



PROJECT MANUAL

SUPPLEMENTARY SPECIFICATIONS AND BID DOCUMENTS

Project: **MARTIN LUTHER KING (MLK)
SPLASH PAD AND OTHER IMPROVEMENTS**

Owner: City of Trenton
City Hall
319 East State Street
Trenton, New Jersey 08608

Engineer: French & Parrello Associates, PA
1800 Route 34, Suite 101
Wall, New Jersey 07719

Andrew L. French, PE
Professional Engineer
License No. GE42894

Andrew L. French, PE
License No. GE42894

BIDDER

ADDRESS

PHONE

FAX

City of Trenton
City Hall, 319 East State Street, Trenton, New Jersey 08608

RE-ADVERTISEMENT

INVITATION TO BID

FOR

**CONSTRUCTION OF MARTIN LUTHER KING (MLK) PARKING LOT,
SPLASH PAD AND RESTROOM FACILITY
LOCATED AT
347 BRUNSWICK AVENUE
TRENTON, NJ
FOR A PERIOD OF ONE (1) YEAR
FOR THE**

**CITY OF TRENTON
DEPARTMENT OF RECREATION, NATURAL RESOURCES AND CULTURE**

TO BE RECEIVED ON



DECEMBER 15, 2023, AT 11:00A.M.

BID2023-63

DIVISION OF PURCHASING

**CHECKLIST
(REQUIRED WITH BID SUBMITTAL)**

- ☒ Bid Guarantee (Bid Bond or Certified/Cashier's Check) (**with POA for full amount of Bid Bond**) (**MANDATORY**) **Failure to Submit with Bid Submittal is an automatic fatal defect**
- ☒ Consent of Surety (Certificate from Surety Company) (**MANDATORY**)
- ☒ Performance Bond and Labor and Material Payment Bond (**Required from the Awarded Contractor**)
- ☒ Notice of Intent to Subcontract – (electrician, plumbing and mechanical) (**MANDATORY**) **Failure to Submit with Bid Submittal is an automatic fatal defect**

- ☒ Disclosure of Ownership Statement (**MANDATORY**)
- ☒ Disclosure of Invested Activities in Iran (**Required prior to award of the contract**)
- ☒ Acknowledgement of Receipt of Addenda (**MANDATORY**)

- ☒ License(s) and or Certification(s) from Contractor and Sub-Contractors Required for the Project
- ☒ Required Evidence EEO/Affirmative Action Regulations Questionnaire
- ☒ Non-Collusion Affidavit
- ☒ Americans with Disabilities Act of 1990 Language
- ☒ NJ Business Registration Certificate (**prior to award**)
- ☒ NJ Business Registration Certificate – Designated Subcontractor(s) (**prior to award**)
- ☒ NJ Public Works Contractor Registration Certificate from Contractor (**Prior to Award, but effective at the time of bid opening**)
- ☒ NJ Public Works Contractor Certificate for Sub-Contractors for (**prior to award, but effective at time of bid opening**)

- ☒ Affirmative Action Statement
- ☒ Prevailing Wage Statement
- ☒ Equipment Certification
- ☒ Bid Proposal Form
- ☒ One Original Complete Bid and One Complete Copy of the Bid
- ☒ Bid **must** be placed in a sealed envelope bearing name of bidder, address and **Bid 2023-63**
- ☒ Provide five (5) References.

Proposer Name: _____ Date: _____

Authorized Representative: _____

Signature: _____

Print Name & Title: _____

**CITY OF TRENTON
NOTICE TO BIDDERS
RE-ADVERTISEMENT
BID2023-63**

PURSUANT TO LFN2020-10 that sealed bids will be received by Isabel C. Garcia, QPA, Purchasing Agent, for the City of Trenton, County of Mercer, State of New Jersey on **DECEMBER 15, 2023, at 11:00** A.M. prevailing time in the Division of Purchasing, 1st. Floor, City Hall Annex, 319 East State Street, Trenton, New Jersey, for

CONSTRUCTION OF MKL PARKING LOT, SPLASH PAD AND RESTROOM FACILITY
FOR THE DEPARTMENT OF RECREATION, NATURAL RESOURCES AND CULTURE

PRE-BID MEETING IS SCHEDULED FOR **NOVEMBER 6, 2023, AT 11:00AM** LOCATED AT 347 BRUNSWICK AVENUE, TRENTON, NJ. INTERESTED PROPOSERS **MUST** RSVP WITH RANDY BAUM AT (609)-213-3478.

