant: ASTM C290, non-slag sealant
3. Bond Breaker: Pressure-sensitive tape as recommended by sealant manufacturer to suit application.

C. Forms:

1. Steel or wood of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.
2. Use forms that are straight and free of distortions and defects.
3. Use flexible spring forms or laminated boards to form radius bends as required.
4. All Surfaces not exposed: Of sufficient strength to hold concrete properly in place and prevent leakage of water from forms.
5. Exposed Surfaces: A-Matte, Two-step MDO plywood made for forming I. No wood-textured finish will be permitted on exposed concrete unless specified as such.

D. Form Release Agent: Colorless non-staining, free from oils. Chemical agent shall not impair bonding of paint or other proposed coatings.

E. Wood Headers:

1. Wood: Construction Heart grade rough Redwood header and stake or pressure-treated rough Douglas Fir stake.
2. Nails: Hot-dipped galvanized.

F. Dampproofing: ASTM C836-81, Fluid-V single component, bitumen-modified, moisture-curing polyurethane "Tremproof 60" by Tremco, (800) 321-7906.

G. Curing Compound: ASTM C309, Type I-D, Class A.

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- H. Chamfer Strips: Rigid PVC, or hardwood per drawings in maximum possible lengths
- I. Slip Sheet: 40 mil PVC sheet or 15 lb. felt

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.
- C. Proof-roll prepared sub-base surface for foundations to check for unstable areas and verify need for additional compaction. Verify that sub-grade preparation for site concrete has been completed including base course prior to commencement of Work.
- D. Surface Drainage:
 - 1. Report in writing conflicts discovered on the site or prior Work done by others, which would prevent positive drainage.
 - 2. Do not permit finished site concrete surfaces to vary more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes. Properly correct irregularities.

3.2 PREPARATION

- A. Templates: Use templates for anchor plates, bolts, inserts and/or other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.
- B. Piping and Conduit: Do not embed piping, other than electrical conduit, in structural concrete. Locate conduit to maintain strength of structures at maximum. Verify size, length and location of electrical conduit.
- C. Aggregate Base Course: Compact base course to thicknesses as shown on Contract Drawings or as indicated per the Geotechnical Report, to the relative compaction density as required per the Geotechnical Report. Aggregate Base Course shall be graded to the lines and levels indicated; no ruts or depressions shall be allowed.
- D. Gravel Fill or Sand Beds: Re-compact disturbed gravel fill or sand beds and bring to correct elevation.

3.3 FORMWORK

- A. Design, construct, erect, shore, brace, and maintain Formwork according to ACI 347 "Guide to Formwork for Concrete."
- B. Formwork shall be consistent with the orientation and pattern indicated on the Contract Drawings. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install Formwork to allow continuous progress of Work and so that Formwork can remain in place at least twenty-four (24)-hours after concrete placement.

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- C. Coordinate locations of drainage piping requirements, irrigation piping stub-outs, electrical conduits, or other items scheduled to be embedded into cast concrete.
- D. Check completed Formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in ten- (10) feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in ten-(10) feet.
- E. Coat Form Work with Form Release Agent, as required, to ensure Form Work separates from casted concrete without damage to concrete's finished surface.
 - 1. Formwork surfaces shall be clean, dry, and free from contaminants (dirt, dust, rust, build-up, and existing form agents) prior to each use of Formwork
 - 2. Prior to each use, Formwork that comes into direct contact with concrete shall be coated with Form Release Agent in accordance with the Manufacturer's written instructions.
 - 3. Apply Form Release Agent in a uniform and even manner by low pressure spray, roller, or clean cloth, in accordance with the Manufacturer's written instructions.
 - 4. Prior to coating new Formwork, apply one (1) or two (2) heavy coats to edges for waterproofing protection.
 - 5. Excess Form Release Agent or dense form surfaces should be removed with a clean cloth.
 - 6. Do not apply Form Release Agent to reinforcing steel.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean Reinforcement of loose rust and mill scale, earth, or other bond-reducing materials.
- C. Arrange, space, and securely Tie Bars and Bar Supports to firmly hold and support the Steel Reinforcement in position during concrete placement and to prevent displacement before or during casting. Maintain a minimum of two inches (2") cover to the Reinforcement.
- D. Install Steel Reinforcement Bars in sizes as indicated on the Contract Drawings, in lengths as long as practicable. Lap adjoining Bars at a minimum of fifty (50) bar diameters. Lace splices accordingly with Tie Wire. Offset laps of adjoining widths to prevent continuous laps in either direction. Erect and maintain Reinforcement Bars on chairs, secured firmly in position, in the middle of the concrete during casting operations. Do not extend Reinforcement Bars through expansion joints.
- E. Install Construction Joint Dowel Bars & Sleeves per the Manufacturer's recommendation. Reinforcing dowels, or sleeves for the reinforcing dowels, shall be secured in place prior to placing concrete. Align dowels in straight, even alignments in the middle of the concrete profile during casting operations. Dowels and sleeves shall not be pressed into the concrete during casting and after the concrete has been placed.
- F. Install fabricated Steel 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 two-inch (2") overlap to adjacent mats.
- G. Vapor Barrier: If provided, do not cut or puncture Vapor Barrier. Repair damage and reseal Vapor Barrier before placing concrete.

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3.5 CONCRETE PLACEMENT

- A. Preparation: Remove all free water from forms before concrete is deposited. Remove hardened concrete, debris, and foreign materials from interior surfaces of forms, exposed reinforcing, and from surfaces of mixing and conveying equipment.
- B. Sub-Base: Sub-Base shall be free of ruts, holes, ridges, etc. Smooth and compact sub-base to an even plane.
- C. Wetting: Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce absorption and to help maintain concrete workability. Dampen earth sub-grade twenty-four (24) hours before placing concrete, but do not muddy. Re-roll where necessary for smoothness, and remove loose material from compacted sub-base surface prior to placing concrete.
- D. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, dowels/sleeves, and items to be embedded or cast in. Notify other trades to permit installation of their Work.
 - 1. Reinforcement and Forms shall be secured firmly in position such that they will not be displaced during the placement of concrete.
 - 2. Reinforcement Bars, Ties, and Welded Wire Fabric shall be completely encased in concrete, at a minimum of two-inches (2") from any edge of the concrete.
 - 3. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- E. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate site concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Screed surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form 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.
- I. When adjoining concrete lanes are placed in separate pours, do not operate equipment on concrete until concrete has attained eighty-five-percent (85%) of its fully hydrated compressive strength.
- J. 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.

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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 calcium chloride, salt, or other materials containing anti-freeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg. F. (32 deg. C.). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, reinforcement steel, and sub-grade just before placing concrete. Keep sub-grade moisture uniform without standing water, soft spots, or dry areas.

3.6 JOINTS

- A. General: Refer to ACI 302 "Guide for Concrete Floor and Slab Construction" for work under this Article. Construct construction, isolation, expansion, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
1. When joining existing 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 site concrete and at locations where site concrete operations are stopped for more than one-half (1/2) hour, unless site concrete terminates at isolation joints.
1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of site concrete strips, unless otherwise indicated on the Contract Drawings.
 2. Provide tie bars at sides of site concrete strips where indicated.
 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Expansion Joints: Form expansion joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, buildings, foundations, walls, other fixed objects, and in other locations as indicated on the Contract Drawings. Provide Expansion Joints at full depth of site concrete where site concrete meets vertical faces of buildings, structures, foundations, walls, etc.
1. Locate expansion joints at maximum intervals of twenty (20) feet, unless otherwise indicated on the Contract Drawings.
 2. Extend joint fillers full width and depth of joint.
 3. Provide Construction Joint Dowel Bars at the spacing distances indicated in the Contract Drawings.
 4. Terminate Joint Filler less than 1/2 inch or more than one-inch (1") below finished surface if joint sealant is indicated.
 5. Place top of Joint Filler flush with finished concrete surface if joint sealant is not indicated.
 6. Furnish joint fillers in one (1)-piece lengths. Where more than one (1) length is required, lace or clip joint-filler sections together.

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7. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints and Isolation Joints: Form weakened-plane contraction joints and isolation joints, sectioning concrete into areas as indicated on the Construction Drawings, or at spacing intervals as recommended by the PCA.
1. General Methodology: Contraction Joints shall be placed in Site Concrete to minimize the occurrence of random cracking on the surface due to drying, shrinkage or stress loading and to reduce the width of concrete cracks should they occur. When not indicated on the Contract Drawings, Contraction Joints shall be placed at 24x the thickness of the site concrete.
 2. Tooled (Grooved) Contraction Joints:
 - a. Form Tooled (Grooved) Joints in fresh concrete after initial floating using a jointer to cut the above the groove so that a smooth, uniform impression is obtained. Strike joints before and after floating and troweling.
 - b. Perform in a continuous operation to avoid misalignment of joints. Use snap-lines and forms, as required, to achieve consistent lines. Re-form crooked or misaligned joints at no cost to Owner.
 - c. Radius: 1/8 inch.
 - d. Depth: Construct depth equal to a minimum of one-fifth (1/5) of the concrete slab thickness.
 3. Saw-Cut Contraction Joints:
 - a. Construct Saw-Cut Contraction Joints with a circular power saw, equipped with a new, shatterproof abrasive or diamond-tipped blade. Cut 3/16-inch-wide joints (maximum width of saw-blade) into concrete surface. Cutting action shall not tear, abrade, spall, shatter, or otherwise damage the surface.
 - b. Saw-cut concrete surface when successful jointing results can be achieved and prior to uncontrolled random contraction cracking of concrete occurs.
 - 1) Early-entry Sawcuts: When used, provide sawcuts into fresh concrete at 1" to 1-1/4" depth, or as indicated on the Contract Drawings.
 - c. Perform saw-cut joints cleanly and smoothly, to a constant and equal depth, in a continuous consistent line, with no over-cutting.
 - d. Depth:
 - 1) Contraction Joints: Construct depth equal to a minimum of one-fifth (1/5) of the concrete slab thickness.
 - 2) Isolation Joints: Construct depth equal to the full depth of the concrete thickness.
 - e. Perform in as continuous an operation as possible, to avoid misalignment of joints. Use chalk lines, forms, or templates as required, to achieve consistent lines)
 - f. Use a hand grinder with a 4-inch diamond blade to saw-cut up to vertical edges such as walls, steps, curbs and columns. Do not over-cut into vertical surfaces or adjacent concrete surfaces.
- E. Edging: Tool edges of site concrete, as required, after initial floating, with an edging tool to the following radius or chamfer. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

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1. Radius: 1/4 inch (aka "Carpet Edger").

3.7 CONCRETE FINISHES

A. General:

1. Finished site concrete surfaces indicated herein this Section shall be "slip-resistant", per the requirements outlined in and per ADAAG 4.5.1.
 - a. The minimum coefficient of friction shall meet or exceed 0.8 on exterior and 0.6 on interior horizontal pavement surfaces.
 - b. Exposed site concrete surfaces shall have the following finish on all surfaces less than six percent (6%) slope unless noted otherwise:
 - 1) Medium Broom Textured Finish or a textured finish as specified which is equivalent to the finished texture of a Medium Broom Textured Finish.
 - c. Exposed site concrete surfaces shall have the following finish on all surfaces greater than six percent (6%) slope unless noted otherwise:
 - 1) Heavy Broom Textured Finish or a textured finish as specified which is equivalent to the finished texture of a Heavy Broom Textured Finish.
 - d. Color(s) and finish(es) specified herein shall match referee samples and field-constructed mock-up samples as approved by the Landscape Architect.
 - e. Wetting of concrete surfaces during screeding, initial floating, or finishing operations is strictly prohibited.

B. Float Finish:

1. Applications: Provide Float finish for Veneer Unit Paving Sub-slabs. Provide in areas as indicated on Contract Drawings.
2. After initial screeding and floating, commence a second floating operation when bleed-water sheen has disappeared and the 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. Re-float surface immediately to uniform granular texture.
 - a. Float Texture:
 - 1) Use aluminum or magnesium float to produce medium texture.
3. Provide contraction jointing and edging, as required, in the locations indicated in the Contract Drawings, and of the type(s) indicated herein this Section.
4. After concrete is fully hydrated (approx. 30-days), seal float texture finished concrete surface with two (2) coats of Sealer as specified herein this Section, per the Manufacturer's latest printed instructions.

C. Broom Finish:

1. Obtain by drawing a stiff bristled broom across a floated finish.
2. Direction of brooming to be perpendicular to direction of paving (or as shown on Drawings.)
3. Exposing of Aggregates: Do not dislodge or unevenly expose the aggregates. Avoid direct hosing of the surface and do not use a pressurized nozzle.

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- D. Steel-Trowel Finish:
 - 1. Float finish as specified above.
 - 2. After surface water disappears and floated surfaces have sufficiently hardened, power trowel to produce an even smooth surface.
- E. After concrete has set enough to ring trowel, retrowel to a uniform smooth finish, free of trowel marks or other blemishes. Avoid excessive troweling that produces burnished areas.

3.8 CONCRETE PROTECTION 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 follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Protection:
 - 1. Protect concrete against rapid drying and damage by rain and freezing conditions
 - 2. Keep concrete moist for at least 7 days. Protect with liquid curing compound, or a covering that will not stain or discolor finished concrete surfaces. Obtain acceptance of proposed method prior to use.
- C. Spraying: Spray concrete during the curing period as frequently as drying conditions may require.
- D. Curing: Cure concrete in accordance with the ACI Manual of Concrete Practice. During curing period, maintain concrete above 70 degrees F. for at least 3 days or above 50 degrees F. for at least 5 days.

3.9 INSTALLATION OF JOINT SEALANTS

- A. Provide a Joint Sealant that is compatible with the substrate material(s) to which it is being applied. Do not use a Joint Sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the application tool.
- B. Ambient Temperature Criteria: The ambient temperature shall be within the limits of 40d. F. and 90d. F. when the Joint Sealant is being applied.
- C. Sealant Installation Standard: Comply with recommendations of ASTM C1193 for use of Joint Sealants as applicable to materials, applications and conditions indicated.
- D. Surface Preparation of Joints:
 - 1. Remove foreign material from joint substrates which could interfere with adhesion of Joint Sealant, including dust, surface dirt, dirt, moisture, water repellents, grease, oil, wax, lacquer, paint, waterproofing, or other foreign matter that would tend to destroy or impair adhesion.
 - 2. Remove oil and grease with solvent. Surfaces must be wiped dry with clean cloths.
 - 3. Clean porous surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or acid washing to produce a clean, sound substrate. Remove loose particles remaining from cleaning operations by vacuuming or blowing out joints.
 - 4. Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing.
 - 5. Clean non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of Joint Sealants.

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- E. Sealant Preparation: Do not add liquids, solvents, or powders to the Joint Sealant material (for single-component materials). Where specified, mix multi-component elastomeric Joint Sealants in accordance with manufacturer's instructions.
- F. Primer: Immediately prior to application of the Joint Sealant, clean out loose particles from joints. Where recommended by the sealant manufacturer, apply Primer to joints in accordance with sealant manufacturer's instructions. Do not apply Primer to exposed finish surfaces. Do not allow spillage or migration of Primer onto adjoining surfaces.
- G. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
 - 1. Install Joint Fillers to provide sealant support for optimum performance cross-sectional shapes and depths.
 - a. Do not leave gaps between ends of Joint Fillers.
 - b. Do not stretch, twist, puncture or tear Joint Fillers.
 - c. Remove absorbent Joint Fillers which have become wet prior to sealant application and replace with dry material.
 - 2. Install Bond Breaker to the back or bottom of the joint cavity (between sealants and joint-fillers, compression seals or back of joints where required), as recommended by the Joint Sealant manufacturer, for each type of joint and sealant used, to prevent "third-side" adhesion of the Joint Sealant to the back of the joint. Carefully apply the Bond Breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the Bond Breaker.
- H. Installation of Joint Sealants:
 - 1. Install Joint Sealant after concrete substrate material has been cast and allowed to cure. Remove protective cap from preformed Joint Filler. Remove any excess Joint Filler material that will inhibit an adequate depth and bond of the Joint Sealant material.
 - 2. Place masking tape where required along the joint cavity to prevent contact of the Joint Sealant with adjoining surfaces. Remove masking tape within ten (10) minutes after joint has been filled and tooled.
 - 3. Apply the Joint Sealant in accordance with the manufacturer's printed instructions with an application tool having a nozzle that fits the width of the joint cavity. Install Joint Sealant by proven techniques to contact and solidly full wet joint substrates, completely filling the recesses provided for each joint configuration, providing uniform, optimum performance cross-sectional shapes and depths. Do not allow spillage or migration of Joint Sealant onto adjoining surfaces.
- I. Tooling of Non-Sag Joint Sealants: Tool Non-Sag Joint Sealants to form smooth, uniform beads of configuration indicated, free of wrinkles, streaks, gouges, boils, air holes, etc. and to ensure contact and adhesion of the Joint Sealant with the sides of the joint. Remove excess Joint Sealants from surfaces adjacent to joint. Do not use tooling agents which discolor Joint Sealants or adjacent surfaces or are not approved by Sealant Manufacturer.
- J. Sanding of Joint Sealant: Lightly apply dry sand to cover freshly-poured elastic Joint Sealant material. When Joint Sealant has hardened, remove excess sand that has not bonded to Joint Sealant.
- K. Protection and Curing:
 - 1. Protect installed Joint Sealants during and after curing period from contact with contaminating substances or from damage.

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2. Cut out and remove damaged or deteriorated Joint Sealers and reseal joints with matching new materials.
3. Clean off excess Joint Sealants or sealant smears adjacent to joints as Work progresses by methods and with cleaning materials approved by the Sealant Manufacturer.

3.10 REPAIRS AND PROTECTION

- A. Remove in its entirety (from joint to joint) and replace site concrete that is broken, cracked, damaged, or defective, or concrete which does not meet requirements of this Section.
- B. Drill test cores where directed by the Landscape Architect, when necessary, to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory site concrete areas with Portland cement concrete bonded with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from site concrete for at least fourteen (14) days after placement. When construction traffic is permitted, maintain site concrete as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain exposed site concrete free of stains, discoloration, dirt, and other foreign material. Clean site concrete not more than two (2) days before date scheduled for Substantial Completion inspection.

3.11 DAMPPROOFING

- A. Preparation of Surfaces:
 1. Clean all surfaces to be dampproofed. Remove all dirt, grease, and other foreign matter which might interfere with adhesion and penetration. Allow surfaces to dry thoroughly.
 2. Carefully repair all cracks, holes, voids, open areas and other defects in concrete surfaces to be dampproofed. Use Portland Cement mortar; strike flush, permit to dry.
 3. Thoroughly clean all excess mortar from concrete surfaces after drying.
- B. Application of Dampproofing Compound:
 1. Cover entire retaining surface of backside of walls from top of footing to finished grade with specified dampproofing. Apply according to manufacturer's current printed instructions.
 2. Apply dampproofing in a clean line conforming to finished ground grade.
 3. Provide a completed dampproofing coating which is a continuous, uniform, unbroken, impervious film, free from pinholes and other surface breaks.

3.12 FIELD QUALITY CONTROL

- A. Samples: Owner will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary.
- B. Rejected Materials: Remove off the site all concrete below specified strength.
- C. Cost of Removal and Retesting: Pay for full costs of removal of rejected concrete and its replacement with concrete of specified strength and retesting.

END OF SECTION

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SECTION 321443

POROUS UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete grid pavers with aggregate fill.
2. Solid concrete pavers with openings between pavers filled with aggregate.
3. Aggregate setting bed for pavers.
4. Edge restraints.

1.2 ACTION SUBMITTALS

A. Product Data: For materials other than aggregates.

B. Sieve Analyses: For aggregate materials, according to ASTM C 136.

C. Samples:

1. Full-size units of each type of unit paver indicated.
2. Exposed edge restraints.
3. Aggregate fill.
4. Aggregate setting bed materials.

1.3 QUALITY ASSURANCE

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

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE UNIT PAVERS

A. Concrete Grid Pavers: Grid paving units complying with ASTM C 1319, made from normal-weight aggregates.

1. Thickness: as indicated
2. Face Size and Shape: as indicated.
3. Opening Percentage: as indicated.
4. Color: selected by Landscape Architect from manufacturer's full range

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- B. Solid Concrete Pavers for Porous Paving: Solid interlocking paving units of shapes that provide openings between units, complying with ASTM C 936/C 936M, and made from normal-weight aggregates.
1. Thickness: as indicated.
 2. Face Size and Shape: as indicated.
 3. Opening Percentage: as indicated.
 4. Color: selected by Landscape Architect from manufacturer's full range

2.2 ACCESSORIES

- A. Plastic Edge Restraints: Triangular PVC extrusions, 1-3/4 inches high by 3-1/2 inches wide, designed to serve as edge restraints for unit pavers; rigid type for straight edges and flexible type for curved edges, with pipe connectors and 3/8-inch- diameter by 12-inch- long steel spikes.
- B. Steel Edge Restraints: Painted steel edging, 3/16 inches thick by 4 inches high, with loops pressed from or welded to face to receive stakes at 36 inches o.c., and with steel stakes 15 inches long for each loop.
1. Color: As selected by Landscape Architect from manufacturer's full range.
- C. Aluminum Edge Restraints: Straight, 1/8 inch thick by 4 inches high extruded-aluminum edging, with loops pressed from face to receive stakes at 12 inches o.c., and with aluminum stakes 12 inches long for each loop.

2.3 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 57.
- B. Graded Aggregate for Base Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.
- D. Soil Mix for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate blended with planting soil. Use blend consisting of 1/2 sand and 1/2 planting soil mix.
- E. Graded Aggregate for Leveling Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- F. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured according to test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
 2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

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2.4 FILL MATERIALS

- A. Aggregate Fill for Porous Paving: Graded, sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8.
 - 1. Color: As indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be structurally unsound or visible in finished work.
- B. 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.
- C. Tolerances:
 - 1. Variation in Plane between Adjacent Units (Lipping): Do not exceed 1/16-inch unit-to-unit offset from flush.
 - 2. Variation from Level or Indicated Slope: Do not exceed 1/8 inch in 24 inches and 1/4 inch in 10 feet or a maximum of 1/2 inch.
- D. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.2 SETTING-BED INSTALLATION

- A. Compact subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.
- B. Place drainage geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
- C. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.
- D. Place aggregate subbase and base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.
- E. Place drainage geotextile over compacted subbase, overlapping ends and edges at least 12 inches.
- F. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.
- G. Place leveling course, and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

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3.3 PAVER INSTALLATION

- A. Set unit pavers on leveling course, being careful not to disturb leveling base. If pavers have lugs or spacer bars to control spacing, place pavers hand tight against lugs or spacer bars. If pavers do not have lugs or spacer bars, place pavers with a 1/16-inch- minimum and 1/8-inch- maximum joint width
- B. Compact pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz.
- C. Place soil fill immediately after vibrating pavers into leveling course. Spread and screed soil fill level with tops of pavers. Vibrate pavers and add soil fill until porous paving is filled to about 3/4 inch from top surface; remove excess soil fill if any.
- D. After filling pavers with soil, sow seed according to Section 329200 "Turf and Grasses," except sow seed at half the rate specified for seeding lawns. Sweep seed from surfaces of pavers into voids and water with fine spray.
- E. Place graded aggregate fill immediately after vibrating pavers into leveling course. Spread and screed aggregate fill level with tops of pavers.
- F. As work progresses, remove and replace 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.

3.4 MAINTENANCE AND PROTECTION

- A. Water newly planted grass and keep moist until grass is established. Maintain grass that is planted in paving to comply with requirements in Section 329200 "Turf and Grasses."
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades for 60 days after planting.

END OF SECTION

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SECTION 321500

AGGREGATE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete exterior Aggregate Surfacing installation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Aggregate or Cobble Mulch Surfacing
 - 2. Aggregate Pavement Surfacing
 - 3. Weed control barriers/geotextile filter fabric
 - 4. Steel edging restraints
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 312219 "Landscape and Fine Grading".
 - 3. Section 329113 "Soil Preparation".
 - 4. Section 329400 "Landscape Planting Accessories".
 - 5. Section 329813 "Landscape Establishment Period".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM – American Society for Testing and Materials.
 - 2. ANSI – American National Standards Institute.
- B. Definitions:
 - 1. psi – pounds per square inch (measurement).
 - 2. cu/ft – cubic-feet/foot (measurement).
 - 3. o.c. – on-center (measurement).

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1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Client and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Material Samples: For each type of material specified herein, provide Material Samples for review by the Landscape Architect. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled plastic bags (as applicable):
 - 1. 0.50 cu/ft of Aggregate Surfacing Material (i.e. Aggregates, Decomposed Granite, Cobbles, etc.) for each color and texture of material required for Project.
 - 2. One (1) two-foot (2'-0") square sample of Weed Control Barrier/Geotextile Filter Fabric.
- H. Mock-Ups:
 - 1. Aggregate paving: One (1) - 4 ft. x 4 ft. x thickness for each stone type shown on Drawings, to remain at job site until Final Acceptance.
 - a. Panel to include steel edge on all sides, and geotextile underlayment and stabilizer installed as specified
- I. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Planting Accessories installations.

1.4 QUALITY ASSURANCE AND CONTROL

- A. Installer Qualifications:
 - 1. Engage an experienced Installer who has completed Aggregate Surfacing work similar in material, design, and extent to that indicated for this Project and with a record of successful installation.

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2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

B. Observation: Landscape Architect may observe installation of Aggregate Surfacing at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Aggregate Surfacing for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Aggregate Surfacing immediately from Project site.

C. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing services, and inspections necessary to perform and complete Work under this Section.

D. Single-Source Responsibility: Obtain each color, type, and variety of products/materials from a single source with resources to provide products/materials of consistent quality in appearance and physical properties without delaying Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage. Deliver and store perishable material in original, unopened packaging.

B. Damaged Materials: Be responsible for all damage or disfiguration of Work until Final Acceptance. Remove off site and replace at no additional cost to Owner all damaged or rejected materials.

C. Deliver materials so as to not delay Work, and install only after preparations for installation have been completed.

1.6 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Do not install Crushed aggregate during rain or while subbase is wet from rain.

B. Existing Conditions: For protection of existing plants to remain, see 015639 Temporary Tree and Plant Protection.

1.7 COORDINATION, SCHEDULING, AND OBSERVATIONS

A. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to installing Aggregate Surfacing are encountered, such as adverse drainage conditions or obstructions, cease installation operations and notify Landscape Architect for further direction.

C. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.

D. Installation: Perform installation of Aggregate Surfacing only when weather and soil conditions are suitable in accordance with locally accepted practices.

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- E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.8 LANDSCAPE ESTABLISHMENT PERIOD

- A. Refer to Section 329813 "Landscape Establishment Period", for requirements under this Article.

1.9 MAINTENANCE

- A. Service: Immediately repair all damage to the work as the result of weather or traffic conditions. Report all damage resulting from work of other trades after acceptance of aggregate surfacing work. Repair to match adjacent undisturbed work.

PART 2 - PRODUCTS

2.1 AGGREGATE SURFACING MATERIALS

- A. Gravel or Aggregate Mulch or General Surfacing Materials:

- 1. General: Hard, durable aggregates, washed free of loam, sand, clay, and other foreign substances or debris.
- 2. Quantity: Provide and install in quantity required to provide acceptable depth and coverage as indicated on the Contract Drawings.
- 3. Material: Match approved referee sample, as acquired by the Landscape Architect, to compare for material, color, texture, size, and other characteristics relating to aesthetic effects.
 - a. Type/Color: Per Materials and Finish Schedule, Refer to Contract Drawings
 - b. Size: Per Materials and Finish Schedule, Refer to Contract Drawings

- B. Aggregate Pavement Surfacing Materials:

- 1. General: Hard, durable, local aggregates, washed free of loam, sand, clay, and other foreign substances or debris.
- 2. Quantity: As indicated on the Contract Drawings.
- 3. Material: Match approved referee sample, as acquired by the Landscape Architect, to compare for material, color, texture, size, and other characteristics relating to aesthetic effects.
 - a. Type/Color: Per Finish Schedule, Refer to Contract Drawings
 - b. Size: Per Finish Schedule, Refer to Contract Drawings

2.2 WEED CONTROL BARRIER/GEO-TEXTILE FILTER FABRIC

- A. Type: Permeable, lightweight, continuous, non-woven, geo-textile polypropylene filament material, UV-resistant, engineered to allow water permeability and deter soil permittivity, per ASTM D4491. Geo-Textile Filter Fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. Meet AASHTO M288-96, Class 1.

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1. Mirafi FW402 Filter Fabric and Geotextile underlayment: "Mirafi FW402" Geotextile material by Mirafi, Inc., (800) 438-1855, or equivalent at on grade areas.

2.3 MISCELLANEOUS MATERIALS

- A. Steel Header/Edge: Refer to 329400 "Landscape Planting Accessories".
- B. Sub-Base Coarse Aggregate: Refer to 312219 "Landscape and Fine Grading"
- C. Water: Fresh, clean, potable water as available from Owner. Transport as required.
- D. Polymer Resin based Binding Agent: Soiltac by Soilworks, Inc., 800-545-5420, www.soilworks.com, or equivalent as approved by Landscape Architect.
- E. Water based Binding Agent: Stalok by Stabilizer Solutions, Inc., 800-336-2468, www.stabilizersolutions.com, or equivalent as approved by Landscape Architect.

PART 3 - EXECUTION

3.1 GENERAL

- A. NO WORK UNDER THIS SECTION SHALL COMMENCE UNTIL ALL SUBMITTALS UNDER THIS SECTION HAVE BEEN REVIEWED AND APPROVED, IN WRITING. DO NOT PROCEED WITH INSTALLATION UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- B. Installation practices of the Aggregate Surfacing shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practice, as approved by the Landscape Architect. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.
- C. Examination: Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of Work of this Section. No work under this section shall commence until all submittals under this section have been reviewed and approved, in writing. Do not proceed with installation until satisfactory conditions have been corrected.
- D. Prior to Work in this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and as required, to the point where the installation of the Landscape Planting Accessories may commence properly.
- E. Excavation and Layout:
 1. Stake layout to lines and dimensions indicated on the drawings. Notify owners representative of all discrepancies in drawings and existing conditions. Owners representative and landscape architect to approve all layout prior to excavation.
 2. After approval of layout, excavate and fill on grade areas as necessary to achieve the necessary sub-grade.
- F. Compaction: After completion of grading, compact sub-grade to minimum 95% compaction.
- G. Geotextile:
 1. Verification: Do not place geotextile prior to acceptance of sub-grade preparation.

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2. Placement: Evenly spread the fabric and lap up sides as shown on the drawings. Provide 12" overlap at seams in the fabric.

H. Steel Header/Edge:

1. Headers: Install header true to line and grade as shown on the Drawings. Maintain smooth curves and crisp corners per the drawings. Align header edges and set flush with adjacent paving or surfaces. Double stake joints using manufacturers preformed stake openings. Any butt joints are to be field welded.
2. Stakes: Install stakes provided with each section of header at manufacturer's recommended spacing or as required to maintain header alignment.

3.2 INSTALLATION

A. Limestone sub-base:

1. TXDOT #247, Grade B, Type 2 or 3 base material or approved equal
2. Compact limestone sub grade, holding grade down for the finished decomposed granite aggregate surfacing.

B. Aggregate Mulch Surfacing:

1. Lines and Levels:
 - a. Install aggregate mulch surfacing true to grade, properly coinciding with adjacent work and elevations.
 - b. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than 1/8 in. in 10 ft. from true profile and cross section.
 - c. Provide a finished surface that is within 1/2" or less of elevation difference between aggregate mulch and coinciding hardscape pavement areas.
2. Initial installation compaction: Water condition and thoroughly compact each lift of aggregate paving to a minimum 60 percent, generally provide an even light rolling of surface to lay materials down and fill intersecting openings.
3. Provide aggregate material to depth specified in Contract Drawings placed in 1" lifts for material of 1/2" or smaller and 2" lifts of 3/4" and larger material to final depth.
4. Do not place aggregate mulch near or within the vicinity of tree and plant material trunks, stems or bases in an equivalent distance of 1" per 1" caliper or atop root flares.
5. Finish Mulch Surface: Provide a uniform texture and color on the exposed surface.
6. Damaged or Defective Installation: Repair and replace in accordance with these Specifications at no additional cost to Owner.

C. Stabilized Aggregate Surfacing:

1. Lines and Levels:
 - a. Install cobble and aggregate surfacing true to grade, properly coinciding with adjacent work and elevations.
 - b. Provide a finished surface uniform in texture and appearance. Do not permit finished work to vary more than 1/8 in. in 10 ft. from true profile and cross section.
2. Initial installation compaction: Water condition and thoroughly compact each lift of aggregate paving to a minimum 90 percent.

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3. Stabilization: Note that the below stabilization process is to occur during one work day. Do not commence work if weather will change to rain or if the work cannot be complete accomplished during one day. Reschedule to a suitable day and resolve equipment, manpower and materials such that the work can be accomplished during one day. Stabilize aggregate paving material.
 - a. Till to loosen only the top 2 inches of the compacted paving and apply 1 gallon of Soil Tac per 35 square feet.
 - b. Till to mix the 1 gallon per 35 square feet rate of product into the top 2 inches of aggregate. Level and compact the work to final grade.
 - c. Install Soil Tac final application at a rate of ¼ gallon per gallon of water per 70 square feet in 4 successive applications for a total application rate of 1 gallon of product per 70 square feet. Do not allow the gravel to dry between applications.
 - d. Roll and compact to 95 % density, level and screed to grade, touch low areas as needed with wet stabilized aggregate.
 - e. Keep traffic off the area until the aggregate has set and the product has dried.
4. Contaminated Areas: Do not permit mixture to contaminate planting areas. Clean up immediately all mixtures spilled on adjacent paving.
5. Grading: When surface areas have been rolled and it becomes necessary to add a thin layer of material to bring the surface to grade, the previously rolled or compacted area shall be raked to provide a bond with the added material and the added material shall have 25 square feet per gallon product rate..
6. Finish Paving Surface: Provide a uniform texture and color on the exposed surface.
7. Damaged or Defective Installation: Repair and replace in accordance with these Specifications at no additional cost to Owner.
8. Replacement:
 - a. If compression tests of samples fail to meet specified compressive strength, immediately remove and replace aggregate surfacing with material conforming to Specifications.
 - b. Pay cost of all work required for removing and replacing the aggregate surfacing.

3.3 FIELD QUALITY CONTROL

- A. Tests: For each lift, have the testing laboratory verify the degree of compaction. Recompact failed areas until specified compaction is achieved. Testing to be paid for by Contractor.

3.4 PROTECTION

- A. Protect the paving against traffic, injury or defacement during installation and subsequent construction operations until Final Acceptance.

END OF SECTION

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SECTION 323236

GABION WALLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required, to make a complete aggregate/rock-filled welded wire reinforcement Gabion Wall installation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Gabion Wall Basket, consisting of a Welded Wire Reinforcement Frame, and Accessories.
 - 2. Aggregate/Rock Infill.
 - 3. Geotextile Filter Fabric.
- C. Related Sections: The following Sections contain requirements that relate to Work in this Section:
 - 1. Section 312219 "Landscape Fine Grading".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM – American Society for Testing and Materials.
 - 2. AASHTO – American Association of State Highway and Transportation Officials.
- B. Material Specification Standards:
 - 1. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 2. ASTM A641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 3. ASTM A974 – Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses (Metallic Coated or Polyvinyl Chloride (PVC) Coated).
 - 4. AASHTO M288-96 – Standard Specification for Transportation Materials and Methods of Sampling and Testing, 18th Edition.
- C. Material Testing Standards:
 - 1. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
 - 2. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - 3. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - 4. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

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D. Definitions:

1. psi – pounds per square inch (measurement).
2. AOS – Apparent Opening Size.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design gabions walls and footings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Gabion Retaining Walls shall withstand the effects of gravity loads, Global Stability and the following loads and stresses within limits and under conditions indicated:

1. Analyzed and Engineered as a standard Mechanically Stabilized Earth (MSE) Gravity Retaining walls (use their own weight to resist the lateral earth pressures):
 - a. Stepped back walls.
 - b. Heights not exceeding 6'
 - c. Standard IBC requirements for forces applied.
 - d. Meets Global Stability requirements.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Client and one for Contractor) and one copy maintained by Landscape Architect.

B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.

C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.

D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.

E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.

F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.

G. Product/Material Data. Submit available Product/Material data, manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of material and product indicated:

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1. Gabion Wall Basket, consisting of a Welded Wire Reinforcement Frame, and Accessories.
 2. Aggregate/Rock Infill.
 3. Geotextile Filter Fabric.
- H. Material Samples: Submit Material Sample sets as indicated to the Landscape Architect for verification:
1. One (1) 12" x 12" square panel of Welded Wire Reinforcement sample of Gabion Wall Basket.
 2. Five (5) pound sample of Aggregate/Rock Infill. Submit in re-sealable plastic bag, and label accordingly.
 3. One (1) 12" x 12" square panel of Geotextile Filter Fabric.
- I. Material Test Reports: Submit test results from an independent testing laboratory for compliance of each type of specified, per associated ASTM standards.
1. Testing results for tensile strength, elongation, and zinc-coating adhesion of Welded Wire Reinforcement Frame for Gabion Wall basket.
 2. Cost of testing shall be borne by the Contractor or Manufacturer.
- J. Scaled Shop Drawings: Show general layout, grounding method, assembly, and anchoring and supporting systems for each Gabion Wall. Shop drawings shall be signed and sealed by the qualified professional engineer responsible for their preparation.
1. Shop Drawings shall be sealed and signed by State of Arkansas licensed engineer.
- K. Structural Calculations: For each Gabion Wall, comply with design loadings, including structural analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
- L. Field-Constructed Mock-ups:
1. Provide complete Field-Constructed Mock-ups for all respective materials receiving finishing which is to be used as the basis for judging quality of workmanship throughout the project, as follows:
 - a. Size: Provide one (1) Field-Constructed Mock-up for each Gabion Wall type indicated herein this Section. Each Mock-up shall measure 4'-0" long.
 2. Prior to the installation of Work in this Section, erect Field-Constructed Mock-ups to verify selections made under the Submittals Article herein to demonstrate aesthetic effects as well as qualities of materials and execution. Build Field-Constructed Mock-ups to comply with the following requirements, using materials indicated for final Unit of Work, including same base construction, joints, and contiguous Work as indicated.
 3. Locate Field-Constructed Mock-ups in the location and of the size indicated or, if not indicated, as directed by the Owner.
 4. Notify the Landscape Architect at least one (1) week in advance of the dates and times when the Field-Constructed Mock-ups will be erected and ready for review.
 5. Demonstrate the proposed range of aesthetic effects and workmanship in the Field-Constructed Mock-ups that will be produced in final Unit of Work.
 6. When the Landscape Architect determines that Field-Constructed Mock-ups does not meet requirements, retain it for reference and construct additional Field-Constructed Mock-ups until it is accepted. Modify or correct Work as directed by Landscape Architect.

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7. Obtain the Landscape Architect's acceptance of the Field-Constructed Mock-ups, in writing, prior to the start of the final Unit of Work. Accepted Mock-ups is a prerequisite to commencing Work under this Section.
8. Retain and maintain Field-Constructed Mock-ups during construction in an undisturbed condition. Accepted Field-Constructed Mock-ups shall be the standard for judging the completed Work under this Section.
9. Demolish and remove the Field-Constructed Mock-ups when directed by the Owner.
10. Accepted Field-Constructed Mock-ups may become part of the completed Work, if directed by the Landscape Architect.

- M. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Gabion Wall installations.

1.5 QUALITY ASSURANCE AND CONTROL

- A. Manufacturer Qualifications: Each Manufacturer shall specialize in the manufacturing of Gabion Wall Materials for a minimum of five (5) years.

- B. Installer Qualifications:

1. Engage an experienced Installer who has completed Gabion Wall installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance. Installation shall be by a Contractor and crew with at least five (5) years of experience in placing Gabion Walls on projects of similar nature and dollar cost.

- C. Single-Source Responsibility: Obtain each color, type, and variety of Gabion Wall materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.

1. Aggregate/rock materials shall come from a local single source, and the Welded Wire Reinforcement Gabion Wall basket assembly shall be obtained from a different single source.

- D. Manufacturer's Directions: Follow Manufacturer's directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings and Contract Specifications.

- E. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, and inspections necessary to perform and complete Work under this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage. It is the responsibility of the Contractor to install "factory condition" Units.

- B. Deliver materials in original, unopened packaging. Protect from dampness.

- C. Deliver materials in a timely manner so as to not delay Work, and install only after preparations for installation have been completed.

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- D. Protect materials during storage and construction against soilage or contamination from earth and other materials. Deliver and unload materials at the Project Site in such a manner that no damage occurs to the products or materials.

1.7 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.
- B. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
- C. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- D. Excavation: When conditions detrimental to installing Gabion Walls is encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease installation operations and notify Landscape Architect for further direction.
- E. Traffic Control: Maintain access for vehicular, bicycle, and pedestrian traffic as required for other construction activities during installation of Gabion Walls. Access shall also be unobstructed and maintained at all times to allow for entry and exit of emergency vehicles.
- F. Grades and Levels: Establish and maintain required levels and grade elevations. Review installation procedures and coordinate Work herein this Section with other Work affected.
- G. Weather: Perform installation of Gabion Walls only when weather and soil conditions are suitable in accordance with locally accepted practices. Do not install Gabion Walls during rain or inclement weather.
- H. Sequence and Scheduling: Do not install Work under this Section prior to acceptance of sub-grade preparation Work under another Section.
- I. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.8 SUBSTITUTIONS

- A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.

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- B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.
- C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.
- D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

PART 2 - PRODUCTS

2.1 GABION WALL (BASKET)

- A. General: Provide materials and products that result in consistent colors, styles, textures, and patterns of the Gabion Wall. Install in necessary quantity in areas as indicated on the Contract Drawings.
- B. Welded Wire Reinforcement Frame (Basket):
 - 1. Meet ASTM 974.
 - 2. Welded wire reinforcement (Mesh) with a uniform square or rectangular pattern, and a resistance weld at each intersection. Welded wire connections shall conform to the requirements of ASTM A185, including wire smaller than w1.2.
 - 3. Wire Size: 9 gauge (.148" diameter).
 - 4. Mesh Opening: 3" x 3", measured from the center-to-center distance between two (2) consecutive longitudinal or traverse wires. Permissive tolerance is +/- 1/8" maximum.
 - 5. Minimum Tensile Strength: Meet 60,000 psi, tested in accordance with ASTM A641.
 - 6. Elongation: Tested on a minimum length twelve inches (12"), meet a maximum of 12%, tested in accordance of ASTM A641.
 - 7. Metallic Coating: Meet ASTM A641, Class 3, Soft Temper, for zinc-coating.
- C. Accessories:
 - 1. Lacing Wire: 12 gauge (.105" diameter) minimum, zinc-coated.
 - 2. Spiral Binder Wire: 11 gauge (.118" diameter) minimum, zinc coated. Spiral Binders shall have the maximum inside diameter of 2-1/2" and a maximum pitch of 3".
 - 3. Pneumatic Hog Rings: 11 gauge, as approved for use by the Manufacturer.
- D. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Gabion 1, Hesperia, CA
 - 2. Modular Gabion Systems, Houston, TX.
 - 3. or equal, as approved by the Landscape Architect.

2.2 AGGREGATE/ROCK INFILL

- A. General: Provide materials and products that result in consistent colors, textures, and patterns of the Gabion Wall surfaces. Install in necessary quantity in areas as indicated on the Contract Drawings.
- B. Aggregate/Rock Infill:

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1. Quality: Hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the Gabion Wall structure.
2. Size: Gabion Wall Aggregate/Rock Infill shall range from four inches (4") to eight inches (8"). The range in sizes shall allow for a variation of five percent (5%) oversize Aggregate/Rock infill, and five percent (5%) undersize Aggregate/Rock infill, provided it is not placed on the Gabion Wall exposed surfaces. The size shall be as such that a minimum of two (2) layers of Aggregate/Rock must be achieved when filling the Gabion Wall baskets.
3. Type(s):
 - a. Imported Stone Rubble, refer to contract documents for size and color requirements.
 - b. or equal, as approved by the Landscape Architect.

2.3 GEOTEXTILE FILTER FABRIC

- A. Geotextile Filter Fabric: Permeable, lightweight, continuous, non-woven, geo-textile polypropylene filament material, UV resistant, engineered to allow water permeability and deter soil permittivity per ASTM D4491. Geotextile Filter Fabric shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. Meet AASHTO M288-96, Class 1. Fabric shall have a permeability rating ten (10) times greater than that of soil on which paving is founded and an AOS small enough to prevent passage of fines from leveling course into graded aggregate of base course below.
 1. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. 180N, TC Mirafi.(preferred)
 - b. C-80NW, Contech.
 - c. 180 EX, Linq.
 - d. Geotex 801, SI Geosolutions.
 - e. TerraTex N08, Webtec.
 - f. or equal, as approved by the Landscape Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive Gabion Walls, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Gabion Walls. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION OF SUB-GRADE/FOUNDATION

- A. Foundation on which the Gabion Walls are to be placed shall be cut or filled and graded to the lines and levels as shown on the Contract Drawings. Surface irregularities, loose material, vegetation, and all foreign matter shall be removed from the sub-grade/foundation surface area. When fill is required, it shall consist of materials conforming to the specified requirements. Proof-roll prepared sub grade surface to check for unstable areas and areas requiring additional compaction. Do not proceed with installation of Gabion Walls until deficient sub-grades have been corrected and are ready to receive Gabion Walls, as directed by the Landscape Architect.

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1. Compact soil sub-grade uniformly to at least 90% Standard Proctor Density, per ASTM D698.
- B. After sub-grade is firmly compacted in place, place the Geotextile Filter Fabric onto the sub-grade surfaces as indicated on the Contract Drawings. Smooth out the Geotextile Filter Fabric, lapping the edges a minimum of 1'-0". Gabion Walls or specified Geotextile Filter Fabrics shall not be placed until the sub-grade/foundation is completed, and the sub-grade/foundation surfaces have been inspected and approved by the Engineer.

3.3 ASSEMBLY AND PLACEMENT

A. Assembly:

1. Gabion Wall welded wire reinforcement baskets shall be supplied folded flat and packed in bundles. The units are assembled individually by erecting the sides, ends, and internal diaphragms, ensuring that all panels are in the correct position and the tops and all sides are aligned. The four corners shall be connected first, followed by the internal diaphragms to the outside walls.
2. Where lacing wire is used, wrap the wire with tight alternating single and double half-hitches at intervals between four-inches (4") and five-inches (5").
3. Where spiral fasteners are used, provide one (1) tight loop through each 3" x 3" opening in the Gabion Wall welded wire reinforcement mesh.
4. Crimp ends to secure the lacing wires or spirals in place.
5. Use the same fastening procedures to install interior diaphragms where they are required.
 - a. Interior diaphragms will be required where any inside dimension exceeds three-feet (3') for Gabion Wall baskets thicker than twelve-inches (12").
 - b. Diaphragms shall be installed to assure that no open intervals are present that exceed three-feet (3').
 - c. For Gabion Wall baskets twelve-inches (12") or less, rectangular cells are allowed with dimensions no greater than three-feet (3') in one direction and not to exceed six-feet (6') in the perpendicular direction.

B. Placement:

1. Place the empty Gabion Wall baskets on the prepared and approved sub-grade/foundation and interconnect the adjacent Gabion Wall baskets along the top, bottom, and vertical edges using lacing wire or spirals.
2. Wrap the wire with alternating single and double half-hitches at intervals between four-inches (4") and six-inches (6").
3. Where Spiral fasteners are used, first screw down the spiral fasteners at the connecting edges, and crimp the end of each spiral to secure it in place. Lacing may be used as needed to supplement the interconnection of the welded wire reinforcement, and the closing of lids.
4. Interconnect each layer of Gabion Walls to the underlying layer of Gabion Walls along the front, back, and sides. Stagger the vertical joints between the Gabion Walls of adjacent rows and layers by at least one-half of a basket cell length (i.e. running bond pattern).

3.4 FILLING OPERATION

- A. General: After adjacent empty wire Gabion Wall baskets are set to line and grade and common sides are properly connected, place in straight-line tension to gain uniform alignment. Staking of the Gabion Wall baskets may be done to maintain the established proper alignment prior to the placement of the aggregate/rock.

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- B. Place Geotextile Filter Fabric in locations as indicated on the Contract Drawings, or in locations as needed to deter sediment erosion into the Gabion Walls. No temporary stakes shall be placed through the Geotextile Filter Fabric.
- C. Pre-formed stiffeners or connecting lacing wire shall be attached during the filling operation to preserve the strength and shape of the structure.
- D. Cross Tie Wires: Internal-connecting cross-tie wires shall be placed in each unrestrained Gabion Wall basket cell greater than eighteen-inches (18") in height, including Gabion Wall basket cells left temporarily unrestrained. Two (2) internal connecting wires shall be placed concurrently with aggregate/rock placement, at each twelve-inch (12") interval of depth. Place cross-ties or stiffeners (lacing wire or preformed wire stiffeners) across the corners of the Gabion Wall baskets, (at twelve-inches (12") from the corners) to provide diagonal bracing.
- E. Aggregate/Rock Placement: Gabion Wall baskets shall be carefully filled with the approved aggregate/rock either by machine or hand methods, ensuring alignment, avoiding bulges, and providing a compact mass that minimizes voids. At no point in the filling process may aggregate/rock be mechanically-placed from a height of over 36" from machine to fill area. Machine-placement will require supplementing with handwork to ensure the desired results. The cells in any row shall be filled in horizontal stages so that the depth of the aggregate/rock being placed in any one (1) cell does not exceed the depth of aggregate/rock in any adjoining cell by more than twelve-inches (12"). Along the exposed faces, the outer layer of aggregate/rock shall be carefully placed and arranged by hand to ensure a neat, compact placement with a uniform appearance.
 - 1. Fill shall be placed in horizontal layers not exceeding twelve inches (12") in compacted thickness for heavy compaction equipment. For zones where compaction is accomplished with hand equipment, fill shall be placed in horizontal layers not exceeding six-inches (6") in un-compacted thickness. Only hand-operated equipment shall be allowed within three feet (3') of the wall face.
 - 2. Fill shall be compacted per the recommendation of the geotechnical engineer or to a minimum 95% of the maximum density, and within +3%/-3% of optimum moisture content, as determined in accordance with ASTM D698 (Standard Proctor Density), whichever is greater.
 - 3. In the absence of Owner's direction to employ more stringent compaction specifications, the compacted density of the fill shall be tested every 2,000 square feet per 12" lift.
 - a. Testing methods, frequency and verification of material specifications and compaction shall be the responsibility of the Owner.
 - 4. Heavy and/or construction equipment not involved with the wall construction shall not operate within ten-feet (10') of the wall face until final pavement and/or curbing is in place near the wall, as applicable.
- F. Topping: The last layer of aggregate/rock infill shall be uniformly leveled to the top edges of the Gabion Wall baskets. The welded wire reinforcement lids shall be placed over the aggregate/rock infill using only approved lid closing tools as necessary. The use of crowbars or other single-point leverage bars for lid closing is prohibited due to the potential for damage to the Gabion Wall baskets.
- G. Securing Lids: The Gabion Wall basket lids shall be secured to the sides, ends and diaphragms with spiral binders or lacing wire wrapped with alternating single and double half-hitches in the mesh openings.