PROPOSERS MUST DOWNLOAD THE SPECIFICATIONS FROM THE FOLLOWING LINK:

<https://form.jotform.com/230724942697163>

BIDDER SHALL LOG ON TO A VIRTUAL BID OPENING ON DECEMBER 15, 2023, AT 11:00AM TO:

<https://www.zoomgov.com/j/1614268962?pwd=ZW44eitzdnZ4UUtUUFh6MWtNeFB6UT09>

Specifications and other bid information may be obtained at the Office of Purchasing, 1st Floor, City Hall Annex, 319 East State Street, Trenton, NJ 08608 during regular business hours (8:30 am - 4:30 pm). and on the City's Website at <https://nj-trenton.civicplus.com/list.aspx>

Proposers shall visit the City of Trenton's website at <https://nj-trenton.civicplus.com/list.aspx> for any addenda/notices issued prior to the bid opening. Failure to do so shall result in rejection of your submission.

Proposers are required to comply with the requirements of P.L. 1975, c127(N.J.A.C.17:27 et seq).

SCHEDULE

RELEASE DATE:	October 20, 2023
PRE-BID MEETING:	November 6, 2023, 2023, at 11:00am On Site
QUESTIONS BY:	November 17, 2023
ADDENDA DATE:	December 4, 2023
BID OPENING:	December 15, 2023, at 11:00AM
PROJECT COMPLETION:	240 CALENDAR DAYS FROM "NOTICE TO PROCEED"
LIQUIDATED DAMAGES:	\$500.00 PER DAY

City of Trenton (609)-989-3139
Isabel C. Garcia, QPA

PRE-BID MEETING IS SCHEDULED FOR NOVEMBER 6, 2023, AT 10:00AM LOCATED AT 347 BRUNSWICK AVENUE, TRENTON, NJ. INTERESTED PROPOSERS MUST RSVP WITH RANDY BAUM AT (609)-213-3478.

QUESTIONS

Questions **must** be submitted in writing to igarcia@trentonnj.org. Deadline date for questions is **NOVEMBER 17, 2023**. The city is not obligated to answer questions past the deadline date.

ACKNOWLEDGEMENT OF ADDENDA – DECEMBER 4, 2023

If changes are made to the Request for Proposal, an Addendum will be advertised in the Trenton Times and on the City's Website at <https://nj-trenton.civicplus.com/list.aspx>

Proposers shall visit the City of Trenton's website at for any addenda/notices issued prior to the request for bid opening at <https://nj-trenton.civicplus.com/list.aspx>

BID SUBMITTAL INSTRUCTIONS

Provide one (1) full original bid (**with original signature**), labeled "**Original**," and two (2) identical additional copy of the full bid package in a sealed envelope. Bid **must** be clearly identified on the outside of the sealed envelope with the firm's name, **BID2023-63**, and "**RE-ADVERTISEMENT - CONSTRUCTION OF MKL PARKING LOT, SPLASH PAD AND RESTROOM FACILITY FOR THE DEPARTMENT OF RECREATION, NATURAL RESOURCES AND CULTURE**".

Sealed bids **must** be submitted to Ms. Isabel Garcia, QPA, Purchasing Agent, City of Trenton, City Hall, 319 East State Street, Trenton, Division of Purchasing, 1st floor NJ 08608 on or before **December 15, 2023, AT 11:00AM**. The City of Trenton will not assume responsibility for any bids received after the required due date.

Bidders are required to complete, sign (**original signature**), date, and notarize (**as required**) all forms in the Request for Bid.

N.J.A.S.40A:11-13 (e)

Any prospective bidder who wishes to challenge a bid specification/scope of services shall file such challenges in writing with the contracting agent no less than three business days prior to the opening of the bids. Challenges filed after that time shall be considered void and having no impact on the contracting unit or the award of a contract.