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3.5 REPAIR, CLEANING, AND PROTECTION

- A. Damage to the wire or coatings during assembly, placement, and filling shall be repaired promptly in accordance with the Manufacturer's recommendations of the units shall be replaced with undamaged Gabion Wall baskets.
- B. Provide final protection and maintain conditions in a manner that insures that Work is without damage or deterioration at the time of Substantial Completion.
- C. Maintain finished surfaces free of stains, discoloration, dirt, and other foreign material until Final Acceptance of Work.

END OF SECTION

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SECTION 328400

SITE IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work for Sprinkler Irrigation System, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Furnishing and installing a complete irrigation system.
 - 2. Trenching and backfill.
 - 3. Furnishing and installing backflow prevention devices (and pressure reducing valves).
 - 4. Boring under existing paving for irrigation piping and remote-control valve wiring where indicated on plans.
 - 5. Furnishing and installing sleeves for irrigation piping and remote-control valves where indicated.
 - 6. Coordination and installation of water meters and taps.
 - 7. Coordination and installation of electrical meters, and related electrical equipment and wiring by others.
 - 8. Inspections and tests.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 312219 "Landscape and Fine Grading".
 - 3. Section 329200 "Lawns and Grasses".
 - 4. Section 329300 "Trees, Shrubs, Vines and Groundcovers".
 - 5. Section 329813 "Landscape Establishment Period".

1.2 RELATED WORK UNDER SEPARATE CONTRACT

- A. Electrical stub out(s) for irrigation controller(s).

1.3 SUBMITTALS:

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two copies shall be returned and one copy maintained by Landscape Architect.
- B. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.

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- C. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred unless otherwise noted in Division 01.
- D. Provide three (3) sets of Material Samples (if any) for review by the Landscape Architect.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Furnish required copies of manufacturer's literature, certifications, and operating instructions for the complete list of materials, for each type, for the following items:
 - 1. Irrigation Controller.
 - 2. Gate Valves.
 - 3. Pipe and Fittings.
 - 4. Remote Control Valves and wire connectors.
 - 5. Valve Boxes.
 - 6. Quick Coupling Valves.
 - 7. Sprinkler Heads.
 - 8. Moisture Sensor and Mounting Device.
- H. Substitutions:
 - 1. Specific reference to manufacturers' names and products specified in this Section are used as standards, but this implies no right to substitute other material or methods without written approval of the Landscape Architect.
 - 2. Installation of any approved substitution is Contractor's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of Landscape Architect and without additional cost to Owner.
 - 3. Approval by Landscape Architect of substituted equipment and/or dimensional drawings does not waive these requirements.
- I. Record Drawings:
 - 1. The contractor shall transfer all information noted on the field record print to the sepia, vellum or Auto CAD disc as required by the owner. The drawings shall be to scale and all indications shall be recorded in a neat, orderly way. The record sepia shall or Auto CAD disc shall be turned over to the Landscape Architect before the Final Acceptance of the project.
 - 2. Indicate the actual dimensioned location of valves and quick couplers, irrigation main line piping, sleeve crossing locations for main and wire, wire routing, meters, pumps and backflow devices and any wire splices.
 - 3. Locate all valves by GPS coordinates. Indicate station numbers and GPS coordinates on the as builds and on metal tags connected to the valves.
 - 4. Dimension main piping at 100 foot intervals and at all changes in direction. Dimension all items from easily identified permanent features, such as buildings, curbs, fences, walks or permanent features and lines.
 - 5. Drawings shall show approved substitutions, if any, of material including manufacturer's name, and catalogue number in a revised legend.

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- J. Prior to the end of the establishment period, provide to the General Contractor or Owners Representative, owner's building manager / system operator record drawings:
1. Four sets of color-coded, laminated reduced size irrigation as built drawings for each different controller
 2. Four sets of a one sheet composite of the record drawings
 - a. The reduced drawings will be reduced to approximately 11" x 17" or as small as practical to read valve numbers and zone areas.
 - b. The composite drawing will be approximately 30" x 42".
 - c. The reduced drawings and composite shall be color-coded to clearly indicate zones or sections of valves and the approximate areas of coverage in different colors such that no adjacent areas are the same color. Laminate the reduced and composite drawing between two sheets of clear plastic.
 3. One AutoCAD file of the dimensioned record drawing on a CD disc. Zones do not need to be colored coded on the disc. Include dimensions as described above and GPS information on the AutoCAD file.

1.4 CONTROLLER AND SYSTEM TRAINING:

- A. Schedule and hold a controller and system training session with the owner's maintenance personnel prior to the end of the 90-day establishment period. Demonstrate operation of the controller and generally train the owner on manual and automatic operation of the controllers and valves, and. Instructions for the emergency shutdown of the system main lines.
- B. Contractor shall make a daily record of all work installed during each day on a construction progress drawing. Construction drawings shall be on the construction site at all times while the irrigation system is being installed. Update the drawings on a daily basis.
 1. All indications shall be recorded in a neat, orderly way.

1.5 INTENT OF THE DRAWINGS: Sprinkler lines shown on the drawings are essentially diagrammatic. Locations of all sprinkler heads, valves, piping, wiring, etc., shall be established by the Contractor at the time of construction. Spacing of the sprinkler heads and quick coupling valves are shown on the drawings and shall be exceeded only with permission of the Owner's authorized representative.

1.6 QUALITY ASSURANCE AND CONTROL

- A. Requirements of Regulatory Agencies:
 1. All work and materials shall be in full accordance with latest rules and regulations of safety orders of Division of Industrial Safety; the Uniform Plumbing Code and other applicable laws or regulations, including the City of Westlake Plumbing Code.
 2. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Contract Documents be at variance with the aforementioned rules and regulations, notify Landscape Architect and get his instructions before proceeding with the work affected.
- B. Testing:
 1. Preliminary review of completed installation will be made by Landscape Architect prior to backfilling of trenches and during hydrostatic testing.

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2. Final review shall be made in conjunction with the final review of lawn, shrub and tree planting.

1.7 EXTRA MATERIALS/SPARE PARTS

- A. Provide five (5) each type head and five (5) each type of nozzle used as spare parts. Provide two (2) sets of keys to each controller. Provide two (2) quick coupler keys with swivel hose ells for every ten (10) quick couplers installed, minimum of two (2). Provide one (1) each of tools required for adjustment of sprinklers, nozzles and valve operation. Deliver spare parts to the owner at or before the time of training.

1.8 PROJECT/SITE CONDITIONS

- A. Contractor shall acquaint himself with all site conditions. Should utilities or other work not shown on the plans be found during excavations, Contractor shall promptly notify Landscape Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities not shown on plans.
- B. Contractor shall take necessary precautions to protect site conditions. Should damage be incurred, this Contractor shall repair damage to its original condition or furnish and install equal replacement at his expense.
- C. Existing Irrigation System: All existing irrigation circuits shall be kept in operation at all times. If the existing system is damaged by this construction, Contractor shall be responsible for immediate repair of such damage. After each repair, all heads of the repaired circuit shall be removed so that the lines can be cleared of all dirt and foreign matter.

1.9 WARRANTY

- A. In addition to manufacturer's guarantees or warranties, all work shall be warranted for one year from the date of Final Acceptance against defects in material, equipment and workmanship by Contractor. Warranty shall also cover repair of damage to any part of the premises resulting from leaks or other defects in materials, equipment and workmanship to the satisfaction of the Owner.
- B. Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, etc., during Guarantee Period. Report such conditions to Landscape Architect in writing.

PART 2 - MATERIALS

2.1 MATERIALS: Materials throughout the system shall be as specified and/or noted on the Drawings, new and in perfect condition.

2.2 WATER METER(S): Shall be installed by the local water district in accordance with their requirements. Cost will be paid by (Contractor).

2.3 PRESSURE REDUCING VALVE

- A. Valve to be 90-01-AB PRESSURE REDUCING VALVE as manufactured by the Cla-Val Company, Newport Beach, California, or approved equal.

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2.4 DOUBLE CHECK - DOUBLE GATE VALVE ASSEMBLY

- A. Assembly to be Clayton Model D Double Check - Double Gate Valve assembly as manufactured by Cla-Val Company, Newport Beach, California, or approved equal.

2.5 REDUCED PRESSURE BACKFLOW PREVENTER

- A. Reduced pressure principle backflow preventer to be Clayton Model RP Backflow Preventer as manufactured by Cla-Val Company, Newport Beach, California, or approved equal.

2.6 PRESSURE-TYPE VACUUM BREAKER ASSEMBLY: Rainbird #200 PVB, FEBCO #765 PVB, two (2") inch, or approved equal.

2.7 ATMOSPHERIC VACUUM BREAKER ASSEMBLY

- A. Atmospheric vacuum breaker to be SMR H403, or approved equal.

2.8 PIPE (ALL- PURPLE & LABELED NON POTABLE)

- A. Piping on pressure side of irrigation control valves:

1. Four (4") inch and larger - AWWA C900, PVC 1120, SDR 18. Pipe to have push-on type joints and fittings. Bells to consist of an integral wall section with a solid cross-section rubber ring conforming to ASTM D-1869 "Rubber Rings for Asbestos Cement Pipe". The bell section shall be designed to be at least as strong as the pipe wall. Pipe O.D. to be compatible with standard cast iron pipe fittings.
2. Three (3") inch and larger - Polyvinyl chloride (PVC) 1120-1220, SDR 21.0, Class 200 rubber gasketed pipe, conforming to ASTM D-1784 and ASTM D-2241. Rubber gasket shall conform to ASTM D-1869 and shall be provided by pipe manufacturer.
3. Two and one-half (2 1/2") inch diameter and smaller - Polyvinyl chloride (PVC) 1120-1220, Schedule 40 and shall conform to ASTM D-1785-73.
4. Two and one-half (2 1/2") inch and smaller - To be polyvinyl chloride (PVC) 1120-1220, SDR 13.5, Class 315, and shall conform to ASTM D-2241-73.

- B. Piping on non-pressure side of irrigation control valves:

1. Polyvinyl chloride (PVC) 1120-1220, SDR 26.0, Class 160, and shall conform to ASTM D-2241-73.
2. Polyvinyl chloride (PVC) 1120-1220, SDR 21.0, Class 200, and shall conform to ASTM D-2241-73, except one-half (1/2") inch diameter shall be Class 315.

- C. Identification: All piping shall be continuously and permanently marked with the following:

1. Manufacturer's name or trademark, size, schedule, and type of pipe, working pressure at 73 degrees F. and National Sanitation Foundation (N.S.F.) approval.

2.9 FITTINGS:

- A. Fittings for Rubber-Gasketed Pipe:

1. Connections of three (3") inch and four (4") inch mains to three (3") inch and four (4") inch mains - Class 200 PVC as provided by the same manufacturer as the pipe and conforming to ASTM D-2466 and ASTM D-1869.

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2. Connections of three (3") inch and four (4") inch mains to two and one-half (2 1/2") inches and smaller mains to remote control and quick coupling valves - Schedule 40 PVC solvent-weld socket fittings and conforming to ASTM D-2466.
 3. For push-on type, SDR 18 pipe - Cast iron, AWWA C11D mechanical joint pipe fittings.
- B. Fittings for Solvent-Welded Pipe:
1. Schedule 40, polyvinyl chloride, standard weight, as manufactured by "Sloane", "Lasco", or approved equal, to meet ASTM D-2466-73 and D-2467-73.
 2. Threaded PVC nipples - Schedule 80 PVC.
- C. Fittings for Polyethylene Pipe (Flex-Joints):
1. Polyallomer as manufactured by "Flintkote" or approved equal.
 2. Compression type of CPVC as manufactured by "Pepco".
- D. Fittings for Swing Joints:
1. Supply three (3) Schedule 40 "Marlex" elbows.
 2. Threaded PVC nipples - Schedule 80 PVC.
- E. Copper Tubing (Bubbler and Shrub Risers):
1. Copper shall be "M" domestic hard copper, one-half (1/2") inch diameter.
 2. Use brass heads for all copper riser installations.
- 2.10 GATE VALVES:
- A. Up to three (3") Inch Size: 125 Pound bronze construction, non-rising stem type, sized to line. "Crane" #438; "NIBCO" #T113; or approved equal.
 - B. Four (4") Inch Size and Larger: Iron body, mechanical joint ends, bronze mounted, double disc with parallel or inclined seats, water working pressure 175 psi, AWWA C500, non-rising stem type, turning counter-clockwise to open. "Dresser" #67-01 or approved equal.
- 2.11 SLEEVE FOR CONTROL WIRE AND WATER LINE: PVC 1126-1220, Schedule 40 pipe or Schedule 40 galvanized steel pipe.
- 2.12 IRRIGATION CONTROLLER: Permanent controllers shall be per contract documents.
- 2.13 REMOTE CONTROL VALVES:
- A. Valve to be of size and manufacturer shown on drawings, slow acting valves.
 - B. Valves to be of same manufacturer as controller.
- 2.14 VALVE KEYS: Furnish two keys.
- 2.15 CONTROL WIRE:
- A. Wire: Solid copper wire, U.L. approved for direct burial in ground. ID1 14-2 wire cable by page electric or approved equal (to be spliced to each decoder).
 - B. Splicing Materials: 3M DBR-6 600V splice kits.

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- 2.16 VALVE BOXES: To be injection-molded of Polyesters and fibrous inorganic temperature resistant components. Box shall provide adequate clearance to operate and service valve. Box and lid to be purple and labeled "Non-Potable", as manufactured by "Ametek", "Christy", "Carson", or equal.
- A. For Remote Control Valve: Shall be rectangular, approximately ten (10") inches by fourteen (14") inches inside dimensions by fifteen (15") inches deep.
 - B. For Gate Valves and Quick Coupler Valves: Shall be round, approximately nine (9") inches inside diameter by ten (10") inches deep.
- 2.17 SPRINKLER HEADS: Heads to be as shown on the drawings, where possible supply with black finish with purple indicator.
- 2.18 DRAINAGE VALVES: Automatic drain valve shall have a machined brass body, with stainless steel ball seat and one-half (1/2") inch male pipe thread as manufactured by "Rainbird".
- 2.19 RAIN AND FREEZE SENSOR: per Hunter industries.
- 2.20 SAND BACKFILL: Sand for backfill shall be clean masonry sand free of stones or debris.
- 2.21 CONCRETE FOR THRUST BLOCKS: Shall be "Sakrete" or "Handi-Mix" concrete mix or equal.
- 2.22 CONDUITS: All conduits for irrigation mains and laterals shall be six (6") inch Schedule 40 PVC for remote control wiring and controller power feed, common conduit, unless otherwise specified on the drawings or existing in the field. Use galvanized steel pipe only under public roads for electrical power.
- 2.23 DRIP SYSTEM:
- A. Remote Control Valve – Hunter icz-101 commercial drip control kits. Specified valve to be factory set up at 40 psi fitted with Y type strainer downstream of all remote control valves.
 - B. Backflow Device - Two (2") inch FEBCO vacuum breaker (existing).
 - C. Controllers - As shown on drawings.
 - D. Mains - Schedule 40 PVC. (purple)
 - E. Lateral line three-quarter (3/4") inch flexible poly tubing. PEPCO poly plus 7-11 irrigation hose #P-940 or equal. (purple)
 - F. Distribution Tubing - Three-sixteenths (3/16") inch PEPCO plus tubing #P-185 or equal. (purple)
 - G. Filters - A.G. Products, one (1") inch Wye filter with standard 150 mesh screen, Model 4E-3/4-A or equal.
 - H. Fittings - A.G. Products, compression type or equal. Use standard PVC fittings with A.G. Products Adapter #900-CA.
 - I. End Cap - A.G. Products #GETC or equal.

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- J. Emitters - Rainbird "Drop-In" Bubblers. For Willows, supply two (2) per tree in four (4") inch perforated PVC watering tubes with tops.
- K. Valve Boxes - Ametek. (purple lid)

PART 3 - EXECUTION

3.1 LAYOUT

- A. No consideration will be given to any design changes until after the awarding of the contract. Should any changes be deemed necessary after award of contract, for proper installation and operation of the system, such changes shall be negotiated by the Landscape Architect (and based upon the Unit Price Schedule where applicable).
- B. Layout work as accurately as possible to drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown.
- C. Full and complete coverage is required. Contractor shall make any necessary minor adjustments to layout required to achieve full coverage of irrigated areas at no additional cost to Owner.
- D. Where connections to existing stubouts are required, make necessary adjustments should stubs be located differently in the Drawings. Adjust layout as necessary to install around existing work.
- E. Where piping is shown to be under paved areas but running parallel and adjacent to planted area, the intent is to install piping in planted areas. Do not install directly over another line in same trench.
- F. It shall be the Contractor's responsibility to establish the location of all sprinkler heads on all turf areas in order to assure proper coverage of all areas. In no case shall spacing of sprinkler heads exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted but substitutions of larger sizes may be approved.
- G. The Contractor will stake out the location of each run of pipe and all sprinkler heads of sprinkler valve locations prior to trenching. Before installation is started in a given area, the Landscape Architect shall check all locations and give his approval.

3.2 EXCAVATING AND TRENCHING

- A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations, to their original condition.
- B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify Landscape Architect for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the Record Drawings promptly.

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- C. Dig trenches wide enough to allow a minimum of four (4") inches between parallel pipe lines. Trenches shall be of sufficient depth to provide minimum cover from finish grade as follows:
1. Over pipe on pressure side of irrigation control valve, control wires and quick coupling valves: (18) (24) (30) inches.
 2. Over pipe on non-pressure side of irrigation control valve: (12) (18) inches.
 3. Where system is installed over structure, lay pipe on top of soil separator. Protect soil separator with two (2") inch layer of specified planting soil mix or sand.
 4. All PVC pipe under paving shall be bedded with minimum of four (4") inches of sand backfill on all sides and have twenty-four (24") inch cover.
 5. All mains shall be sloped to drain valves where applicable.
- D. Backfill all pressurized mains and marker boxes with a minimum of four (4") inches of sand. Should existing paving require cutting, saw cut paving a minimum twelve (12") inches wide, compact backfill to ninety-five (95%) percent dry density; dispose of waste off site. Patch to match existing pavement.

3.3 BORING UNDER EXISTING PAVEMENTS:

- A. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation shall be as described under "Excavating and Trenching". The location of the pit shall not interfere with existing plant materials or structures designated to remain.
- B. Holes shall be bored mechanically. Where holes required are larger than two (2") inches, the bore shall be completed using a pilot hole. The two (2") inch hole shall be bored the entire length of the crossing and shall be checked on the opposite end for line and grade. If acceptable, this hole shall serve as the centerline for the larger hole to be bored. Lateral and vertical tolerance is limited to one (1") inch in ten (10') feet, provided that the variation be regular and occur only in one direction.
- C. The use of water or other fluids in connection with the boring operation will be permitted only to lubricate cutting. Jetting shall not be permitted. (In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least ten (10%) percent of high-grade processed bentonite may be used to consolidate cuttings, seal the hole walls and furnish lubrication for subsequent removal of cuttings and installation of the pipe.)
- D. Excavated material will be placed near the top of the working pit and disposed of as required.

3.4 CONCRETE THRUST BLOCKS:

- A. Install where the rubber-gasketed irrigation main changes direction as at ells and tees and where the rubber-gasketed main terminates.
- B. Pressure tests shall not be made for a period of thirty-six (36) to forty eight (48) hours following the completion of pouring of the blocks.
- C. Blocks for these mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.

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- 3.5 WATER METER(S): Install as per the requirements of the local water district and local codes. Costs will be paid by (Owner) (Contractor).
- 3.6 PRESSURE REDUCING VALVE: Install according to local codes. House in a rectangular concrete box of sufficient size to easily allow repair or replacement of unit.
- 3.7 BACKFLOW PREVENTION DEVICE: Install according to local codes and manufacturer's latest printed instructions.
- 3.8 CONDUITS AND SLEEVES:
- A. Furnish and install conduit where control wires pass under or through walls. Conduits to be of adequate size to accommodate retrieval for repair of wiring and shall extend twelve (12") inches beyond edge of walls.(not all conduits may be shown on plan)
 - B. Install sleeves for all pipes passing through or under walls, walks and paving as shown on Drawings. Sleeving to be of adequate size to accommodate retrieval for repair of wiring or piping and shall extend twelve (12") inches beyond edge of paving or other construction. (not all sleeves may be shown on plan)
 - C. Coordinate conduit and sleeve installation with other trades as required.
- 3.9 PIPE LINE ASSEMBLY:
- A. General:
 - 1. Install pipes and fittings in accordance with manufacturer's latest printed instructions.
 - 2. Clean all pipes and fittings of dirt, scales and moisture before assembly.
 - 3. All pipe, fittings and valves, etc., shall be carefully placed in the trenches. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be closed by approved means.
 - 4. All lateral connections to the mainline as well as all other connections shall be made to the side of the mainline pipe. No connections to the top of the line shall be allowed.
 - B. Solvent-Welded Joints for PVC Pipes:
 - 1. Use solvents and methods by pipe manufacturer.
 - 2. Cure joint a minimum of one hour before applying any external stress on the piping and at least twenty four (24) hours before placing the joint under water pressure.
 - C. Threaded Joints for Plastic Pipes:
 - 1. Use Teflon tape on the threaded PVC fittings except where Marlex fittings are used.
 - 2. Use strap-type friction wrench only. Do not use metal-jawed wrench.
 - 3. When connection is plastic to metal, male adaptors shall be used. The male adaptor shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon tape or equal upon approval.
 - D. Threaded Joints for Galvanized Steel Pipes:
 - 1. Factory-made nipples shall be used wherever possible. Field-cut threads in pipes will be permitted only where absolutely necessary; when field threading, cut threads accurately on axis with sharp dies.
 - 2. Use pipe joint compound to make threads only.

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E. Joints for Polyethylene Pipes:

1. Double-clamp all connections one and one-quarter (1 1/4") inch diameter and greater.
2. Make all connections between polyethylene pipes and metal valves or pipes with threaded fittings using male adaptors.

F. Laying of Pipe:

1. Pipes shall be bedded in at least two (2") inches of finely divided material with no rocks or clods over one (1") inch diameter to provide a uniform bearing.
2. Pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction. One additional foot per 100 feet of pipe is the minimum allowance for snaking.
3. Do not lay PVC pipe when there is water in the trench.
4. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
5. Plastic pipe shall be cut with PVC pipe cutters or hacksaw, or in a manner so as to ensure a square cut. Burrs at cut ends shall be removed prior to installation so that a smooth unobstructed flow will be obtained.
6. All plastic to plastic joints shall be solvent-weld joints or slip seal joints. Only the solvent recommended by the pipe manufacturer shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.
7. Unless waived by the Landscape Architect, the Contractor shall install bell type or approved slip joint fitting at a minimum of twenty (20') feet OC for all pressurized mains.

3.10 GATE VALVES: Group valves together and locate in planted areas where possible. Box shall be flush with finish grade. (For three (3") inches or larger rubber-gasketed pipe, anchor valve with thrust block.)

3.11 IRRIGATION CONTROL VALVES: Install control valves in valve boxes where shown and group together where practical. Place no closer than twelve (12") inches to walk edges, buildings and walls. Valve boxes shall be flush with finish grade.

3.12 SPRINKLER HEADS:

- A. Place all rotary pop-up sprinkler heads in lawn areas on temporary risers with top of heads four (4") inches above finish grade. Place part-circle rotary pop-up sprinkler heads twelve (12") inches from edge of and flush with top of adjacent walks, header boards, curbs, and mowing bands, or paved areas at time of installation. Rotary sprinklers to be installed on a swing joint assembly as detailed.
- B. Install all impact sprinkler spray heads and bubbler heads on a swing joint assembly as detailed on the Drawings.
- C. Stake on-grade shrub sprinkler head risers with a thirty (30") inch length of three-eighths (3/8") inch diameter smooth rebar and two (2) stainless steel pipe clamps. Set shrub heads twelve (12") inches above grade in groundcover areas or as required by height of plant material and eight (8") inches above grade in shrub areas. Place heads a minimum of six (6") inches from back of curb or edge of pavement. Place adjacent to walls. Stake heads prior to backfilling trenches. Stakes to be parallel to riser. Where copper risers are specified, use a section of flex hose below grade.

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3.13 AUTOMATIC CONTROLLER

- A. Install per local code and manufacturer's latest printed instructions.
- B. Connect remote control valves to controller in clockwise sequence to correspond with station setting beginning with Stations 1, 2, 3, etc.
- C. Affix controller name (i.e. "Controller A") on inside of controller cabinet door with letters minimum of one (1") inch high. Affix a non-fading copy of irrigation diagram to cabinet door below controller name. Irrigation diagram to be sealed between two sheets of 20 mil (minimum) plastic. (Irrigation diagram is detailed on plan.) (Irrigation diagram shall be a reduced copy of the as-built drawing and shall show clearly all valves operated by the controller, showing station number, valve size, and type of planting irrigated.)

3.14 CONTROL WIRING

- A. Install control wires with sprinkler mains and laterals in common trenches wherever possible. Lay to the side of pipe line. Provide looped slack at valves and snake wires in trench to allow for contraction of wires. Tie wires in bundles at ten (10') foot intervals.
- B. Control wire splices at remote control valves to be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than 500 feet. Line splices to be Marconi-type taped and sealed with 3M dbr-6 600V splice kits.
- C. Install a minimum of one (1) extra control wire to the control valve located the greatest distance from the controller in both directions and label each end blank.