CITY OF TRENTON

ACKNOWLEDGMENT OF RECEIPT OF ADDENDA
MANDATORY

THIS FORM MUST BE COMPLETED AND SUBMITTED WITH YOUR BID

The undersigned Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number

Dated

_____ (ICG)

Acknowledged for: _____
(Name of Bidder)

By: _____
(Signature of Authorized Representative)

Name: _____

Title: _____

CITY OF TRENTON RESIDENT EMPLOYMENT POLICY

In order for the City of Trenton to keep an accurate reporting of community involvement and support in local development projects, the following is required by City of Trenton Ordinance 14-43 to be completed by each Contractor and Sub-Contractor.

NAME OF BUSINESS _____

CONTACT PERSON _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

TELEPHONE _____ FAX _____ E-MAIL _____

1. Number of Trenton residents hired as well as the number of Trenton residents currently employed on this project _____
2. The number of training positions, if any, and the amount of positions that will be filled by Trenton residents. _____

3. The necessary level of job skills required of Trenton residents to plan and implement the work to be done on the job. _____

4. Please describe all "good faith" efforts to hire Trenton residents (e.g. copies of hiring ads, list of residents who applied for positions, letters informing community groups of job opportunities) _____

CITY OF TRENTON

ETHICS COMPLAINT DISCLOSURE

I affirm that neither I nor other members of my firm have any prior or pending ethic complaints.

SIGNATURE

DATE

OR

I am disclosing the following prior or pending ethic complaints against me or my firm

Listing:

SIGNATURE

DATE

THIS STATEMENT MUST BE INCLUDED WITH THE REPOSENSE TO THE REQUEST FOR BID SOLICITATION

Subscribed and sworn before me
this ____ day of _____, 20__ (Affiant)

(Notary Public)

(Print Name & Title
Affiant)

My Commission expires: (Corporate Seal)



REGISTER TO DO BUSINESS WITH THE CITY OF TRENTON

An e-notification and/or text message will be sent to all vendors currently registered with the City of Trenton, directing them to bidding opportunities, notices, postponements, bid results, awarded contract information and addendums on the City of Trenton Division of Purchasing website.

REGISTER AT:

<https://nj-trenton.civicplus.com/list.aspx>

SUBSCRIBE & UNSUBSCRIBE

1. You can SUBSCRIBE or UNSUBSCRIBE to any of the E-Mailing Lists displayed below.
2. Type your email address in the box and select Sign In.
3. If you want to receive text messages enter your phone number and select Save.
4. To subscribe or unsubscribe click  and/or  next to the lists to which you wish to subscribe/unsubscribe.
5. Please remember to set your spam blocker to allow mail from listserv@civicplus.com.

Contract Language for BRC Compliance

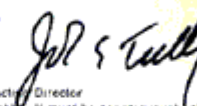
Goods and Services Contracts (including purchase orders)


** Construction Contracts (including public works related purchase orders)*

N.J.S.A. 52:32-44 imposes the following requirements on contractors and all subcontractors that **knowingly** provide goods or perform services for a contractor fulfilling this contract:

- 1) the contractor shall provide written notice to its subcontractors and suppliers to submit proof of business registration to the contractor;
- 2) subcontractors through all tiers of a project must provide written notice to their subcontractors and suppliers to submit proof of business registration and subcontractors shall collect such proofs of business registration and maintain them on file;
- 3) prior to receipt of final payment from a contracting agency, a contractor must submit to the contracting agency an accurate list of all subcontractors and suppliers* or attest that none was used; and,
- 4) during the term of this contract, the contractor and its affiliates shall collect and remit, and shall notify all subcontractors and their affiliates that they must collect and remit to the Director, New Jersey Division of Taxation, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sales of tangible personal property delivered into this State.

A contractor, subcontractor or supplier who fails to provide proof of business registration Or provides false business registration information shall be liable to a penalty of \$25 for each day of violation, not to exceed \$50,000 for each business registration not properly provided or maintained under a contract with a contracting agency. Information on the law and its requirements is available by calling (609) 292-9292.

STATE OF NEW JERSEY BUSINESS REGISTRATION CERTIFICATE FOR STATE AGENCY AND CASINO SERVICE CONTRACTORS		DEPARTMENT OF TREASURY DIVISION OF REVENUE PO BOX 252 TRENTON, N.J. 08646-0252
TAXPAYER NAME: TAX REGISTRATION TEST ACCOUNT	TRADE NAME: CLIENT REGISTRATION	
TAXPAYER IDENTIFICATION#: 970-097-382/500	SEQUENCE NUMBER: 0107330	
ADDRESS: 847 ROEBLING AVE TRENTON NJ 08611	ISSUANCE DATE: 07/14/04	
EFFECTIVE DATE: 01/01/01	 John S. Tully Acting Director	
FORM-BRC(08-01)	This Certificate is NOT assignable or transferable. It must be conspicuously displayed at above address.	