3.15 CLOSING OF PIPE AND FLUSHING OF LINES

- A. Cap or plug all openings as soon as lines have been installed to prevent entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
- B. Thoroughly flush out all water lines before installing heads, valves and other hydrants.
- C. Test as specified.
- D. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution.
- E. All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas, shall be set to grade. Sprinkler heads which are to be installed in lawn areas where the turf has not yet been established shall be set one (1") inch above the proposed finish grade. Heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable destruction. Such lowering of heads shall be done by this Contractor as part of the original contract with no additional cost to the Owner.

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3.16 TESTING

A. Make hydrostatic tests when welded PVC joints have cured as per manufacturer's instructions.

1. Pressurized Mains:

- a. Completely install water meter, mains, isolation valves and control valves. Do not install laterals.
- b. Open all isolation valves.
- c. Fill all lines with water and shut off at meter.
- d. Pressurize the main with air to 70 psi. Monitor gauge for pressure loss for four (4) hours.
- e. Leave lines and fittings exposed throughout testing period.
- f. Leaks resulting from tests shall be repaired and tests repeated until the system passes.
- g. Test all isolation valves for leakage.

2. Non-Pressure Laterals:

- a. Test piping after laterals and risers are installed and system is fully operational.
- b. Leave trenches open to detect possible leaks.

B. Submit written requests for inspections to the Landscape Architect at least forty eight (48) hours prior to anticipated inspection date.

3.17 BACKFILL AND COMPACTING

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches with clean soil, free of debris.

B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to minimum ninety-five (95%) percent density under pavements, eighty-five (85%) percent under planted areas.

C. Compact trenches in areas to be planted by thoroughly flooding the backfill. Jetting process may be used in those areas.

3.18 CLEAN UP: Clean up and remove all debris from the entire work area prior to Final Acceptance to satisfaction of Landscape Architect.

END OF SECTION

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SECTION 329113

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete and thorough preparation of the planting soil, including soil amendment products, imported topsoil, as required, to make up deficiencies in quantity of soil available on site, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Agronomic Soil Fertility Testing and Soil Percolation Testing.
 - 2. Topsoil.
 - 3. Pre-Plant Weed Control.
 - 4. Soil Conditioners, Amendments, and Fertilizers.
 - 5. Import soil for specific plant material types and related requirements.
 - 6. Mixing of planting mediums
 - 7. Transporting and storage of soils and planting mediums.
 - 8. Machinery and loading restrictions.
 - 9. Structural Soil Tree Trench requirements.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 312219 "Landscape and Fine Grading".
 - 3. Section 329200 "Lawns and Grasses".
 - 4. Section 329300 "Trees, Shrubs, Vines and Groundcovers".
 - 5. Section 329813 "Landscape Establishment Period".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. USDA – United States Department of Agriculture.
 - 2. ASTM – American Society for Testing & Materials.
- B. Definitions:
 - 1. Topsoil:
 - a. Topsoil - Shall be friable soil, providing sufficient structure in order to give good till and aeration.
 - b. Gradation Limits - Soil shall be a sandy loam, loam, clay loam or clay. The definition of soil texture shall be per the USDA classification scheme. Gravel over ¼-inch in diameter shall be less than 10% by weight.

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- c. Permeability Rate - Hydraulic conductivity rate shall be not less than one-inch (1") per hour, nor more than twenty-inches (20") per hour, then tested in accordance with the USDA Handbook Number 60, Method 34b, or other approved Methods.
- d. Fertility - The range of the essential elemental concentration in soil shall be as follows:

<u>Ammonium Bicarbonate/ DTPA Extraction (PPM):</u>	
Element	(mg/kilogram) dry weight basis
Phosphorous	4 - 40
Potassium	60 - 220
Iron	4 - 35
Manganese	0.6 - 6
Zinc	0.6 - 8
Copper	0.1 - 5
Boron	0.2 - 1
Magnesium	50 - 500
Sodium	0 - 100
Sulfur	25 - 500
Molybdenum	.1 - 30

- e. Acidity - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook number 60) shall be 6.0 – 7.9.
- f. Salinity - The salinity range measured in the saturation extract (Method 3a, USDA Hand Number 60) shall be 0.5 – 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milli-equivalents per liter in the saturation extract, the maximum salinity shall be 4/0 dS/m.
- g. Boron - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/1 (parts per million).
- h. Sodium Adsorption Ratio (SAR) - The maximum SAR shall be 4 measured per Method 20b, USDA Handbook Number 60.
- i. Soil Organic Matter Content - Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter.
- j. Calcium Carbonate Content - Free calcium carbonate (limestone) may be present.
- k. Heavy Metals - The maximum permissible elemental concentration in the soil shall not exceed the following:

<u>Ammonium Bicarbonate/DTPA Extraction (PPM):</u>	
Element	(mg/kilogram) dry weight basis
Arsenic	
Cadmium	2
Chromium	10
Cobalt	2
Lead	30
Mercury	1
Nickel	5
Selenium	3
Silver	.5
Vanadium	3

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- l. Elemental Concentration - If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50%. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be present at 50% or more of the above values.
- m. Phytotoxic constituent, herbicides, hydrocarbons, etc. – Germination and growth of plants shall not be restricted more than 10% compared to standard controls. Standard controls shall be both monocots and dicots. Petroleum hydrocarbons shall not be present.
- n. Sub Grade - Soil level resulting from the rough grading work under another Section. Cultivation of sub grade areas prior to placement of Topsoil is included in this Section.
- o. Stockpiled Topsoil - Soil stockpiled for spreading over prepared sub-grade.
- p. Stockpiled Native Topsoil: Topsoil stripped from the site prior to rough grading Work (under another Section), to be spread and amended as Work under this Section.
- q. Imported Topsoil: Off-site Topsoil, imported and stockpiled under this Section, to be spread and amended as Work under this Section.

C. Measurements:

- 1. PPM: Measurement, in parts per million.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.
- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product Data and physical Product Samples: Submit Manufacturer's current catalog cuts, specifications, and physical Product Samples provided in re-sealable labeled plastic bags (min. one (1) gallon size) for the following (as applicable):
 - 1. Planting Soil (Imported/Amended Topsoil) – Product Data and Sample.
 - 2. Soil Amendments (for each type used) – Product Data and Sample
 - 3. Bulk Composted Organic Soil Amendment Material – Product Data and Sample
 - 4. Granular Soil Conditioning Material – Product Data.

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5. Fertilizers (for each type used) – Product Data.
 6. Mycorrhizal Additives (granular or tabular) – Product Data.
- H. Approved Testing Laboratory and Procedures for Agronomic Soil Fertility Analyses:
1. Agronomic Soil Fertility Analyses shall be conducted by a reputable, certified, agronomic soils laboratory. Laboratory shall be a member of the Council on Soil Testing and Plant Analysis. The same laboratory shall be used throughout the duration of the Contract:
 - a. Wallace Laboratories, El Segundo, CA. 310-615-0116.
 2. Contractor shall verify and confirm the selected Testing Laboratory and specific location(s) of soil sample(s) with the Landscape Architect prior to commencing soil sampling operations.
 3. Submit the physical Samples directly to the selected Laboratory for analysis, per the procedures outlined per Part III herein this Section.
 4. Along with the testing data results, the Agronomic Soil Fertility Analysis shall include written recommendations by the Laboratory for amending and/or correcting the sampled soil conditions, utilizing the organic-based Soil Amendments and Fertilizers described herein this Section.
 - a. The Analyses shall also include Maintenance and Post-Maintenance fertilization programs for planted areas within the Contract.
 5. Agronomic Soil Fertility Analyses shall be performed on each of the native site soil samples, the imported topsoil (as required) and lightweight soil mix (as required).
- I. Submit bound copies of the laboratory's Agronomic Soil Fertility Analysis and Recommendations to Landscape Architect a minimum of 45 days prior to amending of the soil and ordering soil amendments. The locations of where each of the soil test samples were derived from the Project Site shall be keyed to the site plan and shall be included with the results.
- J. Planting operations shall not commence until the results of the Agronomic Soil Fertility Analysis and Recommendations are reviewed accordingly by the Landscape Architect.
1. The quantity or type of amendments may be modified by the Agronomic Soil Fertility Analysis and Recommendations. Recommendations, as approved by Landscape Architect, shall take precedence over the amendment and fertilizer application rates specified herein or on the Contract Documents.
- K. Approved Testing Laboratory and Procedures for Compost:
1. Compost shall be STA Certified by the US Composting Council at minimum.
 2. Provide Initial certifications for approved use of product and supplier and additional testing as noted below.
 3. Submit the physical samples directly to the landscape architect for third party testing as desired.
 4. Along with the Compost certification requirements noted above, the compost shall be tested periodically for compost maturity as listed below with written results, if conducted by third party, provided to Landscape Architect prior to incorporation of compost into project.
 - a. Test every 1000 cubic yards delivered to the site.

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- b. Provide a minimum (1) one-gallon sampling of compost to landscape architect or designated third party testing agency.
 - c. Samples will be tested using a standard Solvita Test by Landscape Architect or Third Party Testing agency.
 - d. Test results will be provided within 24 hours from landscape Architect.
 - e. Test results will be provided with 48 hours if conducted by Third Party Testing Agency.
 - f. Results shall a Solvita Compost Maturity Index value of 7 or 8. Anything higher or lower will be rejected and compost shall be removed from site at contractor's cost.
5. Compost maturity testing shall be performed on each different supplier loads if provided by alternate suppliers or from alternate compost yards.

1.4 QUALITY ASSURANCE AND CONTROL

- A. Certificates of inspection: Provide those required by law for transportation, with invoice. File copies of certificates with Landscape Architect after acceptance of material. Inspection by governmental officials at point of origin does not preclude rejection of materials at project site.
- B. Intent: The amendments and quantities included herein are approximate and are for bidding purposes only. Following an on-site soil analysis by the Wallace Labs, El Segundo, California, 310-615-0116, composition of amendments may change. Contract price shall be adjusted accordingly.
- C. All testing noted herein shall be paid for by Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened packages or containers, with manufacturer's labels intact and legible, showing weight, analysis, and name of manufacturer. Store and secure properly to prevent theft or damage.
- B. Store packaged materials off ground and under cover, away from damp surfaces and inclement weather.
- C. Deliver and install materials so as to not delay Work, and install only after preparations for installation have been completed.
- D. Protect materials during storage and construction against soilage or contamination from earth and other materials.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Notify the Contractors performing Work related to installation of Work under this Section in ample time so as to allow sufficient time for them to perform their portion of Work and that progress of Work is not delayed. Verify conditions at the Project Site for Work that affects installation under this Section. Coordinate items of other trades to be furnished and set in place.
- B. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

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- C. Excavation: When conditions detrimental to adequate Soil Preparation operations are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease operations and notify Landscape Architect for further direction.
- D. Installation: Perform Soil Preparation operations only when weather and soil conditions are suitable in accordance with locally accepted practices.
- E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

1.7 PROJECT/SITE CONDITIONS

- A. Project Site shall be free of weeds and invasive grasses, (Nut Grass, etc.) prior to Topsoil distribution or soil amendment placement.
- B. Excessive rock, dead or declining vegetation, trash, debris, or other items that has accumulated throughout the duration of the Project shall be removed from the Project Site by the Contractor, and as directed by the Landscape Architect.
- C. Grading and soil preparation Work shall be performed only during the period when beneficial and optimum horticultural results may be obtained. If the moisture content of the soil should reach such a level that working it would destroy soil structure or cause compaction, spreading and grading operations shall be suspended until, in the opinion of the Landscape Architect, the moisture content is increased or reduced to acceptable levels and the desired results are likely to be obtained.
 - 1. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect.
 - 2. If the soil moisture level is found to be insufficient for planting, planting pits shall be filled with water and allowed to drain before commencing planting operations.
- D. Planting areas which become compacted in excess of 85% relative compaction due to construction activities shall be tilled and thoroughly cross-ripped to a minimum depth of twelve-inches (12") to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.

1.8 BIDDING

- A. The amendments, quantities and procedures included herein are for bidding purposes only. Following an on-site agricultural soil analysis after the rough grading, the amendments and quantity and procedures may change.
- B. Tests shall be paid for by the Contractor.

1.9 FINAL ACCEPTANCE

- A. Acceptance: The Landscape Architect will accept the Work upon satisfactory completion of all soil preparation.

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- B. Notification: Notify Landscape Architect for review of soil preparation prior to proceeding with planting operations.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Definition: Topsoil shall be defined as an onsite soil material that could be used in the planting mixes for backfill of tree, shrub and groundcover planting pits provided it can be made to conform to the provisions included under the title "Topsoil".
- B. General Qualifications: Topsoil shall be fertile, friable, well-drained soil, of uniform quality, free of stones over 1-inch diameter, sticks, oils, chemicals, asphalt materials and residues, toxic substances, concrete and other deleterious materials, as a planting medium for the project. It shall not be infested with nematodes or other undesirable disease-causing organisms such as insects and plant pathogens.
- C. Topsoil shall be friable and have sufficient structure in order to give good tilth and aeration to the soil. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
- D. Import Topsoil shall be screened sandy loam from Clear Fork Materials, 817-441-7777 or equal as approved by Owner or Landscape Architect.
- E. Gradation limits
 - 1. Soil shall be a sandy loam, loam, clay loam or clay. The material shall be as specified within these specifications or if not specifically identified it shall be similar to the existing site soil.
 - 2. The definition of soil texture shall be the USDA classification scheme.
 - 3. Gravel over ¼-inch in diameter shall be less than 10% by weight.
 - 4. 100 % of the material shall pass a 1" sieve.
- F. Permeability Rate - Hydraulic conductivity rate shall be not less than one inch per hour nor more than 20 inches per hour when tested in accordance with the USDA Handbook Number 60, method 34b or other approved methods.
- G. Fertility - The range of the essential elemental concentration in soil shall be as follows:

Ammonium Bicarbonate/DTPA Extraction	Parts per million (mg/kilogram) Dry Weight Basis
phosphorus	2 - 40
potassium	40 - 220
iron	2 - 35
manganese	0.3 - 6
zinc	0.6 - 8
copper	0.1 - 5
boron	0.2 - 1
magnesium	50 - 150
sodium	0 - 100
sulfur	25 - 500
molybdenum	0.1 - 30

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H. Chemistry - Suitability Considerations:

1. Acidity - The soil pH range measured in the saturation extract (Method 21a, USDA Handbook Number 60) shall be 6.0 - 7.9.
2. Salinity - The salinity range measured in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 0.5 - 2.0 dS/m. If calcium and if sulfate ions both exceed 20 milliequivalents per liter in the saturation extract, the maximum salinity shall be 4.0 dS/m.
3. Chloride - The maximum concentration of soluble chloride in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 150 mg/l (parts per million).
4. Boron - The maximum concentration of soluble boron in the saturation extract (Method 3a, USDA Handbook Number 60) shall be 1 mg/l (parts per million).
5. Sodium Adsorption Ratio (SAR) - The maximum SAR shall be 3 measured per Method 20b, USDA Handbook Number 60.
6. Aluminum – Available aluminum measured with the Ammonium Bicarbonate/DTPA Extraction shall be less than 5 parts per million.
7. Soil Organic Matter Content - Sufficient soil organic matter shall be present to impart good physical soil properties but not be excessive to cause toxicity or cause excessive reduction in the volume of soil due to decomposition of organic matter.
8. Calcium Carbonate Content - Free calcium carbonate (limestone) shall not be present.
9. Heavy Metals - The maximum permissible elemental concentration in the soil shall not exceed the following concentrations:

Ammonium Bicarbonate/DTPA Extraction	Parts per million (mg/kilogram) Dry Weight Basis
arsenic	1
cadmium	1
chromium	10
cobalt	2
lead	30
mercury	1
nickel	5
selenium	3
silver	0.5
vanadium	3

- a. If the soil pH is between 6 and 7, the maximum permissible elemental concentration shall be reduced 50%. If the soil pH is less than 6.0, the maximum permissible elemental concentration shall be reduced 75%. No more than three metals shall be present at 50% or more of the above values.
- I. Phytotoxic constituent, herbicides, hydrocarbons etc. - Germination and growth of monocots and dicots shall not be restricted more than 10%. Total petroleum hydrocarbons shall not exceed 50 mg/kg dry soil measured per the modified EPA Method No. 8015. Total aromatic volatile organic hydrocarbons (benzene, toluene, xylene and ethylbenzene) shall not exceed 0.5 mg/kg dry soil measured per EPA Methods No. 8020.

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- J. Existing Soil to be amended: Inspect existing soil and do all work necessary to bring it to standards specified under "Topsoil" above. Amend as specified herein.
1. The Contractor shall schedule a site visit with the Landscape Architect for the purpose of obtaining a soil analysis. Samples shall be taken from five typical tree/planting locations and delivered by the Contractor to the designated soil testing laboratory. Submit soils analysis and recommendations to the Landscape Architect for acceptance. Soil analysis shall indicate quantities, chemical properties and recommended manufacturer or supplier.
 2. Areas of existing soil to be amended shall be all areas to be planted. Modified amending without tilling is required in slope areas. Turf and grass shall receive full soil preparation.

2.2 ORGANIC AMENDMENTS

- A. Compost Amendment: Acceptable products are finely ground tree and shrub trimmings and vegetable products that have been decomposed and fully composted at least 120 days.
1. Stabilized Decomposed Matter material shall have an acid-soluble ash content of no less than 6% and no more than 20%.
 2. The pH of the material shall be between 6 and 7.5.
 3. The salt content shall be less than 10 millimho/cm @ 25° C. on a saturated paste extract.
 - a. Higher amounts of salinity may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the salinity. Final determination will be made during soil testing and recommendations.
 4. Boron content of the saturated extract shall be less than 1.0 parts per million.
 - a. Higher amounts of boron may be present if the soils are to be preleached to reduce the excess or if the plant species will tolerate the boron. Final determination will be made during soil testing and recommendations.
 5. Silicon content (acid-insoluble ash) shall be less than 50%.
 6. Calcium carbonate shall not be present if to be applied on alkaline soils.
 7. Types of acceptable products are composts, manures, mushroom composts, straw, alfalfa, peat mosses etc. low in salts, low in heavy metals, free from weed seeds, free of pathogens and other deleterious materials.
 8. Composted wood products are conditionally acceptable [stable humus must be present]. Wood based products are not acceptable which are based on red wood or cedar.
 9. Sludge-based materials are not acceptable if the soil already has a high level (toxic level) of zinc, copper or other heavy metals based on soil analysis.
 10. Carbon:Nitrogen ratio is less than 25:1.
 11. The compost shall be aerobic without malodorous presence of decomposition products.
 12. The maximum particle size shall be 0.5 inch, 80% or more shall pass a No. 4 screen for soil amending. The maximum particle size shall be 0.25 inch for hydroseeding.
 13. Suppliers of stabilized mature compost shall include the following:
 - a. River Valley Horticultural Products, Inc. – 21701 Lawson Road, Little Rock, Arkansas, 72210, 501-821-4770
 - b. American Composting, Inc. – 11911 Faulkner Road, North Little Rock, Arkansas, 72117, 501-945-8888
 - c. Tulsa Topsoil – 431 South 193rd Avenue, Tulsa, Oklahoma, 74108, 918-605-5279
 - d. Gem Dirt – 2526 West 101st Street South, Tulsa, Oklahoma, 74132, 918-298-0299
 - e. Or approved equal by Landscape Architect.

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- B. Maximum total permissible pollutant concentrations in amendment in parts per million on a dry weight basis:

Item	Parts Per Million Maximum	Item	Parts Per Million Maximum
arsenic	20	mercury	10
copper	150	vanadium	500
selenium	50	cobalt	50
cadmium	15	molybdenum	60
lead	200	zinc	300
silver	10	nickel	100
chromium	300		

2.3 IMPORT PLANTING MIXTURE:

- A. The following materials are to be used for all ground cover beds, shrub beds and tree plantings as prescribed herein:
- B. Backfill Mix or Planter Infill Mix or Preparation Layer (8" depth) for On-Grade Planting or Pocket Plant Pits: Thoroughly mix the following components per one (1 cy) cubic yard of mix:
1. 65% by volume of on-site topsoil
 2. 15% by volume of expanded shale (1/8" to 1/4" diameter)
 3. 20% by volume of organic compost
 4. 1/3 pound (lb) ammonium sulfate
 5. 1/2 pound (lb) of triple super phosphate
 6. 1/2 pound (lb) potassium sulfate (0-0-50)
 7. 2 pounds (lbs) agricultural gypsum
 8. Mycorrhizal Inoculum – (granular at 1 lb per 1000 sq, ft.)
 9. Suppliers of above noted mixture shall include the following:
 - a. River Valley Horticultural Products, Inc. – 21701 Lawson Road, Little Rock, Arkansas, 72210, 501-821-4770
 - b. American Composting, Inc. – 11911 Faulkner Road, North Little Rock, Arkansas, 72117, 501-945-8888
 - c. Tulsa Topsoil – 431 South 193rd Avenue, Tulsa, Oklahoma, 74108, 918-605-5279
 - d. Gem Dirt – 2526 West 101st Street South, Tulsa, Oklahoma, 74132, 918-298-0299
 - e. Or approved equal by Landscape Architect.

2.4 IMPORT AMENDMENT AND SOIL FOR PARTICULAR PLANTS:

- A. The following materials are to be used for acid loving plant beds:
1. Azalea Mix as mixed and provided containing composted green waste, sand and soil with a pH be between 4.5 and 6.5. Provide sample to laboratory for testing and recommendations. Provide additional sample to Landscape Architect.
 2. Suppliers of above noted mixture shall include the following:
 - a. River Valley Horticultural Products, Inc. – 21701 Lawson Road, Little Rock, Arkansas, 72210, 501-821-4770
 - b. American Composting, Inc. – 11911 Faulkner Road, North Little Rock, Arkansas, 72117, 501-945-8888
 - c. Tulsa Topsoil – 431 South 193rd Avenue, Tulsa, Oklahoma, 74108, 918-605-5279

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- d. Gem Dirt – 2526 West 101st Street South, Tulsa, Oklahoma, 74132, 918-298-0299
- e. Or approved equal by Landscape Architect.

B. The following materials are to be used for cactus planting:

- 1. Very sandy loam with pH of 6.5 to 6.8. Provide sample to laboratory for testing and recommendations. Provide additional sample to Landscape Architect.
- 2. Suppliers of above noted mixture shall include the following:
 - a. River Valley Horticultural Products, Inc. – 21701 Lawson Road, Little Rock, Arkansas, 72210, 501-821-4770
 - b. American Composting, Inc. – 11911 Faulkner Road, North Little Rock, Arkansas, 72117, 501-945-8888
 - c. Tulsa Topsoil – 431 South 193rd Avenue, Tulsa, Oklahoma, 74108, 918-605-5279
 - d. Gem Dirt – 2526 West 101st Street South, Tulsa, Oklahoma, 74132, 918-298-0299
 - e. Or approved equal by Landscape Architect.

2.5 CHEMICAL ADDITIVES:

A. The following additives may or may not be used depending on the outcome of the soils report.

- 1. Ground Limestone: Agricultural limestone containing not less than 85% of total carbonates, ground to such fineness that 50% will pass #100 sieve and 90% will pass #20 sieve.
- 2. Dolomite Lime: Agricultural grade mineral soil conditioner containing 35% minimum magnesium carbonate and 49% minimum calcium carbonate, 100% passing #65 sieve. "Kaiser Dolomite 65 AG" as manufactured by Kaiser, Inc. Mineral Products Department, or equal.
- 3. Gypsum: Agricultural grade product containing 90% minimum calcium sulfate dihydrate.
- 4. Iron Sulfate (Ferric or Ferrous): Supplied by a commercial fertilizer supplier, containing 20% to 30% iron and 35% to 40% sulfur.
- 5. Sulfate of Potash: Agricultural grade containing 50% to 53% of water-soluble potash.
- 6. Single Superphosphate: Commercial product containing 20% to 25% available phosphoric acid.
- 7. Ammonium Sulfate: Commercial product containing approximately 21% ammonia measured as nitrogen.
- 8. Ammonium Phosphate: Commercial product containing approximately 18% ammonia measured as nitrogen and 48% phosphoric acid.
- 9. Ammonium Nitrate: Commercial product containing approximately 17% ammonia measured as nitrogen and 17% nitrate nitrogen.
- 10. Calcium Nitrate: Agricultural grade containing 15.5% nitrogen and 21% calcium.
- 11. Urea Formaldehyde (Urea-Form): Granular commercial product containing 38% slow release nitrogen with a minimum of 23% WIN (water insoluble nitrogen).
- 12. I.B.D.U. (Iso Butyldiene Diurea): Commercial product containing 31% slow release nitrogen.
- 13. Soil Sulfur: Agricultural grade sulfur containing a minimum of 96% sulfur.
- 14. Iron Sequestrene: Geigy Iron Sequestrene 138 Fe (Iron EDDHA)
- 15. Gro-Safe: Herbicide absorbent as manufactured by American Norit Company of Jacksonville, FL (800) 641 9245).
- 16. Mycorrhizal additive/Restorative: JRM Chemical, Cleveland Ohio, 800-962-4010 or Tri-C Natural Solutions, Chino, California 800-927-3311 or approved equal.

2.6 WATER: Clean, fresh and potable, furnished and paid for by Owner.

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PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. General:

1. Moisture Content: Do not work soil when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in air or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content.
2. Provide 8" topsoil at all planting areas with noted bed preparation requirements below.
3. Provide 4" topsoil at all lawn and meadow areas with noted soil preparation per Specification Section 329200 "Lawns and Grasses".

B. Preparation of Existing Soil:

1. Verification of Existing Grades: Verify that grades are within 1 in. plus or minus of the required finished grades. Report all variations to the Landscape Architect.
2. Clearing of Debris: Clear all planting areas of stones 1 in. diameter and larger, weeds, debris and other extraneous materials prior to amending existing soil or spreading imported topsoil.
3. Cultivation: Rip or cultivate all planting areas to a depth of 12 inches immediately prior to amending existing soil or placing topsoil. Rototill to reduce soil clods to a maximum diameter of one (1") inch in the top six (6") inches. Do not rototill within the existing tree areas.