 STATE OF NEW JERSEY BUSINESS REGISTRATION CERTIFICATE	
Taxpayer Name:	TAX REG TEST ACCOUNT
Trade Name:	
Address:	847 ROEBLING AVE TRENTON, NJ 08611
Certificate Number:	1093907
Date of Issuance:	October 14, 2004
For Office Use Only:	
20041014112823533	

INSTRUCTIONS TO BIDDERS

I. SUBMISSION OF BIDS

A. City of Trenton, Mercer County, New Jersey (hereinafter referred to as "OWNER") invites sealed bids pursuant to the Notice to Bidders.

B. Sealed bids will be received by the designated representative at the time and place stated in the Notice to Bidders, and at such time and place will be publicly opened and read aloud.

C. The bid proposal form shall be submitted, in a sealed envelope: (1) addressed to the OWNER as follows: City of Trenton, Division of Purchasing, City Hall Annex, First Floor, 319 East State Street, Trenton, NJ 08608 (2) bearing the name and address of the bidder written on the face of the envelope, and (3) clearly marked "BID" with the contract title and/or bid # being bid.

D. It is the bidder's responsibility to see that bids are presented to the OWNER on the hour and at the place designated. Bids may be hand delivered or mailed; however, the OWNER disclaims any responsibility for bids forwarded by regular or overnight mail. If the bid is sent by overnight mail, the designation in section C, above, must also appear on the outside of the delivery company envelope. Bids received after the designated time and date will be returned unopened.

E. Sealed bids forwarded to the OWNER before the time of opening of bids may be withdrawn upon written application of the bidder who shall be required to produce evidence showing that the individual is or represents the principal or principals involved in the bid. Once bids have been opened, they must remain firm for a period of sixty (60) calendar days.

F. All prices and amounts must be written in ink or preferably typewritten. Bids containing any conditions, omissions, unexplained erasures or alterations, items not called for in the bid proposal form, attachment of additive information not required by the specifications, or irregularities of any kind, may be rejected by the OWNER. Any changes, white-outs, strikeouts, etc. on the proposal page must be initialed in ink by the person responsible for signing the bid.

G. Each bid proposal form must give the full business address of the bidder and be signed by an authorized representative. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing. Bids by corporations must be signed in the legal name of the corporation, followed by the name of the State in which incorporated and must contain the signature and designation of the president, secretary or other person authorized to bind the corporation in the matter. When requested, satisfactory evidence of the authority of the officer signing shall be furnished.

H. Bidders must insert prices for furnishing all of the materials and/or labor required by these specifications. Prices shall be net, including any charges for packing, crating, containers, etc. All transportation charges shall be fully prepaid by the contractor F.O.B. destination and placement at locations specified by the OWNER. As specified, placement may require inside deliveries. No additional charges will be allowed for any transportation costs resulting from partial shipments made at the contractor's convenience.

I. The vendor shall guarantee any or all materials and services supplied under these specifications. Defective or inferior items shall be replaced at the expense of the

vendor. In case of rejected materials, the vendor will be responsible for return freight charges.

II. BID SECURITY

The following provisions if indicated by an (X), shall be applicable to this bid and be made a part of the bidding documents:

☒ **A. BID GUARANTEE (REQUIRED WITH BID SUBMITTAL)**

Bidder shall submit with the bid a certified check, cashier's check or bid bond in the amount of ten percent (10%) of the total price bid, but not in excess of \$20,000, payable unconditionally to the OWNER. When submitting a Bid Bond, it shall contain Power of Attorney for full amount of Bid Bond from a surety company authorized to do business in the State of New Jersey and acceptable to the OWNER. The check or bond of the unsuccessful bidder(s) shall be returned as prescribed by law. The check or bond of the bidder to whom the contract is awarded shall be retained until a contract is executed and the required performance bond or other security is submitted. The check or bond of the successful bidder shall be forfeited if the bidder fails to enter into a contract pursuant to N.J.S.A. 40A:11-21. Failure to submit this shall be cause for rejection of the bid.

☒ **B. CONSENT OF SURETY (REQUIRED WITH BID SUBMITTAL)**

Bidder shall submit with the bid a Certificate (Consent of Surety) with Power of Attorney for full amount of bid price from a Surety Company authorized to do business in the State of New Jersey and acceptable to the OWNER stating that it will provide said bidder with a Performance Bond in the full amount of the bid. This certificate shall be obtained in order to confirm that the bidder to whom the contract is awarded will furnish Performance and Payment Bonds from an acceptable surety company on behalf of said bidder, any or all subcontractors or by each respective subcontractor or by any combination thereof which results in performance security equal to the total amount of the contract, pursuant to N.J.S.A. 40A:11-22.

Failure to submit this shall be cause for rejection of the bid.

☒ **C. PERFORMANCE BOND (REQUIRED FROM AWARDED CONTRACTOR)**

Successful bidder shall simultaneously with the delivery of the executed contract, submit an executed bond in the amount of one hundred percent (100%) of the acceptable bid as security for the faithful performance of this contract.

Failure to deliver this with the executed contract shall be cause for declaring the contract null and void.

☒ **D. LABOR AND MATERIAL (PAYMENT) BOND (REQUIRED WITH CONTRACTS))**

Successful bidder shall with the delivery of the performance bond submit an executed payment bond to guarantee payment to laborers and suppliers for the labor and material used in the work performed under the contract.

Failure to deliver this with the performance bond shall be cause for declaring the contract null and void.

☒ **E. MAINTENANCE BOND (REQUIRED)**

Successful bidder shall upon acceptance of the work submit a maintenance bond in the amount of 100% guaranteeing against defective quality of work or materials for the period of:

_____ 1 year
 X 2 years

The performance bond provided shall not be released until final acceptance of the whole work and then only if any liens or claims have been satisfied and any maintenance bonds required have been executed and approved by the OWNER.

The surety on such bond or bonds shall be a duly authorized surety company authorized to do business in the State of New Jersey N.J.S.A. 17:31-5.

III. INTERPRETATION AND ADDENDA

A. The bidder understands and agrees that its bid is submitted on the basis of the specifications prepared by the OWNER. The bidder accepts the obligation to become familiar with these specifications.

B. Bidders are expected to examine the specifications and related documents with care and observe all their requirements. Ambiguities, errors or omissions noted by bidders should be promptly reported in writing to the appropriate official. In the event the bidder fails to notify the OWNER of such ambiguities, errors or omissions, the bidder shall be bound by the bid.

C. No oral interpretation of the meaning of the specifications will be made to any bidder. Every request for an interpretation shall be in writing, addressed to the OWNER'S representative stipulated in the bid. In order to be given consideration and timely issuance of addenda, if any, for all bids other than construction and municipal solid waste collection and disposal service, written requests for interpretation must be received at least seven (7) days prior to the date fixed for the opening of the bids Saturdays, Sundays, and holidays excepted; and for construction work bids, written requests for interpretation must be received at least nine (9) days, Saturdays, Sundays and holidays excepted prior to the date fixed for the opening of the bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications, and will be distributed to all prospective bidders, in accordance with N.J.S.A. 40A:11-23. All addenda so issued shall become part of the contract documents, and shall be acknowledged by the bidder in the bid. The OWNER'S interpretations or corrections thereof shall be final.

D. DISCREPANCIES IN BIDS

1. If the amount shown in words and its equivalent in figures do not agree, the written words shall be binding. Ditto marks are not considered writing or printing and shall not be used.
2. In the event that there is a discrepancy between the unit prices and the extended totals, the unit prices shall prevail. In the event there is an error of the summation of the extended totals, the computation by the OWNER of the extended totals shall govern.

IV. BRAND NAMES, PATENTS AND STANDARDS OF QUALITY

A. Brand names and/or descriptions used in this bid are to acquaint bidders with the type of commodity desired and will be used as a standard by which alternate or competitive materials offered will be judged. Competitive items must be equal to the standard described and be of the same quality of work. Variations between materials described and the materials offered are to be fully identified and described by the bidder on a separate sheet and submitted with the bid proposal form. Vendor's literature WILL NOT suffice in explaining exceptions to these specifications. In the absence of any changes by the bidder, it will be presumed and required that materials as described in the proposal be delivered.