C. If rock, road base or similar material is encountered, remove that material is encountered, remove that material to full depth plus two inches and haul and dispose of offsite at the direction and approval of the owner's representative.

3.2 SOIL CONDITIONING

A. Verification: Do not commence amending of existing soil prior to acceptance by Landscape Architect of soil preparation.

B. Turf Area(s) Soil Preparation:

1. Rip or cultivate existing sub-soil to a four-inch (4") depth minimum in excavation areas unless under existing tree canopies.
2. Remove all rock one inch in diameter or greater.
3. After irrigation is installed, fill areas with specified imported planting mix or topsoil as shown on details with light compaction and rake smooth per grading plans.
4. Add adequate planting mix or topsoil to compensate for settling and watering.
5. Provide soil amendments (if not applied to import soil mixtures) at rates noted herein and rototill and mix/blend with topsoil to a minimum 4" depth.
6. For any mounded areas, excavate uniformly to depth noted and create mounded areas with planting soil mix.
7. Final rake smooth and level per grading plans and allow to settle.
8. Adjust grades accordingly after settling is confirmed.

C. Ground Cover Area(s) Soil Preparation:

1. Rip or cultivate existing sub-soil to a eight-inch (8") depth minimum in excavation areas unless under existing tree canopies.

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2. Remove all rock one inch in diameter or greater.
3. After irrigation is installed, fill areas with specified imported planting mix or topsoil as shown on details with light compaction and rake smooth per grading plans.
4. Add adequate planting mix or topsoil to compensate for settling and watering.
5. Provide soil amendments (if not applied to import soil mixtures) at rates noted herein and rototill and mix/blend with topsoil to a minimum six-inch (6") depth.
6. For any mounded areas, excavate uniformly to depth noted and create mounded areas with planting soil mix.
7. Final rake smooth and level per grading plans and allow to settle.
8. Adjust grades accordingly after settling is confirmed.

D. Shrub Area(s) Soil Preparation:

1. Rip or cultivate existing sub-soil to a eight-inch (8") depth minimum in excavation areas unless under existing tree canopies.
2. Remove all rock one inch in diameter or greater.
3. After irrigation is installed, fill areas with specified imported planting mix or topsoil as shown on details with light compaction and rake smooth per grading plans.
4. Add adequate planting mix or topsoil to compensate for settling and watering.
5. Provide soil amendments (if not applied to import soil mixtures) at rates noted herein and rototill and mix/blend with topsoil to a minimum six-inch (6") depth.
6. For any mounded areas, excavate uniformly to depth noted and create mounded areas with planting soil mix.
7. Final rake smooth and level per grading plans and allow to settle.
8. Adjust grades accordingly after settling is confirmed.

E. Amendments Application Rate: Apply to all planting areas at the following rates per 1,000 square feet at noted soil preparation depths or as noted upon agricultural soil testing results:

1. 5 pounds ammonium sulfate
2. 6 pounds super phosphate
3. 8 pounds potassium sulfate (0-0-50)
4. 35 pounds agricultural gypsum
5. (Other Chemical additives per soils testing report per final direction by Landscape Architect upon review of soil testing, if any, which may also vary amendments noted above.)
6. Areas to receive Hydroseeding: Delete fertilizer and gypsum component.

F. Incorporation of Amendments: Incorporate homogeneously and thoroughly with top 8 in. of soil layer and bring amended soil to finish grades and elevations shown on Drawings. Do not work soils under muddy conditions.

G. Surface broadcast amendments at 1/3 the specified rate in the existing tree areas prior to hand soil conditioning or raking, do not otherwise incorporate.

3.3 SOIL PERCOLATION TESTING

A. Type/Quantity: During operations of Agronomic Soil Fertility Testing and prior to installing Plant Material, Contractor shall perform Soil Percolation Tests, through the direction of the Landscape Architect, in selected representative areas of the Project Site, to verify acceptable natural drainage, soil structure, and soil composition. Contractor shall verify the locations of the Soil Percolation Tests with the Landscape Architect.

B. Procedure: Each Soil Percolation Test shall be performed as follows:

1. Dig a hole: 2'-0" wide x 2'-0" long x 2'-0" deep.

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2. Fill the hole with water to top and cover with plywood and barricade. Allow hole to drain and fill again to top.
3. Make twice daily observations, noting the depth of water each day.
4. Report findings, in writing, to the Landscape Architect. Include the length of time the water takes to drain completely from each hole, date of test, location, and other information, which may be useful in providing further recommendations.

- C. Results: Based on the combined results of the Agronomic Soil Fertility Testing and the Soil Percolation Tests, Contractor may be required to install additional tree drainage sumps or other drainage methods at each planting pit for trees larger than 15-gallon container stock. This does not relieve the Contractor's obligation within the Base Bid to provide the required Tree Root Aeration Units indicated in Section 329400 – Landscape Planting Accessories. Contractor shall include, as a line-item price within the Base Bid, the price per each additional tree drainage sump, should they be required (based on the testing). Should additional tree drainage sumps or other methods is required, compensation shall be awarded to the Contractor at the line-item price (each) as provided by the Contractor.

3.4 SOIL MOISTURE CONTENT

- A. General: Do not work soil when moisture content is so great that excessive compaction occurs, or when it is so dry that dust will form in air, or that clods will not break readily. Apply water, if necessary, to bring soil to an optimum moisture content for tilling and planting. Soil moisture level prior to planting shall be no less than 75% of field capacity. The determination of adequate soil moisture for planting shall be the judgment of the Landscape Architect. Range: Maintain within two-percent (2%) above or below optimum moisture content at times during Work.

3.5 PROTECTION OF SITE

- A. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and contracted Landscape Establishment Period.
- B. Protect concrete paving, headers, and drainage from staining due to contact with wet nitrogen stabilized mulch/sawdust, or contact with chelated iron. Correct any stained concrete.

3.6 DRAINAGE OF PLANTING AREAS

- A. Surface Drainage:
1. Discrepancies: Provide proper surface drainage of planted areas. Submit in writing all discrepancies in the Contract Drawings or Specifications, or prior Work done by others, which Contractor feels precludes establishing proper drainage.
 2. Correction: Include description of work required for correction or relief of said condition.
- B. Detrimental Drainage, Soils and Obstructions:
1. Notification: Submit in writing all soils or drainage conditions considered detrimental to growth of plant materials. State condition and submit proposal and cost estimate for correcting condition.
 2. Correction: Submit for acceptance a written proposal and cost estimate for the correction before proceeding with Work.
 3. Obstructions: If rock, underground construction Work, tree roots, or other obstructions are encountered in the performance of Work under this Section, submit cost required to remove the obstructions to a depth of not less than six-inches (6") below the required soil depth.

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3.7 CLEAN UP AND PROTECTION

- A. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.
- B. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section, as directed by the Landscape Architect.

END OF SECTION

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SECTION 329200

LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Turf Grass and/or Ornamental Groundcover (via sown seed, stolon, plug, hydromulch or sod) planting installation, as shown on the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Sodded Turf Grasses.
 - 2. Seeded Meadow or Native Turf Grasses (Machine broadcast).
 - 3. Seeded Meadow or Native Turf Grasses (Hydroseeded).
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 312219 "Landscape Fine Grading".
 - 3. Section 328400 "Site Irrigation System".
 - 4. Section 329113 "Soil Preparation".
 - 5. Section 329300 "Trees, Shrubs, Vines and Groundcovers".
 - 6. Section 329813 "Landscape Establishment Period".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASPA – American Sod Producers Association.
 - 2. AOSA – Association of Official Seed Analysts.
- B. Definitions:
 - 1. Plant Material(s): Refers to living plant species, inclusive of turf grass (via sown seed, stolons, and/or sod), ornamental grasses or groundcovers (via sown seed or sown plugs) for the Project.
 - 2. Planting Area (PA): As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
 - 3. Hydro-Mulching: Refers to the practice of sowing seeds (via hydro-seeding method) or stolons (via hydro-stolonizing method) together within a slurry mixture of water, fertilizer, cellulose (wood) fiber mulch, binder additive / soil and mulch tackifier, and other additives and materials, which is sprayed uniformly on a prepared soil surface through a pressurized distribution system.

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C. Measurements:

1. SQ/FT: Measurement, in square-foot.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Samples and Product Data: Submit samples, certification, and manufacturers' literature for the following items:
1. Seed Varieties: Guaranteed statement of composition, mixture and percentage of purity and germination of each variety
 2. Sod Information and Certification
 3. Mulch: Manufacturers literature
 4. Soil Stabilizer: Manufacturers literature
 5. Fertilizer: Manufacturers literature
 6. Erosion Control Fabric
- H. Test Data: Submit all laboratory test data for all materials.
1. Owner's Test: The Owner may choose to test the seed or seed mixes. The Contractor shall be notified.
- I. Submittal Schedule: All products in this section that are required for submittal shall be included in one (1) Section 329200 submittal package.
- J. Samples: (Not Required)

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1.4 QUALITY ASSURANCE AND CONTROL

- A. Certificates of Inspection: Provide as required by law for transportation of each shipment of seed along with invoice. Submit copies of certificates after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection at project site.
1. Sod: Shall be subject to inspection and approval by Landscape Architect at the site upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Landscape Architect reserves right to refuse inspection at this time if, in his judgment, a sufficient quantity of sod is not available for inspection.
 2. Seed: The Landscape Architect shall be furnished a signed copy of statement from vendor, certifying that each container of seed delivered is labeled in accordance with the Federal Seed Act and is at least equal to requirements previously specified. Seed analysis shall be furnished prior to commencement of planting operations. Each lot of seed may be resampled and retested in accordance with latest Rules and Regulations under the Federal Seed Act at the discretion of the Landscape Architect. If these tests reveal the seed to be below the specified pure live seed content, the Contractor shall be required to plant additional seed to compensate for the deficiency at no additional cost to the Owner. The State Seed Laboratory will conduct the seed retests. Allowance will be made for the actual pure live seed content of the specified grasses in determining the actual planting rate.
- B. Inspections:
1. Make written request for inspection after seeding or sodding operations have been completed. Such inspection is for the purpose of commencement of the Landscape Establishment Period.
 2. Submit written requests for inspections to the Landscape Architect at least seven (7) days prior to anticipated inspection date.
- C. Applicable Standards: Apply the current or latest editions of the standards for seed as described in the following:
1. Hortus III - 1976 Edition, Bailey Horatorium, Cornell University.
 2. Federal Seed Act.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Seed:
1. Delivery: Furnish standard seed in unopened manufacturer's standard containers bearing original certification labels showing quantity, analysis and name of manufacturer.
 2. Storage: Store seed with protection from weather or other conditions that would damage or impair the effectiveness of the product.
- B. Mulch: Each package of cellulose fiber shall be marked by the manufacturer to show the air dry weight content.
- C. Sod:
1. Harvest and Delivery: Harvest from the source and deliver to project site within 24 hours. Deliver only as much sod as can be installed in one day's work.
 2. Review: Sod not transplanted within this time period shall be reviewed prior to installation.

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- D. Product Storage:
 - 1. Protect products from weather or other conditions that would damage or impair the effectiveness of the items.

1.6 PROJECT/SITE CONDITIONS

- A. General Requirements: Installation under this Section shall be performed only during the time of day and during seasons when satisfactory results can be expected, unless authorized by the Landscape Architect.
 - 1. Seeds: Install immediately after finish grading and irrigation installation are accepted.
 - 2. Sod: Install immediately after finish grading and irrigation installation are accepted.
 - 3. Stolons: Install immediately after finish grading and irrigation installation are accepted.
 - 4. Plugs: Install immediately after finish grading and irrigation installation are accepted.
- B. Climate Restrictions: Do not install Plant Materials under this Section during rainy or inclement weather.
- C. Hydro-mulching Operations:
 - 1. Irrigated Areas: Commence Work within fourteen (14) calendar days after the completion and acceptance of Soil Preparation (per Section 329113 – Soil Preparation.) in planting areas.
 - 2. Un-irrigated Areas: Commence work only as soon as the area is ready, Contractor is responsible to provide temporary irrigation, as required, to un-irrigated areas to insure proper germination and growth establishment of the seeded and / or hydro-mulch to meet a minimum of 95% coverage of the hydro-mulched areas to satisfy Final Acceptance requirements.

1.7 SUBSTITUTIONS

- A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.
- B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.
- C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.
- D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

1.8 ANALYSES OF SAMPLES AND TESTS

- A. Samples: Landscape Architect reserves the right to take and analyze samples of materials for conformity to specifications at any time. Furnish samples upon request.

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- B. Rejected Materials: Remove rejected materials immediately from the site at Contractor's expense. Pay cost of testing of materials not meeting specifications.

1.9 LANDSCAPE ESTABLISHMENT PERIOD

- A. Refer to Section 329813 "Landscape Establishment Period", for requirements under this Article.
 - 1. During the duration of the Landscape Establishment Period, continuously maintain Landscape Planting Accessories by tightening, holding plumb, and/or repairing Staking and/or Guying supports, providing adequate depths and coverage requirements of Landscape Mulching Materials, monitoring drainage within Tree Root Aeration Units, hold Edging Materials true and in proper alignments, and other requirements, as required, to establish healthy, viable landscape planting materials until Final Acceptance of Work is granted.

1.10 PROTECTION OF ADJACENT AND EXISTING LAWNS TO REMAIN:

- A. Do not store materials or equipment, permit burning, or operate or park equipment on existing lawn areas to remain except as actually required for construction in those areas.
- B. Provide barricades, fences or other barriers as necessary to protect existing lawns to remain from damage during construction.
- C. Notify Landscape Architect in any case where Contractor feels grading or other construction called for by Contract Documents may damage existing lawns to remain.
- D. If existing lawn areas to remain are damaged during construction, Contractor shall replace such lawn areas of the same quality as those damaged at no cost to Owner. Determination of extent of damage and value of damaged lawns shall rest solely with Landscape Architect.

1.11 WARRANTY PERIOD

- A. Time Period: Warrant that all lawns, sodded areas, hydromulch meadow and grass areas will be in a healthy and flourishing condition of active growth twelve (12) months from date of Final Acceptance.
- B. Appearance During Warranty: All grassed areas shall be free of dead or dying patches, and all areas shall show foliage of a normal density, size and color for the season during which it is reviewed
- C. Delays: All delays in completion of planting operations which extend the planting into more than one planting season shall extend the Warranty Period correspondingly.
- D. Coverage: Warrant growth and coverage of lawn and meadow planting to the effect that:
 - 1. For meadows: a minimum of 95% of the area planted shall be covered with specified planting after one growing season with no bare spots.
 - 2. For Sod: Complete lush cover with no brown sections, edges, seams or cracks showing. Sod shall have established to the extent that satisfactory capillary action between the sod and soil has been established. 100 per cent coverage.
 - 3. For Seed: Ninety-eight (98%) percent uniform coverage of grass in excess of one (1") inch height. No bare spots of greater than one half (1/2) square foot and no aggregate bare areas in any 100 square feet greater than 2 square feet.

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- E. Exceptions: Contractor shall not be held responsible for failures due to neglect by Owner, Client, vandalism, etc., during Warranty Period. Report such conditions in writing.

1.12 FINAL ACCEPTANCE:

- A. Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work, but exclusive of re-application under the Guarantee Period. Final Acceptance of lawn establishment shall be as follows:
 - 1. For Sod: Complete lush cover with no bare or brown sections and no seams or cracks are showing. Sod shall have established to the extent that satisfactory capillary action between the sod and soil has been established and there are no bare areas.
 - 2. For Seed: Complete coverage with no more than 30% soil visibility levels. Coverage must be equal and well distributed over entire area.
 - 3. The Landscape Architect and/or Owner shall interpret the above. Upon Final Acceptance, the Owner will assume the responsibility for maintenance of the work.

1.13 REPLACEMENTS

- A. Unacceptable Workmanship: Hydroseed areas exhibiting conditions that are determined as unacceptable workmanship shall be repaired and/or replaced at no additional cost to the Owner.
- B. Replacements: Replace, without cost to Owner, and as soon as weather conditions permit, all hydroseed not in a vigorous, thriving condition, as determined by Landscape Architect during and at the end of Warranty Period.
- C. Matching: Closely match all replacement seed with adjacent areas of lawn or grass. Apply all requirements of this Specification to all replacements.

PART 2 - PRODUCTS

2.1 SOD

- A. One-year old sod, variety as shown on the drawings.
 - 1. Sod shall be dense with the grass having been mowed at one (1") inch height before lifting from field. All grown on fumigated soil.
 - 2. Sod shall be in vigorous condition, dark green in color, free of disease and harmful insects.
 - 3. Do not stack for more than twenty-four (24) hours between time of cutting and time of delivery.
 - 4. Landscape Architect reserves the right to reject any sod deemed unacceptable for installation.

2.2 SEED

- A. Composition: Fresh, clean, certified, Class 'A', new crop seed.
- B. Weed Seed: Do not exceed 0.25%.

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2.3 FERTILIZER FOR TANK MIX

- A. Shall be as established through soil testing, pelleted, uniform in composition, free-flowing, and suitable for application with approved equipment. The fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name or trademark and warranty of the producer.

2.4 MULCH

A. General:

1. Composition: Green-colored, fibrous, virgin wood cellulose mulch containing no growth or germination-inhibiting factors.
2. Dispersion in Slurry: Mulch shall be manufactured in such manner that after addition to and agitation in slurry tanks with fertilizer, seed, water and other approved additives, fibers in the material will become uniformly suspended to form a homogeneous slurry.
3. Absorption Capacity: When hydraulically sprayed on the ground, the material will form a blotter-like groundcover impregnated uniformly with seed which will allow the absorption of moisture and allow rainfall to percolate to the underlying soil.

B. Specifications:

1. Weight: Weight specifications of this material from suppliers, and for all applications, shall refer only to air dry weight of the fiber material. Absolute air dry weight is based on the normal standards of the Technical Association of the Pulp and Paper Industry for wood cellulose and is considered equivalent to 10% moisture.
2. Labeling: Each package of the cellulose fiber shall be marked by the manufacturer to show the air dry weight content.

2.5 HYDRAULIC EQUIPMENT FOR HYDROMULCH SEEDING

- A. Mixer: Use a commercial type hydro-seeder for the application of slurry. Equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix slurry.
- B. Distribution Lines: Large enough to prevent stoppage and to provide even distribution of the slurry over the ground.
- C. Pump Capacity: 150 psi at the nozzle.
- D. Slurry Tank: Minimum capacity of 1000 gallons and shall be mounted on a traveling unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste.

2.6 WATER: Potable water as furnished by Owner. Transport as required.

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2.7 FIBER MULCH

- A. Fiber mulch, for use with the hydraulic application of grass seed and fertilizer, shall consist of specially prepared mulch. It shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed an appropriate color to allow visual metering of its application. The mulch shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover which readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air dry weight of the fiber, a standard equivalent to eighteen (18%) percent moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry weight content. Suppliers shall be prepared to certify that laboratory and field testing of their product has been accomplished and that it meets all of the foregoing requirements.
- B. Soil Stabilizer:
 - 1. Composition: Totally organic substance, supplied in powder form and at least 90% of which is 92% pure muciloid derived from ground *Plantago ovata-insularis* husks. Stabilizer shall be water-soluble, non-toxic hydrophilic and shall not inhibit germination.
 - 2. Product: "Ecology Controls M-binder" by Ecology Controls, (213) 877-8600, or "R-Binder" by Clyde Robin Seed Co., (415) 785-0425.
- C. Mulch and Soil Stabilizer:
 - 1. Composition: Pre-mixed, organic-based combination of virgin-wool fiber and stabilizing agent with no growth or germination-inhibiting elements.
 - 2. Product: "Hydro Mulch 2000 Fiber" by Conwed Corporation., (612) 221-1190.

2.8 TOPSOIL AND SAND

- A. Shall be as specified in Section 329113 "Soil Preparation", for the purpose of topdressing under existing trees.
 - 1. Blend
 - a. 1/3 Cubic Yard Sandy Loam Topsoil (75%)
 - b. Compost (25%)
 - c. Fertilizer according to the soil report recommendations

2.9 LAWN FERTILIZER FOR EXISTING LAWN

- A. Shall be as specified in Section 329813 "Landscape Establishment Specification" or as recommend by the project agronomist during the soil testing and recommendations portion of Section 329113 "Soil Preparation".

2.10 TOPDRESS SOIL MIX

- A. Blend
 - 1. 1/3 Cubic Yard Topsoil (33%)
 - 2. 1/2 Cubic Yard Sand (50%)
 - 3. 1/6 Cubic Yard Compost (17%)

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- 2.11 WATER: Shall be free from oil, acid, alkali, salt, and other substances harmful to growth of grass. The water source shall be subject to approval prior to use.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.
- C. Verification of Conditions:
 - 1. Grades: Verify that grades are within 1 in. plus or minus of the required finished grades. Verify that erosion control materials have been installed in other sections. Report all variations in writing.
 - 2. Stones, Weeds, Debris: Verify that all areas to receive lawns and grasses are clear of stones larger than 3/4 inch in diameter, weeds, debris and other extraneous materials.

3.2 GENERAL

- A. Areas to Receive Hydroseeding: All designated areas as delineated on the Drawings.
- B. Perform seeding on a section-by-section basis and after approval of Landscape Architect of graded condition. Complete areas in a continuous manner.
- C. Scheduling:
 - 1. Irrigated Areas: Within fourteen (14) calendar days after the completion of finish grading in any area. In the event of anticipated bad weather conditions, apply immediately.

3.3 SPECIAL MULCHING EQUIPMENT

- A. Hydraulic equipment used for the application of fertilizer, seed, and slurry of prepared wood fiber mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to forty (40) pounds of fiber plus a combined total of seventy (70) pounds of fertilizer solids for each one hundred (100) gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which provide even distribution of the slurry on the slopes to be seeded. The slurry tank shall have a minimum capacity of eight hundred (800) gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste. The Landscape Architect may authorize equipment with smaller tank capacity provided that the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.

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- B. Mixing: Care shall be taken that the slurry preparation takes place on the site of the work. The slurry preparation should begin by adding water to the tank when the engine is at half throttle. When the water level has reached the height of the agitator shaft, good recirculation shall be established and seed shall be added. Fertilizer shall then be added, followed by wood pulp mulch. The wood pulp mulch shall only be added to the mixture after the seed and when the tank is at least one-third filled with water. The engine throttle shall be opened to full speed when the tank is half filled with water. All the wood pulp mulch shall be added by the time the tank is two-thirds to three-fourths full. Spraying shall commence immediately when the tank is full. The operator shall spray the area with a uniform, visible coat by using the green color of the wood pulp as a guide.
- C. Application:
1. Contractor shall obtain approval of hydromulch area preparation from the Landscape Architect prior to application.
 2. Operators of hydromulching equipment shall be thoroughly experienced in this type of application. Apply specified slurry mix in a motion to form a uniform mat at specified rate.
 3. Keep hydromulch within areas designated and keep from contact with other plant material.
 4. Slurry mixture which has not been applied within four (4) hours of mixing shall not be used and shall be removed from the site.
 5. After application, the Contractor shall not operate any equipment over the covered area.
 6. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive slurry mix. Keep all paved and planting areas clean during maintenance operations.
 7. Refer also to the maintenance portion of this Section.
- D. Unseeded Areas: If, in the opinion of the Landscape Architect, unplanted skips and areas are noted after hydromulching, the Contractor shall be required to seed the unplanted areas with the grasses that were to have been planted at no additional cost to the Owner.

3.4 SOIL PREPARATION AND CONDITIONING

- A. Provide 4" topsoil at all lawn and meadow planting areas with noted bed preparation requirements below.
- B. Verification:
1. Stones, Weeds, Debris: Verify that all areas to receive lawns are clear of stones larger than 1-1/2 in. diameter, weeds, debris and other extraneous materials.
 2. Grades: Verify that grades are within 1 in. plus or minus of the required finished grades. Report all variations in writing.
- C. Soil Moisture:
1. Excessive Moisture: Do not commence work of this section when soil moisture content is so great that excessive compaction will not occur, nor when it is so dry that dust will form in air or that clod will not break readily.
 2. Inadequate Moisture: Apply water, as necessary, to bring soil to optimum moisture content for planting.
- D. Existing trees: Insure soil preparation within the drip lines of existing trees is by hand and in compliance with Section 329113 "Soil Preparation".

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- E. Soil Conditioning for all meadow grass areas:
1. Rip soil to a depth of 6 inches minimum on 12 inch centers
 2. Relieve compaction, construction traffic and compacted areas by ripping soil to a depth of 12 inches and 12 inch centers.
 - a. In any existing tree areas, reduce tilling to a maximum of 2 inch depth.
 3. Apply compost prior to final tilling at 2 yards per 1,000 sq. ft.
 4. Rototill ripped soil with compost surfacing to a depth of 6 inches to reduce clods and soil to less than 1 inch diameter.
 5. Fine grade
 6. Apply Hydro-mulch seeding as specified.
- F. Soil Conditioning for Sod and Turf Seed Areas:
1. Comply with requirement above. Apply fertilizer during hydro mulch process.

3.5 HYDROSEED

- A. Preparation: Do all slurry preparation at the job site.
1. Water: Add water to the tank when the engine is at half throttle. When the water level has reached the height of the agitator shaft, establish good re-circulation and add seed.
 2. Seed: Do not allow seed to remain more than 30 min. in slurry.
 3. Fertilizer: Add fertilizer, followed by the mulch. The mulch shall only be added to the mixture after the seed, and when the tank is at least 1/3 filled with water.
 4. Mixing: Open the engine throttle to full speed when the tank is half-filled with water. Add all the mulch by the time the tank is 2/3 to 3/4 full. Commence spraying immediately when the tank is full.
- B. Application:
1. General: Apply specified slurry mix in a sweeping motion to form a uniform mat at the specified rate. Keep hydroseeding within designated areas and keep from contact with other plant materials.
 2. Unused Mix: Do not use slurry mixture that has not been applied within 4 hours of mixing. Promptly remove from the site.
 3. Protection: After application, do not operate any equipment over the hydroseeded areas.
 4. Reseeding: Reseed all areas and parts of areas that fail to show a uniform stand until all areas are satisfactorily covered.

3.6 SODDING ON PREPARED FINISHED GRADE

- A. Bed Preparation: Immediately after the soil preparation is completed and finished grade has been approved, begin sodding operations. If sod bed is dry immediately prior to sod installation, dampen surface with a fine mist of water.

3.7 DRILLED SEEDING ON PREPARED FINISHED GRADE

- A. Immediately after finished grade has been approved, begin seeding operations. Lightly disc seed bed surface to a depth of on-quarter (1/4") inch immediately before seeding operations.
- B. Apply seed by mechanical "culti-packer" type or approved similar equipment. Cover the seed and form the seed bed in one operation. In areas inaccessible to culti-packer, seed by hand.

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- C. Take extreme care during seeding and raking to ensure that no change occurs in finish grades and that seed is evenly distributed over entire seed bed.
- D. Roll seeded bed with 200-pound ballast roller.
- E. Water with fine spray.

3.8 CLEAN-UP

- A. General: Keep all areas of work clean, neat and orderly at all times. Keep all paved areas clean during planting operations.
- B. Overspray: Immediately after application, thoroughly wash off any plant materials, planting areas, or paved areas not intended to receive slurry mix.
- C. Debris: Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance.

END OF SECTION

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SECTION 329300

TREES, SHRUBS, VINES AND GROUNDCOVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Exterior Landscape Planting installation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Excavation of tree pits and trenches
 - 2. Excavation of plant pits and beds
 - 3. Provide and install plant materials and related items
 - 4. Finish grading of planted areas
 - 5. Warranty and replacements
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section
 - 2. Section 015639 "Temporary Tree and Plant Protection".
 - 3. Section 312219 "Landscape and Fine Grading".
 - 4. Section 328400 "Site Irrigation System".
 - 5. Section 329113 "Soil Preparation".
 - 6. Section 329813 "Landscape Establishment Period".
 - 7. Section 334300 "Landscape Drainage".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM – American Society for Testing Materials.
 - 2. USDA – United States Department of Agriculture.
 - 3. ANSI – American National Standards Institute.
- B. Reference Standards:
 - 1. American National Standard for Nursery Stock (ANSI Z60.1). American National Standards Institute, and American Association of Nurserymen, Latest edition,
 - 2. American Joint Committee on Horticultural Nomenclature, 1942 Edition of Standardized Plant Names.
 - 3. Hortus III, 1976 Edition, Liberty Hyde Bailey Hortorium, Cornell University.
 - 4. The Hillier Gardener's Guide to Trees and Shrubs, 4th Edition, 1978.
 - 5. Manual of Cultivated Conifers, Den Ouden & Boon, 1978.
 - 6. Datascape Guide to Commercial Nomenclature, American Nurserymen Publishing Co., Chicago, IL, 1994.

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7. American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300), American National Standards Institute, Latest Edition.

C. Definitions:

1. Plant Material(s) – Refers to living plant species, inclusive of trees, shrubs, groundcovers, vines, ornamental grasses, cacti/succulents, espaliers, annuals, perennials, etc., as indicated in the Contract Drawings.
2. Planting Area (PA) – As denoted on the Contract Drawings, shall refer to areas to be installed with Plant Material(s), or areas where existing vegetation shall be protected.
3. Plant Height – Measurement of main body height, not measurement to branch tip.
4. Plant Spread – Measurement of main body diameter, not measurement from branch tip to branch tip.
5. Amended Planting Backfill Mixture – Refer to Section 329113 – Soil Preparation.
6. Balled and Burlapped Stock – Healthy, vigorous exterior plants with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum laced as recommended by ANSI Z60.1.
7. Balled and Potted Stock – Healthy, vigorous exterior 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 exterior plant required.
8. Bare-Root Stock – Healthy, vigorous exterior plants grown with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of exterior plant required.
9. Clump – Where three or more young trees were planted in a group and have grown together as a single tree having three or more main stems or trunks.
10. Container-Grown Stock – Healthy, vigorous, well-rooted exterior plants grown in a container with 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 exterior plant required.
11. Fabric Bag-Grown Stock – Healthy, vigorous, well-rooted exterior plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of exterior plant.
12. Finish Grade – Elevation of finished surface of planting soil.
13. Manufactured Topsoil – Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
14. Multi-Stem – Where three (3) or more main stems arise from the ground from a single root crown or at a point right above the root crown.
15. Sub-grade – Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
16. Subsoil – All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

D. Measurements:

1. sq/ft: Measurement, in square-foot.
2. o.c.: Measurement used for On-Center spacing.
3. e.w.: Direction of Measurements - Each Way

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1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Material Samples and Literature: Submit requested items at least sixty (60) days prior to delivery to site. Attach product name, address of manufacturer and/or supplier and appropriate literature to each sample. Literature or Product Data shall consist of manufacturer's current specifications, with catalog cuts, data sheets and installation instructions.
 - 1. Tree and Shrub Planting Fertilizer: Literature.
 - 2. Wood Chip Mulch: One (1) quart sample and analysis.
 - 3. Decomposed Granite Gravel Mulch: One (1) pint (sample), if any.
- H. Plant Material Samples: Submit documentation within thirty (30) days after award of Contract that all plant materials have been located and are ready to be secured. Arrange specific review procedure of plant materials at time of submission. Submittals and review shall be organized as follows:
 - 1. Preliminary Review: Submit representative photographs for review of all plant materials in the required sizes and in available quantity at least sixty (60) working days prior to shipment to the site.
 - a. Submittal shall include two (2) items per plant:
 - 1) A minimum of two color photograph from opposite sides of each tree species
 - 2) One color photocopy of the mounted sheet. Include one (1) set for each plant type and size required for the project. The 8 1/2" x 11" sheet is to include the name and address of the supplier, size of the plant in the picture and Botanical and English name of the plant.
 - b. Tree and photographs shall include a person or device to determine scale.

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2. Tagging: The Landscape Architect may elect to review any of the material at the place of growth. Upon review and acceptance of plant material photograph, specific items will be selected for field review by the Landscape Architect. The Landscape Contractor shall arrange the review and he shall accompany the Landscape Architect for all reviews and tagging plants at place of growth and upon delivery for conformity to specifications.
3. Photograph Acceptance and Nursery Review: Acceptance of material through photographs does not preclude rejection of unsatisfactory material upon delivery. The Landscape Architect reserves the right to refuse review from photographs or at the grower if, in his judgment suitable material or sufficient quantities are not available. Contractor shall insure a sufficient quantity of plants will be available whenever trips are arranged to a nursery for the purposes of tagging material for the project.
4. Unavailable Material: If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price. Substantiate such proof in writing no later than fifteen (15) days after award of contract.
5. Distant Material: Submit photographs with a person adjacent to plants for preliminary review. Such review shall not impair the right of review and rejection during progress of the work.
6. Special Conditions: The above provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials.
7. Plant material submittals are to begin within two to three weeks after the contractor has been selected and given an official contract. All plant material is to be located, approved, and secured 30 days prior to installation.

I. Test Reports: One (1) copy to be sent by testing laboratory directly to Landscape Architect.

J. Submittal Schedule: All products in this section which is required for submittal shall be included in one (1) Section 329300 submittal package.

1.4 QUALITY ASSURANCE AND CONTROL

A. Certificates:

1. Submit certificates of inspection required by law for transportation of each shipment of plants along with invoice.
2. File copies of certificates after acceptance of material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at project site.

B. Applicable Standards: Apply standards for plant materials as described in the following:

1. "American Standard for Nursery Stock", 1980 Edition, American National Standards Institute, Incorporated, (A.N.S.I. Z60-1-1980).
2. "Standardized Plant Names", 1942 Edition, American Joint Committee on Horticultural Nomenclature.
3. American Standard for Nursery Stock, 1980 Edition, American Association of Nurserymen, Inc.
4. Hortus III - 1976 Edition, Bailey Horatorium, Cornell University.

C. Testing Agency: Wallace Laboratories, 365 Coral Circle, El Segundo, CA 90245. Tel (310)-615-0116, Attn: Mr. Garn Wallace, Ph. D.

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1.5 PROJECT/SITE CONDITIONS

A. Protection of Existing Plants to Remain:

1. Operations: Do not store materials or equipment, permit burning, or operate or park equipment under the branches of all existing plants to remain except as actually required for construction and pocket planting in those areas.
2. Barriers: Protect existing barricades, fences or other barriers as necessary at the drip line to protect existing plants to remain from damage during construction.
3. Equipment: Minimal equipment is to be used in the natural areas. Use only light weight rubber-tired machines (Bob-Cat or similar) and wheel barrows or plant carts to transport material. Drive machines out of natural areas except as absolutely necessary. Hold a review of proposed paths prior to work.
4. Notification: Notify Landscape Architect when Contractor feels other construction activities may damage existing plants to remain.

B. Replacement of Damaged Plants:

1. Replacement: Replace existing plants to remain which are damaged during construction with accepted plants of the same species and size as those damaged at no cost to Owner.
2. Landscape Architect Role: Determine extent of damage and value of damaged plants.

1.6 WORK SCHEDULE: Proceed with the work as rapidly as the site becomes available, consistent with normal seasonal limitations for planting work.

1.7 SELECTION, ORDERING AND PURCHASE OF CONTRACT GROWN TREE MATERIAL

- A. Tagging: Upon review and acceptance of plant material photographs, specific items will be selected for field review by the Landscape Architect. The Landscape Contractor shall arrange the review and he shall accompany the Landscape Architect for all reviews and tagging plants at place of growth and upon delivery for conformity to specifications.
- B. Unavailable Material: If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price. Substantiate such proof in writing no later than fifteen (15) days after award of contract.
- C. Special Conditions: The above provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, analysis, genus/species and name of manufacturer/grower.
- B. Storage: Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product. Protect metal containers from sun during summer months with temperatures above 80 degrees F.
- C. Handling: Do not lift or handle container plants by tops, stems or trunks at any time. Do not bind or handle plants with wire or rope at any time.

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- D. Anti-Desiccant: At Contractor's option, spray all evergreen or deciduous plant material in full leaf immediately before transporting with anti-desiccant. Apply an adequate film over trunks, branches, twigs and foliage.

1.9 ANALYSES OF SAMPLES AND TESTS

- A. Sampling: Right is reserved to take and analyze samples of materials for conformity to specifications at any time. Furnish samples upon request.
- B. Rejected Materials: Remove rejected materials immediately from the site at Contractor's expense. Pay cost of testing of materials not meeting specifications.

1.10 LANDSCAPE ESTABLISHMENT PERIOD

- A. Refer to Section 329813 "Landscape Establishment Period", for requirements under this Article.
 - 1. During the duration of the Landscape Establishment Period, continuously maintain Landscape Planting Accessories by tightening, holding plumb, and/or repairing Staking and/or Guying supports, providing adequate depths and coverage requirements of Landscape Mulching Materials, monitoring drainage within Tree Root Aeration Units, hold Edging Materials true and in proper alignments, and other requirements, as required, to establish healthy, viable landscape planting materials until Final Acceptance of Work is granted.

1.11 WARRANTY PERIOD

- A. Warranty:
 - 1. Warrant that all trees less than 4 1/2" caliper and smaller, shrubs, groundcover, and vines planted under this Contract will be healthy and in flourishing condition of active growth one (1) year from date of Substantial Completion.
 - 2. Warrant that all trees 5" caliper and larger planted under this Contract will be healthy and in flourishing condition of active growth two (2) years from date of Substantial Completion.
- B. Delays: All delays in completion of planting operations which extend the planting into more than one planting season shall extend the Warranty Period correspondingly.
- C. Condition of Plants: Plants shall be free of dead or dying branches and branch tips, with all foliage of a normal density, size and color.
- D. Replacements: As soon as weather conditions permit, replace, without cost to Owner all dead plants and all plants not in a vigorous, thriving condition, as determined by Landscape Architect during and at the end of Warranty Period.
- E. Exclusions: Contractor shall not be held responsible for failures due to neglect by Owner, vandalism, etc., during the Warranty Period. Report such conditions.

1.12 REPLACEMENTS

- A. General:
 - 1. Plant materials exhibiting conditions which are determined as being unacceptable due to workmanship by the Contractor shall be repaired and/or replaced at no additional cost to the Owner.

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2. Closely match replacements to adjacent specimens of the same species. Apply all requirements of this Specification to all replacements.
- B. Replacement Quantities: Contractor shall be held responsible for a maximum of two (2) replacements for each failed tree, shrub and vine, and same area of groundcover planting after final acceptance during the Warranty Period.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. General:

1. Growing Conditions: Plants shall be nursery-grown in accordance with good horticultural practices under climatic conditions similar to those of project for at least two years unless otherwise specifically authorized.
2. Appearance: All plants shall be exceptionally heavy, symmetrical, tightly knit, so trained or favored in development and appearance as to be superior in form, number of branches, compactness and symmetry.
3. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions that would prevent thriving growth.
4. Container Stock: Verify that all container stock has been grown in the containers in which delivered for at least six (6) months, but not over two (2) years. Samples must prove to be free of kinked, circling or girdling roots and with no evidence of a pot-bound condition. Do not install container plants that have cracked or broken balls of earth when taken from container.

B. Measurements:

1. General: Measure plants when branches are in their normal upright position. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Take caliper measurement at a point on the trunk six (6") inches above natural ground line for trees up to four (4") inches in caliper and at a point twelve (12") inches above the natural ground line for trees over four (4") inches in caliper.
2. Size Range: If a range of size is given, do not use plant materials less than the minimum size. Not less than sixty (60%) percent of the plants shall be as large as the maximum size specified. The measurements specified are the minimum size acceptable and are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height and spread shall be rejected.
3. Substitutions: Substituted plants shall be true to species and variety and shall conform to measurements specified except that plants larger than specified may be used if accepted. Use of such plants shall not increase Contract price. If larger plants are accepted, increase the ball of earth in proportion to the size of the plant.

C. Pruning: Do not prune plants before delivery. Prune upon acceptance only under review and direction of Landscape Architect.

1. For pruning after installation, refer to Section 329813 "Landscape Establishment Period".

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- D. Condition: Trees that have multiple leaders, unless specified, or damaged or crooked leaders, will be rejected. Trees having a main leader shall not have been headed back. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over three-quarter (3/4") inch that have not completely callused will be rejected.
- 2.2 BACKFILL MIX FOR ON-GRADE PLANT PITS: See Section 329113 "Soil Preparation" for requirements under this section.
- 2.3 COMMERCIAL FERTILIZERS
 - A. Tree, Shrub and Vine Planting Fertilizer: "Agriform" 21 gram tablets with 20-10-5 (N-P-K) formula as manufactured by Sierra Chemical Company, Milpitas, California, Telephone (408) 263-8080, or accepted equal.
- 2.4 STAKING MATERIALS: Refer to Section 329400 "Landscape Planting Accessories" for requirements under this section.
- 2.5 GUYING MATERIALS: Refer to Section 329400 "Landscape Planting Accessories" for requirements under this section.
- 2.6 VINE SUPPORTS: Refer to Section 329400 "Landscape Planting Accessories" for requirements under this section.
- 2.7 WATER
 - A. Clean, fresh and potable, furnished and paid for by Owner.
 - B. Transport as required.
- 2.8 WOOD CHIP MULCH: Refer to Section 329400 "Landscape Planting Accessories" for requirements under this section.
- 2.9 ANTI-DESICCANT
 - A. At Contractors option, apply anti-desiccants for retarding excessive loss of plant moisture and inhibiting wilt. Material shall be sprayable, water insoluble vinyl-vinyl dine complex that will produce a moisture retarding barrier not removable by rain.
 - 1. Wilt-pruf Formula NCF as manufactured by Nursery Specialty Products, Greenwich, Connecticut, or accepted equal.
- 2.10 DRAINAGE AND SUBDRAINAGE MATERIAL: Refer to Section 334300 "Landscape Drainage" for requirements under this section.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.

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- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.
- C. Installation practices of the Plant Materials shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practices, as judged by the Landscape Architect.
 - 1. Soil moisture levels prior to planting shall be no less than seventy-five-percent (75%) of field capacity. The determination of adequate soil moisture for planting shall be in the sole judgment of the Landscape Architect, and their decision shall be final.
 - a. If the soil moisture level is found to be insufficient for planting installation, planting pits shall be filled with water and allowed to drain before commencing planting operations.
 - b. Any planting area that may become compacted in excess of eighty-five-percent (85%) relative compaction (due to construction operations or other activities during the Contract) shall be tilled and thoroughly cross-ripped to a minimum depth of nine-inches (9") to alleviate the condition, taking care to avoid all existing subsurface utilities, drainage, etc.
 - c. Do not commence planting installation prior to acceptance of Section 329113 – Soil Preparation.
- D. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.
- E. Preparation of Planting Installation: Lay out individual Plant Material locations and areas for multiple plantings. Stake locations, outline areas, and gain the Landscape Architect's acceptance prior to commencing physical planting installation. Contractor shall make minor adjustments to the planting layout as required, per the direction of the Landscape Architect.
- F. No more Plant Materials shall be distributed in the planting area on any day than can be installed and watered on that day. Plant Materials shall be planted and watered immediately after the removal of their containers, as applicable.
- G. Contractor shall protect existing and new improvements and systems installed prior to planting installation. Maintain protection in place until completion of Work and Landscape Establishment Period.
- H. Finish Grades for planting areas shall have been established (per Section 312219 – Landscape Grading) prior to Work under this Section. Verify that grades are within one-inch plus or minus (1"+/-) of the required finish grade, and that all proper soil amendments and fertilizers have been furnished and installed accordingly as specified (per Section 329113 – Soil Preparation).
 - 1. Maintain positive surface drainage of all planted areas throughout the duration of the Contract.
- I. Pre-Planting: Where Plant Materials are to be pre-planted to permit site improvements to be installed around them, Contractor shall be responsible for the accurate layout and placement of those Plant Materials, as measured to their centerlines. Confirm designated pre-planting operations with Landscape Architect prior to commencing Work. Contractor shall also be responsible for the protection of pre-planted Plant Materials while other Work is taking place around them. Provide regular irrigation, as necessary, prior to installation and functioning of irrigation systems (per Section 328400 – Site Irrigation System).

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3.2 DRAINAGE OF PLANTING AREAS

- A. Surface Drainage: Maintain positive surface drainage of planted areas as established under Section 312219 "Landscape and Fine Grading".
- B. Discrepancies: Submit in writing, all discrepancies in the Drawings or Specifications, obstructions on the site, or prior work done by others, which Contractor feels precludes maintaining proper drainage; include description of all work required for correction or relief of said discrepancies.
- C. Detrimental Drainage, Soils and Obstructions:
 - 1. Notification: Supply written notification of all conditions detrimental to growth of plant material. State condition and submit proposal and cost estimate for correcting condition.
 - 2. Testing: Test drainage of plant beds and pits by filling with water twice in succession. Give written notification of conditions permitting the retention of water in planting beds for more than twenty-four (24) hours.
 - 3. Correction: Submit for acceptance a written proposal and cost estimate for the correction before proceeding with work.
 - 4. Obstructions: If rock, underground construction work, tree roots or other obstructions are encountered in the excavation of plant pits, alternate locations may be used as directed. Where locations cannot be changed, submit cost required to remove the obstructions to a depth of not less than six (6") inches below the required pit depth. Proceed with work after acceptance.

3.3 LAYOUT PLANTING AREAS

- A. Layout and Staking: Lay out plants at locations shown on Drawings. Use color-coded wire flags for each species of plant material. Stake each tree, vine and major shrub. Outline shrub and groundcover beds with paint. Locations of plants will be checked in the field and will be adjusted to exact position before planting begins. Right is reserved to refuse review at any time if, in the landscape architect's opinion, a sufficient quantity of plants are not available.
- B. Refer to contract documents – planting details for tree layout staking procedure.

3.4 PLANT PIT EXCAVATION

- A. Plant Pits outside natural areas:
 - 1. Excavate the planting pits for trees and shrubs which shall be three times the diameter and equal to the depth of the root ball. Where adjacent to hardscape, width in the direction of hardscape shall be to hardscape edge unless indicated otherwise in the drawings.
- B. Plant Pits inside natural areas:
 - 1. Excavate the planting pits for trees shall be 12 inches larger and for groundcover and shrubs which shall be 3 inches larger and equal to the depth of the plant material. Avoid root system and adjust location as needed.

3.5 PLANTING OPERATIONS

- A. General:
 - 1. Protect plants at all times from sun or drying winds.

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2. Keep plants that cannot be planted immediately upon delivery in the shade, well-protected and well-watered.

B. Handling of Plant Materials:

1. Remove canned stock carefully after cans have been cut on two sides with accepted cutter. Do not use spade to cut cans.
2. Lift and handle plants only from the bottom of the ball. If rootball is cracked or broken during handling, plant shall be rejected.

C. Installation:

1. Pit Preparation: Add the appropriate amount of backfill mix to the bottom of the plant pit and blend into the existing soil. Tamp and compact mix.
2. Positioning: After removing plant from container, scarify side of rootball to prevent root-bound condition and position plant in planting pit.
3. Backfilling: Use site stockpiled soil to backfill on-grade plant pits. Set each plant plumb and brace rigidly in position until planting soil has been tamped solidly around the ball and roots. When plant pits have been backfilled approximately 2/3 full, water thoroughly and saturate rootball, before installing remainder of the backfill mix to top of pit, eliminating air pockets.
4. Remove top 1/3 minimum of all wiring, rope and burlap as a part of planting operation.
5. Continue backfill and create maximum 3 inch high temporary water basin.
6. Staking and/or Guying: Stake or guy as outlined below.

- D. Adjustment: Adjust plants so that after full settlement has occurred, the natural grade at the base of the plants is flush to a maximum of one (1") inches above the adjacent planting finish grade after natural settlement.

- E. Temporary Watering Basin: Form saucer with three (3") inch high berm centered around tree and 2" higher around shrub pits. Locate basins at twelve (12") inches wider than ball diameter. Basins will not be permanent.

- F. Watering: Water all plants immediately after planting.

- G. Labels: Remove all nursery-type plant labels from plants.

- H. Temporary Watering Basin: Remove watering basins prior to finish grading and after irrigation is in operation within shrub, groundcover and lawn areas.

3.6 STAKING AND GUYING

A. General:

1. Trees shall be able to stand upright without support, and shall return to the vertical after their tops have been deflected horizontally and released. Stake or guy trees which do not meet this qualification. All plant materials shall remain plumb and straight for all given conditions from installation through the guarantee period.
2. Trees supplied with well-tapered, strong trunks that will stand alone may be staked with minimum staking identified and those that are not, may require additional staking supports as identified in the field by Landscape Architect.
3. Tree supports (Staking or Guying), if required, shall be done as outlined in section 329400 "Landscape Planting Accessories".

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3.7 TRAINING OF VINES AND ESPALIERS

- A. Anchors: Place as many anchors as required to securely support the plant and its branching structure as directed.
- B. Ties: Tie branches to anchors with vinyl ribbon ties.
- C. Small Vines: Secure to wall or fence with polyethylene tape at ten (10") inch intervals.

3.8 PRUNING: See "Landscape Establishment Period" - Section 329813.

3.9 MULCHING

- A. Install a two (2") inch deep layer of mulch over all shrub areas including tree and shrub watering basins.

3.10 GROUNDCOVER PLANTING

- A. Tilling: Surface soil in areas to be planted with groundcover shall be tilled to a depth of six (6") inches. Planting soil amendments should be uniformly broadcast and thoroughly incorporated to a depth of six (6") inches by means of rototiller or equal. Do not till in existing tree areas.
- B. Planting: Plant groundcover plants at optimum depth for proper growth. Avoid air pockets. Equally space triangularly, at distances called for in the Drawings.
- C. Watering: Water bed thoroughly after fertilizer application. Wash all fertilizer from leaves of plant materials.

3.11 CLEAN-UP

- A. Keep all areas of work clean, neat and orderly at all times.
- B. Clean up and remove all deleterious materials and debris from the entire work area prior to Final Acceptance.

3.12 FINAL REVIEW

- A. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. Refer to Section 329813 "Landscape Establishment Period" for requirements under this section.

END OF SECTION

SECTION 329400

LANDSCAPE PLANTING ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete exterior Landscape Planting Accessories installation, as shown in the Contract Drawings, and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Mulches (wood products).
 - 2. Root Control Barriers.
 - 3. Stakes and Guys.
 - 4. Erosion Control Materials.
 - 5. Miscellaneous Materials (Herbicides, Vitamin Stimulant/Root Hormone, etc.).
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 329200 "Lawns and Grasses".
 - 3. Section 329300 "Trees, Shrubs, Vines, and Groundcovers".
 - 4. Section 329813 "Landscape Establishment Period".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. ASTM - American Society for Testing and Materials.
 - 2. ANSI – American National Standards Institute.
- B. Measurements:
 - 1. PSI: Measurement, in pounds per square inch.
 - 2. CU/FT: Measurement, in cubic-foot.
 - 3. PPM: Measurement, in parts per million.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect.