B. It is the responsibility of the bidder to demonstrate the equivalency of item(s) offered. The OWNER reserves the right to evaluate the equivalency of an item(s) which, in its deliberations, meets its requirements.

C. In submitting its bid, the bidder certifies that the merchandise to be furnished will not infringe upon any valid patent or trademark and that the successful bidder shall, at its own expense, defend any and all actions or suits charging such infringement, and will save the OWNER harmless from any damages resulting from such infringement.

D. Wherever practical and economical to the OWNER, it is desired that recycled or recyclable products be provided. Please indicate when recycled products are being offered.

V. INSURANCE AND INDEMNIFICATION

A. Insurance Requirements

1. Worker's Compensation and Employer's Liability Insurance

This insurance shall be maintained in force during the life of this contract by the bidder covering all employees engaged in performance of this contract in accordance with the applicable statute. Minimum Employer's Liability \$500,000.

2. GENERAL LIABILITY INSURANCE

This insurance shall have limits of not less than \$1,000,000 combined single limit and \$2,000,000 aggregate and shall be maintained in force during the life of this contract by the bidder.

3. AUTOMOBILE LIABILITY INSURANCE

This insurance covering bidder for claims arising from owned, hired and non-owned vehicles with limits of not less than \$1,000,000. Limit shall be maintained in force during the life of this contract by the bidder.

B. CERTIFICATES OF THE REQUIRED INSURANCE

Certificates as listed above shall be submitted along with the contract as evidence covering Comprehensive General Liability, Comprehensive Automobile Liability, and where applicable, necessary Worker's Compensation and Employer's Liability Insurance. Such coverage shall be with acceptable insurance companies operating on an admitted basis in the State of New Jersey and shall name the OWNER as an additional insured.

C. INDEMNIFICATION

Successful bidder will indemnify and hold harmless the OWNER from all claims, suits or actions and damages or costs of every name and description to which the OWNER may be subjected or put by reason of injury to the person or property of another, or the property of the OWNER, resulting from negligent acts or omissions on the part of the bidder, the bidder's agents, servants or subcontractors in the delivery of materials and supplies, or in the performance of the work under this agreement.

INSURANCE AND INDEMNIFICATION REQUIREMENTS

If it becomes necessary for the consultant, either as principal or by agent or employee, to enter upon the premises or property of the City of Trenton, the consultant hereby covenants and agrees to take use, provide and make all proper, necessary and sufficient precautions, safeguards, and protection against the occurrence of happenings of any accidents, injuries, damages, or hurt to person or property during the course of the work herein covered and be his/her sole responsibility.

The consultant further covenants and agrees to indemnify and save harmless the City of Trenton from the payment of all sums of money or any other consideration(s) by reason of any, or all, such accidents, injuries, damages, or hurt that may happen or occur upon or about such work and all fines, penalties and loss incurred for or by reason of the violation of any City of Trenton regulation, ordinance or the laws of the State, or the United States while said work is in progress. The consultant shall maintain sufficient insurance to protect against all claims under Workers Compensation as statutorily required, General Liability and Professional Liability in the amount of \$1,000,000.00 single occurrence and \$2,000,000.00 general aggregate and Automobile Insurance in the amount of \$1,000,000.00 combined single limit. Vendors are responsible to provide updated certificates as policies renew. Depending upon the scope of work and goods or services provided, specific types of insurance may not be required. The City of Trenton Department of Administration will make this determination.

In all cases where a Certificate of Insurance is required, the City of Trenton is to be named as an additional insured and named as the certificate holder as follows:

"City of Trenton, 319 East State Street, Trenton, NJ 08608". The Certificate shall contain a 30-day notice of cancellation.

WAIVER OF SUBROGATION CLAUSE

Consultant, as a material part of the consideration to be rendered to the City of Trenton, hereby waives all claims against the City of Trenton for damages to the goods, wares and merchandise in, upon or about said premises, and consultant will hold the City of Trenton exempt and harmless from any damage and injury to any such person or to the goods, wares or merchandise of any such person, arising from the use of the premises by the consultant or from failure of the consultant to keep the premises in good condition and repair as herein provided.

Dated and Signed

VI. PREPARATION OF BIDS

A. The OWNER is exempt from any local, state or federal sales, use or excise tax.

B. ESTIMATED QUANTITIES (OPEN-END CONTRACTS)

The OWNER has attempted to identify the item(s) and the estimated amounts of each item bid to cover its requirements; however, past experience shows that the amount ordered may be different than that submitted for bidding. The right is reserved to decrease or increase the quantities specified in the specifications pursuant to N.J.A.C. 5:34-4.9. **NO MINIMUM PURCHASE IS IMPLIED OR GUARANTEED.**

C. Successful bidder shall be responsible for obtaining any applicable permits or licenses from any government entity that has jurisdiction to require the same. All bids submitted shall include this cost in the bid price agreement.

D. CHANGE ORDERS

All change orders shall be in accordance with N.J.A.C.5:30.13, N.J.S.A.40A:11-13g, N.J.S.A.40A:11-23.1a

VII. STATUTORY AND OTHER REQUIREMENTS

A. MANDATORY AFFIRMATIVE ACTION CERTIFICATION

No firm may be issued a contract unless it complies with the affirmative action regulations of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

EEO/AA: Initial Workforce Form: Pursuant to N.J.A.C. 17:27-3.8(a)(4), the submission of Form AA-201 must be provided by the contractor after the notice of award and before the contract is entered into.

1. PROCUREMENT, PROFESSIONAL AND SERVICE CONTRACTS

All successful vendors must submit, within seven days after the receipt of the notice of intent to award the contract or the receipt of the contract, one of the following:

- i. A photocopy of a valid letter for an approved Federal Affirmative Action Plan (good for one year from the date of the letter), or
- ii. A photocopy of an approved Certificate of Employee Information Report, or
- iii. If the vendor has none of the above, the public agency is required to provide the vendor with an initial Affirmative Action Employee Information Report (AA-302).

2. CONSTRUCTION CONTRACTS

All successful contractors must submit within three days of the signing of the contract an Initial Project Manning Report (AA201- available upon request from the Affirmative Action Office) for any contract award that meets or exceeds the bidding threshold.

B. AMERICANS WITH DISABILITIES ACT OF 1990

Discrimination on the basis of disability in contracting for the purchase of bids and services is prohibited. The successful bidder is required to read Americans with Disabilities language that is part of this specification and agrees that the provisions of Title II of the Act are made a part of the contract. The successful bidder is obligated to comply with the Act and to hold the OWNER harmless.

C. PREVAILING WAGE ACT (WHEN APPLICABLE)

Pursuant to N.J.S.A. 34:11-56.25 et seq., contractors on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act. The contractor shall be required to submit a certified payroll record to the owner within ten (10) days of the payment of the wages. The contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period. **P.L. 2009, c.249 (A-4268/S-3095)**: Extends prevailing wage requirements to contracts for "maintenance-related projects" over \$50,000. It is the contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the New Jersey Department of Labor and Workforce Development, Division of Workplace Standards. Additional information is available at: http://lwd.dol.state.nj.us/labor/forms_pdfs/lsse/payrollcert.pdf and as follows:

Public Contracts Section
Office of Wage and
Hour Compliance
CN 389
Trenton, New Jersey 08625-0389
Telephone number: (609) 292-2259

Prevailing Wage Requirements: Right to terminate, N.J.S.A. 34:11-56.27

Pursuant to N.J.S.A. 34:11-56.25 et seq., successful bidders on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act. The contractor shall be required to submit a certified payroll record to the OWNER within ten (10) days of the payment of the wages. The contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period. The contractor shall submit said certified payrolls in the form set forth in N.J.A.C. 12:60-6.1(c). It will be the contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the Office of Administrative Law, CN 049, Trenton, New Jersey 08625 or the New Jersey Department of Labor, Division of Workplace Standards.

"In the event it is found that any worker, employed by the contractor or any subcontractor covered by said contract, has been paid a rate of wages less than the prevailing wage required to be paid by such contract, the public body, the lessee to whom the public body is leasing a property or premises or the lessor from whom the public body is leasing or will be leasing a property or premises may terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable for any excess costs occasioned thereby to the public body,

any lessee to whom the public body is leasing a property or premises or any lessor from whom the public body is leasing or will be leasing a property or premises.”

Certified Payroll

The awarded contractor shall submit certified payroll records to the City of Trenton designee within ten (10) days of the payment wages. It is the contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the New Jersey Department of Labor and Workforce Development, Division of Workplace Standards. The contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period.

Payment Requirements: Prompt Payment Requirements, N.J.S.A. 2A:30A-1:

N.J.S.A. 2A:30A-1 et seq. establishes timing standards for the payment of bills by both public and private sector organizations for a wide range of construction-related contractors. It affects construction-related contracts of all local units - municipalities, schools, counties, fire districts, local authorities, etc. The law intends to ensure that contractors submitting bills for completed work are paid on a timely basis through an established schedule, and that the full chain of subcontractors receive timely payments from their hiring contractor. When payments are not made pursuant to the schedule, the law allows contractors to receive interest on the outstanding balance and, under certain circumstances, to halt work without being subject to breach of contract clauses.

N.J.S.A. 2A:30A-2a requires that the payment be made within 30 calendar days of receipt of the bill, except if an alternate procedure is defined in the bid specifications and contract documents.

Uniformed Police language: N.J.S.A. 40A:11-23.1(c) with N.J.S.A. 40A:11-23(c).

A statement indicating whether uniformed law enforcement officers will be required for the project. The statement shall include a line-item allowance, which shall be a good faith effort on the part of the contracting unit, to reasonably estimate the total cost of traffic control personnel, vehicles, equipment, administrative, or any other costs associated with additional traffic control requirements required by the contracting unit, or any other public entity affected by the project, above and beyond the bidder's traffic control personnel, vehicles, equipment, and administrative

The contracting unit shall not be responsible for additional traffic control costs beyond the number of working days specified in the construction contract in accordance with section 17 of P.L.1971, c.198 (C.40A:11-17), when such a delay is caused by the contractor and liquidated damages have been assessed. The statement prescribed under this subsection shall not be required if the contracting unit will provide for the direct payment of uniformed law enforcement officers and any additional costs directly associated with the provision of those officers, and costs.

The individuals responsible for the assignment of uniformed law enforcement officers for any municipalities affected by a project shall be required to determine where traffic safety control is needed for a project and calculate the number and placement of all necessary personnel, equipment, and the costs associated with these, including hourly rates, and submit this information to the contracting unit. **UNIFORM POLICE IS NOT REQUIRED**

D. STATEMENT OF OWNERSHIP DISCLOSURE

No corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials

or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or accompanying the bid, of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.

Bidders are required to disclose whether they are a partnership, corporation or sole proprietorship. The Stockholder Disclosure Certification form shall be completed, signed and notarized. Failure of the bidder to submit the required information is cause for automatic rejection of the bid.

For a publicly traded direct or indirect parent entity:

A bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10% percent or greater beneficial interest as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10% percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10% percent or greater beneficial interest.

E. THE NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT

The manufacturer or supplier of chemical substances or mixtures shall label them in accordance with the N.J. Worker and Community Right to Know Law (N.J.S.A. 34:5A-1 et seq., and N.J.A.C 7:1G-1.1 et seq.). Containers that the law and rules require to be labeled shall show the Chemical Abstracts Service number of all the components and the chemical name. Further, all applicable Material Safety Data Sheets (MSDS) and hazardous substance fact sheets must be furnished. All direct use containers shall bear a label indicating the chemical name(s) and Chemical Abstracts Service number(s) of all hazardous substances in the container, and all other substances which are among the five most predominant substances in the container, or their trade secret registry number(s). (N.J.A.C. 8:59-5) or adhere to the requirements of The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and the U.S. Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (HCS) as outlined in the **Federal Register** / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations as **adopted in final rule by DEPARTMENT OF LABOR, Occupational Safety and Health Administration, 29 CFR Parts 1910, 1915, and 1926, [Docket No. OSHA-H022K-2006-0062, (formerly Docket No. H022K)], RIN 1218-AC20, Hazard Communication.**

F. NON-COLLUSION AFFIDAVIT

The Non-Collusion Affidavit, which is part of these specifications, shall be properly executed and submitted with the bid proposal.

G. BID DOCUMENT CHECKLIST

Pursuant to NJSA 40A:11-23.1, the bid document checklist must be completed and submitted with your bid.

H. PUBLIC WORKS CONTRACTOR REGISTRATION ACT

Pursuant to P.L. 1999, c.238 (C.34:11-56.48 et seq), no contractor shall bid on any contract for public work as defined in section 2 of P.L.