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- B. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Product/Material Data. Submit available product/material literature (including color charts) supplied by manufacturer's, indicating that their products comply with specified requirements. Provide manufacturing source (name, address, and telephone number), and distributor source (name, address, and telephone number) for each type of product/material.
- H. Material Samples: For each type of material specified herein, provide Material Samples for review by the Landscape Architect. Include the full range of exposed color and texture expected in the completed Work. Provide Material Samples bound and individually wrapped in re-sealable labeled plastic bags (as applicable):
 - 1. 0.50 cubic foot of Landscape Mulch Material (Shredded Wood Mulch).
 - 2. One (1) set of Tree Staking Materials for each type used, as applicable.
 - 3. One (1) set of Tree Guying Materials for each type used, as applicable.
 - 4. One (1) two-foot (2'-0") square sample of Erosion Control Material for each type used, as applicable.
 - 5. One (1) two-foot (2'-0") sample of Landscape Edging Materials and Accessories (stake, etc), to verify gauge, size, and color selected, as applicable.
- I. Scaled Shop Drawings: Not Required.
- J. Field-Constructed Mock-ups: Not Required.
- K. Qualification Data: Submit names for firms and persons specified in the "Quality Assurance and Control" Article to demonstrate their capabilities and experience on similar Landscape Planting Accessories installations.

1.4 QUALITY ASSURANCE AND CONTROL

- A. Installer Qualifications:
 - 1. Engage an experienced Installer who has completed Landscape Planting Accessories work similar in material, design, and extent to that indicated for this Project and with a record of successful installation.
 - 2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that installations under this Section are in progress.

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- B. Observation: Landscape Architect may observe installation of Landscape Planting Accessories at Project Site for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Landscape Planting Accessories for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected Accessories immediately from Project site.
- C. Manufacturer's Directions: Follow Manufacturer's directions and drawings in cases where the Manufacturers of articles used in this Section furnish directions covering points not shown in the Contract Drawings and Contract Specifications.
- D. Permits, Fees, Bonds, and Inspections: Contractor shall arrange and pay for permits, fees, bonds, testing services, and inspections necessary to perform and complete Work under this Section.
- E. Single-Source Responsibility: Obtain each color, type, and variety of products/materials from a single source with resources to provide products/materials of consistent quality in appearance and physical properties without delaying Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide new, unused materials indicated under this Section. Store and secure properly to prevent theft or damage. Deliver and store perishable material in original, unopened packaging. It is the responsibility of the Contractor to install "factory condition" Units.
- B. Damaged Materials: Be responsible for all damage or disfiguration of Work until Final Acceptance. Remove off site and replace at no additional cost to Owner all damaged or rejected materials.
- C. Deliver materials so as to not delay Work, and install only after preparations for installation have been completed.

1.6 COORDINATION, SCHEDULING, AND OBSERVATIONS

- A. Utilities: Determine location of above grade and underground utilities and perform Work in a manner which will avoid damage to utilities. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to installing Landscape Planting Accessories are encountered, such as rubble fill, adverse drainage conditions, or obstructions, cease installation operations and notify Landscape Architect for further direction.
- C. Field Measurements: Contractor shall take field measurements as required. Report major discrepancies between the Contract Drawings and field dimensions to the Landscape Architect prior to commencing Work.
- D. Installation: Perform installation of Landscape Planting Accessories only when weather and soil conditions are suitable in accordance with locally accepted practices.
- E. Construction Site Observations: Periodic site observations shall be made by the Landscape Architect during the installation of Work under this Section for compliance with requirements for type, size, and quality. Landscape Architect retains right to observe Work for defects and to reject unsatisfactory or defective material at any time during progress of Work. Contractor shall remove rejected materials immediately from Project site. The Contractor shall request, in writing, at least one (1) week in advance of the time when mandatory site observation(s) by the Landscape Architect are required.

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1.7 SUBSTITUTIONS

- A. Consideration: Materials to be considered equal to the Materials indicated herein this Section shall be reviewed by the Landscape Architect. Materials with equal performance characteristics produced by other Manufacturer's and/or Distributors may be considered, providing deviations in dimensional size, color, composition, operation, and/or other characteristics do not change the design concept, aesthetic appearance, nor intended performance, as solely judged by the Landscape Architect. The burden of proof on product equality is on the Contractor.
- B. Specific reference to Manufacturer's names and products specified herein are used as standards of quality. This implies no right to the Contractor to substitute other materials without prior written approval by the Landscape Architect for Work under this Section.
- C. Materials substituted and installed by the Contractor, without prior written approval by the Landscape Architect, may be rejected. Contractor shall not be entitled to be compensated by the Owner where the Contractor has installed rejected substitutions without receiving prior written approval.
- D. Contract Price: Substituted Materials under this Section shall not increase the Contract price.

1.8 LANDSCAPE ESTABLISHMENT PERIOD

- A. Refer to Section 329813 "Landscape Establishment Period", for requirements under this Article.
 - 1. During the duration of the Landscape Establishment Period, continuously maintain Landscape Planting Accessories by tightening, holding plumb, and/or repairing Staking and/or Guying supports, providing adequate depths and coverage requirements of Landscape Mulching Materials, monitoring drainage within Tree Root Aeration Units, hold Edging Materials true and in proper alignments, and other requirements, as required, to establish healthy, viable landscape planting materials until Final Acceptance of Work is granted.

PART 2 - PRODUCTS

2.1 LANDSCAPE MULCH MATERIALS

- A. Shredded Wood Mulch: Shredded Hardwood Mulch, free from deleterious materials, debris, and weed seed. Suitable as a top dressing of trees, shrubs and groundcovers, consisting of following:
 - 1. Type: Shredded cedar, redwood, fir, or hardwood commercial wood bark products, composted with humus and leaf materials. Shredded Wood Mulch shall be graded and to average dimensions of one-inch (1") to three-inches (3") in length, and flat in cross-section.
 - a. Minimum organic matter content at 80%.
 - b. pH between 5.0 and 8.0.
 - c. Salt content shall be less than 4 millimho/cm @ 25 ° C. on a saturated paste extract.
 - d. Boron content of the saturated extract shall be less than 1.0 parts per million.
 - e. Calcium carbonate shall not be present.
 - f. Carbon:Nitrogen ratio is less than 100:1.
 - g. Compost shall be aerobic without malodorous presence of decomposition products.

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- h. Maximum particle size shall be 2 inches. A maximum of 5% shall pass a No. 20 screen.

Maximum Total Permissible Pollutant Concentrations (in parts per million (PPM)) on a dry weight basis:	
Arsenic	20 ppm
Molybdenum	30 ppm
Cadmium	15 ppm
Nickel	50 ppm
Chromium	150 ppm
Selenium	25 ppm
Cobalt	50 ppm
Silver	10 ppm
Copper	150 ppm
Vanadium	50 ppm
Lead	150 ppm
Zinc	150 ppm
Mercury	10 ppm

2. Coverage depth:
- a. Refer to Part III indicated herein this Section.

2.2 STAKES AND GUYS

A. Tree Staking and Guying Application:

1. For trees less than 3" in caliper size in planting or lawn areas, use "At Grade Tree Staking Application" by manufacturer and size or product number noted below.
2. For trees 3.5" to 6" in caliper size in planting or lawn areas, use "At Grade Tree Staking Application" by manufacturer and size or product number noted below.
3. For trees 3.5" to 6" in caliper size in hardscape planting pits, tree wells or similar use "Below Grade Tree Staking Application" by manufacturer and size or product number noted below.
4. For trees 6" to 10" in caliper size use "Below Grade Tree Staking Application" by manufacturer and size or product number noted below.
5. For trees 10" and larger use "Below Grade Guying System" by manufacturer and size or product number noted below.
6. Above grade staking systems are not allowed.

B. Tree Staking and Guying Hardware or Systems

1. At Grade Tree Support Staking System.
 - a. Pre-assembled, pre-packaged, tree anchoring system, specifically manufactured to anchor trees in a primary at-grade application. System components (sized accordingly to tree caliper) include main support root ball bar system, below grade anchors (rod driven) or stakes and wire or nylon rope and attachment hardware.
 - b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Root Anchor At Grade Tree Staking by Tree Stake Solutions, LLC, www.treestakesolutions.com for distributors.

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- 2) Or approved equal by Landscape Architect.
- c. Product Application:
 - 1) For trees up to 2" caliper, Root Anchor 45/65 BG or smaller by Tree Stake Solutions or approved equal.
 - 2) For trees 2.5" – 4" caliper, Root Anchor 100/150 BG or smaller by Tree Stake Solutions or approved equal.
 - 3) For trees 4.5" – 6" caliper, Root Anchor 200/300 BG or smaller by Tree Stake Solutions or approved equal.
2. Below Grade Tree Support Staking System.
 - a. Pre-assembled, pre-packaged, tree anchoring system, specifically manufactured to anchor trees in a primary at-grade application. System components (sized accordingly to tree caliper) include main support anchor rod and top cap anchor.
 - b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Arbor Stakes Tree Staking by Arbor Stake, LLC, www.arborstakes.com for procurement.
 - 2) Or approved equal by Landscape Architect.
 - c. Product Application:
 - 1) For trees up to 3" caliper, use (3) Arborstake assemblies evenly distributed per manufacturer or approved equal.
 - 2) For trees 4" to 7", use (3) Arborstake assemblies plus (1) additional per each additional caliper inch above 3" evenly distributed per manufacturer or approved equal.
3. Below Grade Tree Support Root Guying System (complete below grade application).
 - a. Pre-assembled, pre-packaged, tree anchoring system, specifically designed and manufactured to hold the tree's root ball in place, with only the tree protruding from the ground. System components (sized accordingly to tree caliper) include anchors, wire rope, turn buckles, tree collars, and wire rope clamps.
 - b. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Duckbill Tree Anchor System, Foresight Products, LLC, 6430 E. 49th Drive, Commerce City, CO 80022, 800-325-5360.
 - 2) Or equal (no known equal).
 - c. Product Application:
 - 1) For trees up to 4" caliper, Duckbill Tree Anchor System #68RBK.
 - 2) For trees larger than 4.5" caliper, Duckbill Tree Anchor System #88RBK.

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2.3 EROSION CONTROL MATERIALS

- A. Open Weave Jute Fiber Mesh: Biodegradable, woven, 100% natural jute fiber yarn, +/- 0.25" thick, un-dyed and unbleached, 0.92 lbs. per sq. yd. minimum, with 50% to 65% open area. Provide "U"-shaped, 11-gauge steel wire staples, six-inches (6") to eight-inches (8") long, 2" crown, to anchor Jute Fiber Mesh to soil surface.
1. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Anti-Wash/Geojute, Belton Industries, Inc.
 - b. Or equal, as approved by the Landscape Architect.
- B. Rolled Erosion Control Blanket: 95-100% organic biodegradable materials, consisting of machine-manufactured 100% certified weed free agricultural straw fibers, 100% natural coconut-fibers (coir), or a combination thereof, evenly distributed over the entire area of the Blanket. Fibers shall be sewn into a medium weight natural fiber, degradable mesh net (top and/or bottom) on on-one-half-inch (1-1/2") centers, with cotton polyester or polypropylene thread. Blanket rolls shall be a minimum of 6'-6" wide, and a minimum of .05 lb./sq. yd. Provide "U"-shaped, 11-gauge steel wire staples, six-inches (6") to eight-inches (8") long, two-inch (2") crown, to anchor Erosion Control Blankets to soil surface.
1. Products & Manufacturer's: Subject to compliance with requirements, provide product(s) as required by one (1) Manufacturer, subject to specific slope gradient conditions indicated per the Contract Drawings, as follows:

<u>Slope Gradient Application</u>	<u>Product Type and Composition</u>	<u>* Acceptable Manufacturers and Manufacturer's Product Reference Numbers</u>			<u>Anticipated Functional Longevity of Product</u>
		Greenfix America, Brawley, CA 760-351-7791	North American Green, Evansville, IN 800-772-2040	Western Excelsior, Mancos, CO 800-833-8573	
3:1 to 2:1 slopes.	70% Straw + 30% Coconut Fibers (Coir); Double Net (Top & Bottom).	#CFS072B	#SC150BN	#NAT-CS-3	18 Months
2:1 to 1:1 slopes, and greater.	100% Coconut Fibers (Coir); Double Net (Top & Bottom).	#CF072B	#C125BN	#NAT-CC-4	24 Months

2. * or equal, as approved by the Landscape Architect.

2.4 MISCELLANEOUS MATERIALS

- A. Water: Per ASTM C94, from potable domestic source, and free from deleterious materials such as oils, acids, and organic matter. Transport as required.

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B. Stress Reducing Agent:

1. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Roots Concentrate, Roots, Inc., Independence, MO.
 - b. Or equal (no known equal).
2. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

C. Wetting Agent and Soil Penetrant:

1. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - a. Roots NoBurn®, Roots, Inc., Independence, MO.
 - b. Naiad-SS,
 - c. Or equal, as approved by the Landscape Architect.
2. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

D. Herbicides: EPA registered and approved, from the following:

1. Non-Selective Post-Emergent Herbicide: Spray-applied solution containing a minimum of 41% of the active ingredient "glyphosate" (full strength), with a surfactant, mixed with water accordingly per the Manufacturer's directions.
 - a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Roundup® PRO, (41% glyphosate), Monsanto Company, St. Louis, MO.
 - 2) Roundup® PRO Concentrate (50% glyphosate), Monsanto Company, St. Louis, MO.
 - 3) Honcho® Plus, (41% glyphosate), Monsanto Company, St. Louis, MO.
 - 4) High Yield® Kill-Zall Weed & Grass Killer, (41% glyphosate), Voluntary Purchasing Groups, Boneham, TX.
 - 5) Or equal, as approved by the Landscape Architect.
 - b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.
2. Selective Pre-Emergent Herbicide (Packaged dry material application): Pre-emergent control of annual grasses and broadleaf weeds in turf grass areas, and woody ornamental trees, shrubs, vines, and groundcover areas. Product to contain the active ingredient "trifluralin".
 - a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Ronstar® 2G, (granular), Aventis Environmental Science USA.
 - 2) Snapshot® 2.5 GT (granular), (2% trifluralin), Dow AgroSciences LLC.
 - 3) Treflan® HFP (43% trifluralin), Dow AgroSciences LLC.
 - 4) Treflan® TR-10, (10% Granular trifluralin), Dow AgroSciences LLC.
 - 5) Surflan®, Dow AgroSciences, LLC.
 - 6) Or equal, as approved by the Landscape Architect.

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- b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.
- 3. Selective Post Emergent Herbicide: Pre-mixed, flow-able formulation designed for product stability, uniformity in the spray solution and ease of handling. Post-emergent control of annual grasses, nutsedge, and broadleaf weeds in turf, generally with one (1) application.
 - a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) Trimec® Plus.
 - 2) Ornamec® 170 Grass Herbicide.
 - 3) Or equal, as approved by the Landscape Architect.
 - b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.
- E. Plant Vitamin/Hormone Stimulant:
 - 1. Provide in a diluted liquid solution with water, at the time of watering-in recently planted plant species.
 - a. Products & Manufacturer's: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1) SUPERthrive, Vitamin Institute.
 - 2) Roots2, Roots, Inc., Independence, MO.
 - 3) Root-Maxx Plus, Bio-Plex, Mt. Joy, PA.
 - 4) Or equal, as approved by the Landscape Architect.
 - b. Application Rate: Provide at prescribed rate and application per Manufacturer's written recommendations, per one-hundred (100) gallons of water.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.
- B. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the Work installation herein this section.
- C. Installation practices of the Landscape Planting Accessories shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted horticultural practice, as approved by the Landscape Architect. Contractor shall notify the Landscape Architect, in writing, on the anticipated commencement date and length of duration of the landscape installation.

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3.2 PROTECTION OF SITE

- A. Contractor shall protect existing and new improvements and systems installed prior to installation of Landscape Planting Accessories. Maintain protection in place until completion of Work and Landscape Establishment Period.

3.3 STAKING AND GUYING

- A. General: Tree Staking and Tree Guying shall be per the direction of the Landscape Architect. Staking and/or guying of trees shall be completed immediately following tree planting operations.
 - 1. Contactor shall provide new Tree Stake or Tree Guy assemblies; reconditioned or previously-used Tree Stake or Tree Guy assemblies shall not be permitted. Provide one (1) set of Tree Staking materials or Tree Guying materials per tree, as required. Trees shall remain plumb and straight from installation through the Contractor Warranty period. Staking and Guying assemblies shall remain the property of the Owner.
- B. Staking/Guying Methodology: Unless otherwise directed on the Contract Drawings or as directed by the Landscape Architect based on field conditions, provide the tree staking type and quantity noted in Section 2.2 above.

3.4 INSTALLATION OF EROSION CONTROL MATERIALS

- A. Clear away trash, large stones, and other debris. Prepare sub grade; fine grade area to receive Erosion Control Material, eliminating footprints, tracks, and ruts.
- B. Sequences: For hydroseed applications, install the seed slurry prior to installing the Erosion Control Material. In applications where rooted stock is planted on the slope, care shall be exercised to prevent disruption or damage to the underlying material.
- C. Unroll Material as close as possible to its intended final position to minimize the need to drag the Material which would dislocate underlying materials or disturb the prepared sub grade or planting. Install Material flush and completely in contact with the ground. Confirm that there is no tension on the Material to minimize soil contact.
- D. Overlap Material at a minimum of four-inches (4") on the sides and eighteen-inches (18") on the ends. Staples shall be inserted at intervals no greater than three-feet (3') on-center along overlaps and down the center of each roll length.
- E. Joining rolls of the Material shall be installed at the down-channel end of the installed roll, which should overlap the up-channel end of the roll being installed. Overlap should be a minimum of eighteen-inches (18"). Equally set staples on twelve-inch (12") on-center spacing.
- F. Anchor slot at top of slope shall be installed by burying up-channel end in a six-inch (6") minimum deep trench. Equally set staples on twelve-inch (12") on-center spacing.
- G. On slopes less than six-feet (6') in height, Material may be installed with roll perpendicular to the contours.
- H. The terminal fold shall be installed by bringing the Material down to the level area before terminating. Turn the end under a minimum of six-inches (6"). Equally set staples across the fold at twelve-inch (12") on-center spacing.

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3.5 MULCHING

A. Shredded Wood Mulch:

1. General: Verify locations to receive Shredded Wood Mulch.
2. Mulch backfilled surfaces of pits, trenches, all planted areas, unless noted otherwise.
3. Apply the following average thickness of Shredded Wood Mulch, and finish level with adjacent finished surfaces. Do not place Shredded Wood Mulch directly against trunks or stems of Plant Materials. Remove Shredded Wood Mulch that is placed against the growing bases or within the basal nodes of plants.
4. Thickness/Depth: Two-inches (2"), minimum.
5. While settlement and/or decomposition of the Shredded Wood may occur during the duration of the Contract, the Shredded Wood Mulch thickness as indicated shall be consistent throughout the duration of the Contract. The Contractor shall provide additional Shredded Wood Mulch, as needed, and as directed by the Landscape Architect, to maintain the specified constant thickness of the Shredded Wood Mulch, until Acceptance of Work is granted.

3.6 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Anti-Desiccant: Apply using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.

1. When deciduous trees or shrubs are moved in full-leaf, spray with anti-desiccant at nursery before moving and again two (2) weeks after planting.

B. Stress Reducing Agent: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

C. Wetting Agent & Soil Penetrant: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

D. Herbicides: Apply, as required and directed by the Landscape Architect, per Manufacturer's latest printed instructions.

E. Plant Vitamin/Root Stimulant: Apply, per the Manufacturer's latest printed instructions. Refer to application requirements per Section 32 9300 "Trees, Shrubs, Vines and Groundcovers".

3.7 CLEAN UP AND PROTECTION

A. For Work under this Section, keep Work area in a clean, orderly, and safe condition. Contractor shall remove trash caused from his Work on a weekly basis throughout the duration of the Work.

B. Protect landscaping from damage due to landscape operations, operations by other Contractors and trades, and trespassers. Maintain protection during installation and landscape establishment periods. Treat, repair, or replace damaged Landscape Planting Accessories as directed.

C. Upon completion of his Work under this Section, the Contractor shall remove rubbish, waste, debris, excess construction materials, and other items resulting from construction operations offsite as described herein this Section and directed by the Landscape Architect.

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3.8 FINAL REVIEW

- A. Final Review under this Section shall be performed upon completion of the Landscape Establishment Period. Refer to Section 329813 "Landscape Establishment Period" for requirements under this section.

END OF SECTION

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SECTION 329813

LANDSCAPE ESTABLISHMENT PERIOD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes materials, labor, apparatus, tools, equipment, temporary construction, transportation, and services necessary for and incidental to performing the proper completion of Work, as required to make a complete Landscape Establishment Period, as specified during progress of the Work, after installation, for a designated period, as shown in the Contract Drawings (if any), and as specified herein this Section.
- B. Work under this Section consists of, but is not necessarily limited to, furnishing and installing the following:
 - 1. Establishment of Landscape Installation, for a given duration as specified herein this Section.
 - 2. Monitoring, maintenance, adjustment and repair of irrigation.
 - 3. Hand and supplemental watering of plantings
 - 4. Mowing, edging and trimming of lawn areas.
 - 5. Pruning and trimming of trees and shrubs.
 - 6. Weed control and weeding of all planted areas.
 - 7. Application of fertilizers, insecticides, and herbicides.
 - 8. Surface raking or leveling maintenance of aggregate surfacing.
 - 9. General site cleanup; removal of trash and products of maintenance.
- C. Related Documents: The following Documents contain requirements that relate to Work in this Section:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 2. Section 312219 "Landscape and Fine Grading".
 - 3. Section 328400 "Site Irrigation System".
 - 4. Section 329113 "Soil Preparation".
 - 5. Section 329200 "Lawns and Grasses".
 - 6. Section 329300 "Trees, Shrubs, Vines and Groundcovers".
 - 7. Section 329400 "Landscape Planting Accessories".

1.2 DEFINITIONS AND APPLICABLE STANDARDS

- A. References:
 - 1. USDA – United States Department of Agriculture.
 - 2. ASTM – American Society for Testing and Materials.
 - 3. ANSI – American National Standards Institute.
 - 4. ISA – International Society of Arboriculture.
- B. Standards:
 - 1. American National Standard for Tree Care Operation, Tree, Shrub, and Other Woody Plant Maintenance (ANSI A300), American National Standards Institute, Latest Edition.

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2. American National Standard for Tree Care Operations (ANSI Z133), American National Standards Institute, Latest Edition.
3. Tree Pruning Guidelines, International Society of Arboriculture, 1995 Edition.
4. Pruning Standards for Shade Trees, National Arborists Association, Latest Edition.

1.3 SUBMITTALS

- A. General: Refer to Division 01 for project submittal requirements and timelines. If provided in hardcopy submittal booklets submit each item in this Article in required copies with three (3) copies for review by Landscape Architect.
- B. Two (2) copies shall be returned (one for Owner and one for Contractor) and one copy maintained by Landscape Architect. Provide two (2) sets of Material Samples for review by the Landscape Architect unless requested otherwise. One set will be returned for use as site/field referee sample and the other shall be maintained by the Landscape Architect.
- C. Submittal Booklets: Each Submittal Booklet under this Section shall be tabbed into specific sections, containing clearly identified (through yellow highlighter or other specific identification methods) and legible information on the following information indicated in this Article.
- D. Electronic Submittals: Electronic Submittal shall be provided in a single bound file, PDF format preferred, unless otherwise noted in Division 01.
- E. Submittals under this Article will be rejected and returned without the benefit of review by the Landscape Architect if they are difficult to read due to insufficient scale, poor image quality, or poor drafting quality; or if all of the required information is missing or not presented in the format as requested.
- F. No Work under this Section shall proceed until all information indicated herein this Article have been reviewed, accepted, and approved by the Landscape Architect, in writing.
- G. Quality Control Submittals:
 1. Schedule of maintenance operations and monthly status report including list of equipment, materials proposed for the job (and watering schedule).
 2. Licenses, permits and insurance required by the City of Dallas, the State or Federal government pertaining to maintenance work.
 3. Monthly record of all herbicides, insecticides and disease control chemicals used for the project.
 4. Final landscape establishment report documenting specific changes or modifications to the plants or irrigation and incidents of pest or insect infestation controls that had been required to properly maintain and insure the continued vigor of the planting.
 5. Documentation of existing planting and irrigation system.
 6. Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the Director of Agriculture proposed for this work.
- H. Project Close-out Submittal: Include in a single, 3-ring binder a landscape maintenance manual containing an indexed collection of all schedules, records and permits listed above, as well as a documentation of accepted condition of planting and irrigation at Final Acceptance.

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1.4 QUALITY ASSURANCE AND CONTROL

A. Qualifications:

1. Experience: The landscape contractor or maintenance subcontractor shall have a full-time employee assigned to the job as foreman for the duration of the contract. He/she shall have a minimum of four (4) years experience in landscape maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.
2. Labor Force: The landscape maintenance labor force shall be thoroughly familiar with, and trained in, the work to be accomplished and shall perform the task in a competent, efficient manner acceptable to the Owner and Client.

B. Requirements:

1. Supervision: The foreman shall directly supervise the work force at all times. Notify Owner and Client of all changes in supervision.
2. Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner and Client.

1.5 PROJECT/SITE CONDITIONS

- A. Site Visit: At beginning of maintenance period, visit and walk the site with the Owner's representative to clarify scope of work and understand existing project/site conditions.
- B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are healthy, thriving, damaged, dead or dying.
- C. Irrigation System: Document general condition of existing irrigation system, making sure that faulty electrical controllers, broken or inoperable sprinkler heads (or emitters) are reported.

1.6 SEQUENCING AND SCHEDULING

- A. Perform all maintenance during hours mutually agreed upon between Owner, Client and Contractor.
- B. Work force shall be present at the project site at least once a week and as often as necessary to perform specified maintenance in accordance with the approved maintenance schedule.

1.7 CONTRACTOR RESPONSIBILITIES

- A. The Contractor shall begin maintenance after any portion of the sprinkler irrigation, each plant and lawn portion is installed.
- B. Sprinkler Irrigation System: The Contractor's maintenance of the sprinkler irrigation system shall consist of monitoring and adjustment of valves, repair of leaks in both mains and lateral lines and all other work required to establish a complete working irrigation system.
- C. Trees, Shrubs, Groundcovers and Vines: The Contractor's maintenance of new planting shall consist of watering, cultivating, weeding, mulching, re-staking, tightening and repairing of guys, resetting plants to proper grades or upright position, restoration of the planting saucer, and furnishing and applying such sprays and invigorants as are necessary to keep the plantings free of insects and disease and in thriving condition.

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- D. Lawns and Meadows;
1. The Contractor's maintenance of grass areas shall consist of mowing and edging of lawn and turf areas.
 2. Work in all grass areas including meadow grasses shall include watering, weeding, repair of all erosion and reseeding and resodding as necessary to establish a uniform stand of the specified grasses.
 3. Edges of meadows shall be trimmed to keep grasses from blocking walk way edges.
- 1.8 PROTECTION: Protect planting areas and lawns at all times against damage of all kinds for duration of maintenance period. Maintenance includes temporary protection fences, barriers and signs as required for protection. If any plants become damaged or injured, because sufficient protection was not provided, treat or replace as directed by Owner at no additional cost to Owner.
- 1.9 DURATION: Work under this Section shall commence upon the date specified or noted as in the Substantial Completion Certificate or the Site Substantial Completion Certificate (if a separate certification from building or other scopes) and shall occur for a minimum of ninety (90) calendar days or until Final Acceptance by Landscape Architect, whichever is longer.
- 1.10 FINAL ACCEPTANCE: Work under this Section will be accepted by Landscape Architect upon satisfactory completion of all work, including maintenance, but exclusive of the required guaranteed sprinkler irrigation obligations, replacement of plant materials and lawns under the Warranty Period. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.
- 1.11 MAINTENANCE INSTRUCTIONS: At the completion of work, furnish three (3) copies of documented maintenance events and adjustments or changes required by specific plant or site conditions to Owner to enable the contractor and owner to incorporate those items in the maintenance program for the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials required for installed items shall match those already in use.
- B. Samples of all materials not specified under other Sections of these Specifications shall be submitted for review by Landscape Architect prior to use.

2.2 REQUIRED EQUIPMENT

- A. Contractor shall furnish the all necessary maintenance equipment.

2.3 WATER: Clean, potable and fresh, as available from Owner.

2.4 FERTILIZERS

- A. Tightly-compressed, slow-release and long-lasting complete fertilizer tablets bearing manufacturer's label of guaranteed analysis of chemicals present.
 1. Balanced, once-a-season application, controlled-release fertilizers with a blend of coated prills which supply controlled-release nitrogen, phosphorus and potassium, and uncoated, rapidly soluble prills containing nitrogen and phosphorus.

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2.5 HERBICIDES, INSECTICIDES, AND FUNGICIDES

- A. Best quality materials with original manufacturers' containers, properly labeled with guaranteed analysis.
 - 1. Use non-staining materials.

2.6 ANNUALS/PERENNIALS

- A. Nursery-grown in 4-inch, 6-inch, quart or related size pots, full, healthy plants just ready to bloom.

2.7 LAWN SOD AND TURF OR MEADOW GRASS SEED AND SEED MIXES

- A. For sod and seed replacement: Match existing materials.

2.8 REPLACEMENT TREE GUYS, STAKES, TIES AND WIRES

- A. Match originally accepted or existing materials on the site.

2.9 EQUIPMENT

- A. General: Use only the proper tool for each job. Maintain all tools in sharp, properly-functioning condition. Clean and sterilize pruning tools prior to usage.

2.10 INSECT/DISEASE PREVENTION

- A. Take all measures to prevent introduction of insect or disease-laden materials onto the site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing Work under this Section, Contractor shall examine previously installed Work from other trades and verify that such Work is complete and to the point where Work herein may commence properly. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 START OF LANDSCAPE ESTABLISHMENT AND SUBSTANTIAL COMPLETION

- A. Preliminary Review: As soon as planting is substantially completed according to the construction documents, hold a preliminary review to determine the condition of the work.
- B. Date of Review: Notify Landscape Architect at least five (5) working days prior to anticipated date of review.
- C. Beginning of the Maintenance Period: The Landscape Architect will visit the site and determine the status of substantial completion of the work.
 - 1. The date for substantial completion will be determined by the owner's representative and the landscape architect. The landscape architect will issue a written report which will state the date Preliminary Acceptance and Substantial Completion to the Contractor.
 - 2. The report may include items required for correction.

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- D. Warranty Dates and Date for the End of the Landscape Establishment Period will be noted in the substantial completion report when substantial completion is granted.

3.3 PREPARATION

A. Protection:

- 1. Protect all new planting areas from damage of all kinds from beginning of work until sufficiently established or until Final Acceptance.
- 2. Provide temporary protection fences, barriers and signs as required for protection.

B. Replacements:

- 1. Immediately treat or replace all plants which become damaged or injured as a result of Contractor's operations or negligence, as directed by Landscape Architect, at no cost to Owner.
- 2. Replacement plants shall match size, condition and variety of plants replaced.

3.4 WATERING: It shall be the responsibility of the Contractor to assure that the correct watering of plant materials is achieved by supplemental watering as required. Where there is no automatic irrigation and when ever rainfall is not providing adequate water the contractor is responsible for supplemental watering until the end of the establishment period.

- A. Provide regular and supplemental deep watering to all landscape until the plant material has become established and new growth is apparent. Deep watering shall be accomplished with hoses and sprinklers as permitted.
- B. Frequent watering to the lawn areas to insure against drying. This may be accomplished as above, by the existing automatic sprinkler system, hand watering or portable sprinklers. Contractor shall monitor settings of automatic sprinkler controls and recommend necessary adjustments according to climatic changes.
- C. Contractor shall not be responsible for watering all new planting areas beyond the end of the landscape establishment period.
- D. Contractor shall be responsible for damages to irrigation system and for repair costs caused by operation of equipment or by mowing and other maintenance operations.

3.5 WEED CONTROL

A. General:

- 1. All planting, turf, grass and meadow grass areas shall be maintained in a weed free condition throughout the landscape establishment period.
 - a. Apply pre-emergent weed control to shrub, groundcover and annual or perennial plantings at the rates specified by the manufacturer. If plant types are not within manufacturers label guidelines for safe pre-emergent application, weed by hand.
 - b. Apply selective and non-selective herbicides per manufacturers label to eliminate weeds in lawn areas.
- 2. Reference other sections of this specification for additional weed control requirements.

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3.6 MAINTENANCE OF TURF AREAS

A. Watering:

1. Water lawns at such frequency as weather conditions require, to replenish soil moisture to 6 in. below root zone. Maintain optimum water availability in the root zone without erosion or over saturation of the soil.
2. Generally, provide initial daily watering to maintain soil moisture in an optimum condition and to promote rapid germination and establishment. After root and top growth has established (approximately 2 weeks, reduce water rate to a total of 1-1/2 in. of water weekly during hot summer weather, in three (3) applications per week after turf or meadow is established.
3. Water at night if irrigation system is electrically controlled. Otherwise, watering shall be done during early mornings.

B. Weed Control:

1. Control broadleaf weeds with selective herbicides.
2. In areas where crabgrass, nut sedge or other invasive weed specie has infested the lawn, apply a selective herbicide as soon as possible, and prior to flowering as recommended by the manufacturer.
3. Apply pre-emergent herbicides such as Dacthal, Balan, or Betasan prior to invasive grassy weed germination in sodded areas.
4. Do not irrigate for 48 hours after application of herbicidal sprays or otherwise as recommended by the manufacturer.

C. Mowing and Edging:

1. Mowing lawn/grass areas shall be accomplished with sharp, properly adjusted mowers of the correct size for the various areas.
2. Mowing frequency shall be at least one time a week and more often as necessary to keep turf at a height between one and two inches as determined by the specie of turf grass installed.
3. Lawn shall be edged evenly at all walks, headers and other hard edges not less than once a week.
4. Mow meadow areas once during early spring to a height of 6 inches, otherwise mow not more than once per season and then only at the specific request of the owner. Generally mowing shall be no lower than 6 inches.

D. Until the establishment of the turf, the Contractor will be responsible for replacing soils that have eroded onto the paved areas and cleaning of same. Residual soils on paving will be removed and if not mingled with objectionable materials, may be re-used in eroded areas.

E. Immediately upon observing any lawn grass spreading into shrub or groundcover areas, the Contractor shall initiate a program of mechanical removal and maintain this program throughout the Landscape Establishment period.

F. Any lawn grass appearing in paved areas shall receive an application of non-selective herbicide according to manufacturer's direction. The herbicide shall be approved and will not be detrimental structurally to paved areas.

G. Special effort shall be given to the control of fire ants infesting the site. After control is accomplished, the ant mounds shall be lowered and tamped to the existing grade.

H. Apply slow release fertilizer (24-6-12) forty-five days after installation at 5 pounds per 1000 square feet.

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- I. Removal of debris from the site unrelated to horticultural maintenance (paper, bottles, cans, signs, etc.) shall be the responsibility of the landscape establishment Contractor and limited to areas designated. Frequency shall be one time per week during the landscape establishment period.
- J. Replacements:
 - 1. Replace dead and missing plants according to the warranty requirements.
 - 2. Damages due to Contractor's negligence shall be paid for without charge to Owner or Client.

3.7 MAINTENANCE OF TREES AND SHRUBS

- A. Contractor shall adjust and tighten as required all tree staking and guying. Removal as directed by Owner's Representative.
- B. Resetting: Reset plants to proper grades and upright position by excavating the edge of the plant pit and repositioning the plant to grade. Install backfill and properly compact.
 - 1. Do not use stake guys to straighten trees. Replant to plumb.
- C. Contractor shall deep water all new trees until there are definite signs the trees have established themselves and are pushing out new growth.
- D. Temporary Tree Watering basins shall be removed by Contractor at 60 days from time of planting.
- E. Contractor shall be continuously alert for signs of insect and pest presence or damage or the presence or damage from plant fungi or disease.
 - 1. Disease and pest control shall be the responsibility of the installing contractor until the end of the Landscape Establishment Period. The contractor shall take corrective action within 24 hours of finding the problem or of being notified that there is a pest or disease problem.
 - 2. Upon locating such disease or pest damage, the Contractor shall report it to the Owner's representative and advise of the course of action the contractor will take to eliminate the problem
- F. Weed Control:
 - 1. All areas between plants, including watering basins, shall be weed free at all times.
 - 2. Use only recommended and legally approved herbicides to control weed growth.
 - 3. Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.
- G. Pruning:
 - 1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of 18 in. to 48 in. and radial orientation so as not to overlay one another.
 - 2. Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Reduce toppling and wind damage by thinning out crowns.
 - 3. Prune trees to maintain growth within space limitations, maintaining a natural appearance and balancing crown with roots.
 - 4. No stripping of lower branches ("raising up") of young trees will be permitted.

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5. Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.
6. Thin out and shape evergreen trees when necessary to prevent wind and storm damage. Do primary pruning of deciduous trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
7. Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
8. Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1 in. in diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.
9. Branches too heavy to handle shall be precut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18 in. or more from the trunk to remove the branch. Make the third cut at the trunk to remove the resulting stub.
10. Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.

H. Staking and Guying of Trees:

1. Inspect stakes and guys at least once a month to check for rubbing that causes bark wounds.
2. Repair and replace staking and guying as shown and as specified.

I. Replacements:

1. Replace dead and missing plants according to the warranty requirements.
2. Damages due to Contractor's negligence shall be paid for without charge to Owner or Client.

3.8 MAINTENANCE OF EXISTING PLANTINGS TO REMAIN

1. General: Conform to all applicable paragraphs regarding pruning, watering, spraying and fertilizing of new plant materials as specified in this section.
2. Symptoms: Be alert to symptoms of construction damage to existing plantings as evidenced by wilting, unseasonal or early flowering or loss of leaves, and insect or disease infestation due to declining vigor.
3. Notification: Submit in writing of evidences of declining vigor immediately upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified in this section.
4. Proposal: Submit written proposal and cost estimate for the correction of all conditions before proceeding with permanent correction work.

3.9 MAINTENANCE OF ANNUALS AND PERENNIALS

A. Watering:

1. Hand-water all pre-cast pots and planters without an automatic irrigation system.
2. Species, sizes of plants, container sizes and orientation shall dictate frequency of watering. Submit to Owner a watering schedule for different seasonal requirements.

B. Weed Control: All planters with annuals and perennials shall be weed-free at all times.

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- C. Pruning:
 - 1. Limit pruning to removal of damaged or dead twigs and foliage.
 - 2. Remove spent flowers on a weekly basis.

- D. Replacements of Annuals:
 - 1. Replace annuals when materials exhibit a "spent" condition.
 - 2. Thoroughly cultivate soil after removal of "spent" or "dead" plants prior to planting new materials.

- E. Fertilization: Incorporate slow release fertilizers per manufacturer's current specifications, and rake smooth.

- F. Replacements:
 - 1. Replace dead and missing plants according to the warranty requirements.
 - 2. Damages due to Contractor's negligence shall be paid for without charge to Owner or Client.

- G. Allow for 1 replacement of all annuals during or immediately after the establishment period at no added cost to the owner.

3.10 MAINTENANCE OF GROUNDCOVERS

- A. Watering:
 - 1. Check for moisture penetration throughout the root zone at least twice a month.
 - 2. Water as frequently as necessary to maintain healthy growth of groundcovers.

- B. Weed Control:
 - 1. All groundcovers shall be maintained in a weed free condition.
 - 2. Control weeds, preferably with pre-emergent herbicides and with selective systemic herbicides.
 - 3. Minimize hoeing of weeds in order to avoid plant damage.

- C. Fertilization:
 - 1. Recently installed plant materials: Verify with Owner actual completion date of planting installation and rate of prior application of fertilizers.
 - 2. Install slow release 21-6-12 fertilizer except where high phosphorous has been found through soil testing use 21-0-0 ammonium sulfate. Apply at 5 pounds per 1000 square feet.

- D. Mowing and Edging:
 - 1. Edge groundcovers to keep in bounds. Trim top growth as necessary to achieve an overall even appearance.

- E. Replacements:
 - 1. Replace dead and missing plants according to the warranty requirements.
 - 2. Damages due to Contractor's negligence shall be paid for without charge to Owner or Client.

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3.11 INSECTS, PESTS, AND DISEASE CONTROL

- A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:
 - 1. Presence of insects, moles, gophers, ground squirrels, snails and slugs in planting areas.
 - 2. Discolored or blotching leaves or needles.
 - 3. Unusually light green or yellowish green color inconsistent with normal green color of leaves.
- B. Personnel: Only licensed, qualified, trained personnel shall perform required operations for insect, pest and disease control
- C. Application: Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.
- D. Should animal control be required, perform such work in accordance with State, Local and Federal Guidelines as applicable.

3.12 MAINTENANCE OF IRRIGATION SYSTEM

- A. General:
 - 1. Repair without additional charge to Owner all damages to system caused by Contractor's operations. Perform all repairs within one (1) watering period.
 - 2. Report promptly to Owner all accidental damage not resulting from Contractor's negligence or operations.
 - 3. Do not run the irrigation system during rainy season. Set and program automatic controllers for seasonal water requirements.
 - 4. Twice a month, use a probe or other acceptable tool to check the rootball moisture of representative plants as well as the surrounding soil.
- B. Cleaning and Monitoring the System:
 - 1. Continually monitor the irrigation systems to verify that they are functioning properly as designed. Make program adjustments required by changing field conditions.
 - 2. Clean pump filter and strainer at least once a year and as often as necessary to keep the irrigation systems free of sand and other debris.
 - 3. Prevent spraying on windows, building walls, (game courts) by balancing the throttle control on the remote-control valves and the adjustment screws on the sprinkler heads. Do not allow water to atomize and drift.
- C. Winterization: The irrigation system is designed to be completely drained to protect pipe from bursting prior to freezing temperatures. To adequately drain the system, the following procedure must be followed:
 - 1. Air blow-out
 - a. Set automatic control stations to 2-1/2 minutes timing.
 - b. Attach hose from portable air compressor to 1 in. air inlet installed on main line at backflow preventer.
 - c. Operate compressor at 100 cu. ft. per second at 60-80 PSI.
 - 2. Manual drain valves: Open manual drain valves located at low points on the main line to drain main completely after air blow-out has been completed.

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3. Backflow Preventer: Rotate backflow unit at unions and open pet cocks and drain. Reverse operation and tighten unions to resume irrigation.

3.13 MAINTENANCE OF AGGREGATE SURFACING (if any)

A. Decomposed Granite:

1. Maintain decomposed granite in a level and uniform surface removing any rutting caused by water movement or pedestrian/vehicular movements.
2. Redistribute surface so that larger particles are equally distributed over surface and not bunched to edges or corners.
3. Remove any materials (soils, rocks, vegetation etc.) not part of approved and applied decomposed granite surface.
4. Reapply binder agent if areas become too soft or movement occurs greater than 1/2" depth from surface elevation. Refer to Section 32 15 00 "Aggregate Surfacing" for product and application.

B. Gravel Aggregates:

1. Maintain small gravels in a level and uniform surface removing any rutting caused by vehicular and or pedestrian circulation and movements.
2. Remove any materials (soils, rocks, vegetation etc.) not part of approved and applied decomposed granite surface.

C. Cobble, River Rock or Large Aggregates:

1. Maintain small gravels in a level and uniform surface removing any rutting caused by vehicular and or pedestrian circulations and movements.
2. Remove any materials (soils, rocks, vegetation etc.) not part of approved and applied decomposed granite surface

3.14 TERMINATION OF THE MAINTENANCE PERIOD

A. Final Acceptance Procedure:

1. Work will be accepted by the Landscape Architect upon satisfactory completion of all work, including the landscape establishment period, but exclusive of replacement of materials under the Warranty Period.
2. Submit a written request to Landscape Architect for review for Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.

B. Corrective Work:

1. Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
2. Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner or Client.
3. After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.

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4. Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and accepted.

C. Conditions for Acceptance of Work at End of Maintenance Period:

1. Each plant shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
2. Replace all plants not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such plants and planted areas.

D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

3.15 CLEANING

- A. Dispose of all pruned materials, vacuum all lawn clippings and leaves, sweep all walkways and rake smooth all mulched areas.
- B. Remove from the site all containers and evidence of maintenance activities.

3.16 CLOSE OUT

- A. Landscape Maintenance Record: Submit binder to Owner with all documentation and records required and utilized during the maintenance period.
- B. Keys and Identification: Return all keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION

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SECTION 334200

STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Channel drainage systems.
3. Encasement for piping.
4. Manholes.
5. Cleanouts.
6. Nonpressure transition couplings.
7. Expansion joints.
8. Catch basins.
9. Stormwater inlets.
10. Pipe outlets.

1.2 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

1.3 INFORMATIONAL SUBMITTALS

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

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

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

D. Field quality-control reports.

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1.4 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

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

- A. Pipe and Fittings:
1. Marked with CISPI collective trademark and NSF certification mark.
 2. Class: ASTM A 74, Service and Extra Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.2 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings:
1. Marked with CISPI collective trademark and NSF certification mark.
 2. Standard: ASTM A 888 or CISPI 301.
- B. Heavy-Duty, Shielded Couplings:
1. Description: Stainless-steel shield; stainless-steel bands and tightening devices; and rubber sleeve with integral, center pipe stop.
 2. Standards:
 - a. ASTM C 1277 and ASTM C 1540 for couplings.
 - b. ASTM C564 for rubber gaskets.

2.3 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

- A. Pipe: ASTM A 716, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

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2.4 PE PIPE AND FITTINGS

- A. Corrugated PE Drainage Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.
 - 2. Soiltight Couplings: AASHTO M 252M, corrugated, matching tube and fittings.
- B. Corrugated PE Pipe and Fittings NPS 12 to NPS 60: AASHTO M 294M, Type S, with smooth waterway for coupling joints.
 - 1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.
 - 2. Soiltight Couplings: AASHTO M 294M, corrugated, matching pipe and fittings.

2.5 PVC PIPE AND FITTINGS

- A. PVC Corrugated Sewer Piping:
 - 1. Pipe: ASTM F 949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
 - 2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
 - 3. Gaskets: ASTM F 477, elastomeric seals.
- B. Adhesive Primer: ASTM F 656.
- C. Solvent Cement: ASTM D 2564.

2.6 CONCRETE PIPE AND FITTINGS

- A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14, Class 1, with bell-and-spigot ends and [gasketed joints with ASTM C 443, rubber gaskets.
- B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.
 - 1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C 443, rubber gaskets
 - 2. Class II, Wall A
 - 3. Class III, Wall A
 - 4. Class IV, Wall A
 - 5. Class V, Wall B

2.7 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
 - 1. For Concrete Pipes: ASTM C 443, rubber.
 - 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.

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3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded, Flexible Couplings:

1. Description: Elastomeric sleeve with corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

1. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.8 EXPANSION JOINTS

A. Ductile-Iron Flexible Expansion Joints:

1. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated.

2.9 CLEANOUTS

A. Cast-Iron Cleanouts:

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

B. PVC Cleanouts:

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

2.10 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density polyethylene film of high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.

C. Form: Sheet.

D. Color: Black.

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2.11 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.12 CONCRETE

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

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

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

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

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

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1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 1 percent through manhole.
 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 4 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

2.13 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

- A. Narrow, Sloped-Invert, Polymer-Concrete Channel Drainage Systems
1. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 2. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated.
 - b. Include extension sections necessary for required depth.
 - c. Dimensions: 4-inch inside width. Include number of units required to form total lengths indicated.
 - d. Frame: Gray-iron or galvanized steel for grates.
 3. Grates: Manufacturer's designation "medium duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: Ductile iron
 - 1) Locking Mechanism: Not required.
 4. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 5. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 6. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- B. Narrow, Level-Invert, Polymer-Concrete Channel Drainage Systems:
1. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 2. Channel Sections: Narrow, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include rounded bottom, with level invert and with NPS 4 outlets in number and locations indicated.

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- b. Dimensions: 5-inch inside width and 9-3/4 inches deep. Include number of units required to form total lengths indicated.
 - 1) Frame: Gray-iron or galvanized steel for grates.
 - 3. Grates: Manufacturer's designation "medium duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: Ductile iron
 - b. Locking Mechanism: Not required.
 - 4. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - 5. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - 6. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- C. Wide, Level-Invert, Polymer-Concrete Channel Drainage Systems:
- 1. Description: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.
 - 2. Channel Sections: Wide, interlocking-joint, precast, polymer-concrete modular units with end caps.
 - a. Include flat or rounded bottom, with level invert and with outlets in number, sizes, and locations indicated.
 - b. Dimensions: 8-inch inside width and 13-3/4 inches deep. Include number of units required to form total lengths indicated.
 - 1) Frame: Not required.
 - 3. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.
 - a. Material: Ductile iron
 - b. Locking Mechanism: Not required.
 - 4. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
 - 5. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
 - 6. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.
- D. Drainage Specialties: Precast, polymer-concrete units.
- 1. Large Catch Basins:
 - a. 24-by-12-inch polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. Gray-iron slotted grate.
 - c. Frame: Include gray-iron or steel frame for grate.
 - 2. Small Catch Basins:

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- a. 19- to 24-inch by approximately 6-inch polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. Gray-iron slotted grate.
 - c. Frame: Include gray-iron or steel frame for grate.
3. Oil Interceptors:
- a. Polymer-concrete body with interior baffle and four steel support channels and two 1/4-inch- thick, steel-plate covers.
 - b. Steel-plate covers.
 - c. Capacity: 140 gal.
 - d. Inlet and Outlet: NPS 4
4. Sediment Interceptors:
- a. 27-inch-square, polymer-concrete body, with outlets in quantities and sizes indicated.
 - b. 24-inch- square, gray-iron frame and slotted grate.
- E. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
- F. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.14 CATCH BASINS

- A. Standard Precast Concrete Catch Basins:
1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
 2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
 3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
 6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
 8. Steps: Individual FRP steps or FRP ladder wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
 9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
1. Size: 24 by 24 inches minimum unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

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- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.
 - 1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.15 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, according to utility standards.

2.16 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-3, screen opening 2 inches.
 - 2. Average Size: NSSGA No. R-4, screen opening 3 inches.
 - 3. Average Size: NSSGA No. R-5, screen opening 5 inches.
- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

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

3.2 PIPING INSTALLATION

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

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- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
 - 3. Install piping with 36-inch minimum cover.
 - 4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
 - 6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 7. Install PE corrugated sewer piping according to ASTM D 2321.
 - 8. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
 - 9. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
 - 10. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
 - 1. Hub-and-spigot, cast-iron soil pipe and fittings.
 - 2. Hubless cast-iron soil pipe and fittings.
 - 3. Ductile-iron pipe and fittings.
 - 4. Expansion joints.

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
 - 1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
 - 2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
 - 3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
 - 4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
 - 5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
 - 6. Join corrugated PE piping according to ASTM D 3212 for push-on joints.

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7. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
8. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
9. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
10. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
 3. Use Heavy-Duty, top-loading classification cleanouts in vehicle-traffic service areas.
 4. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

- A. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET AND OUTLET INSTALLATION

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

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3.8 CONCRETE PLACEMENT

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

3.9 CHANNEL DRAINAGE SYSTEM INSTALLATION

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

3.10 CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."
- B. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
 - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

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- C. Pipe couplings and expansion joints with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded flexible couplings for same or minor difference OD pipes.
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

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- a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to ASTM C 924.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION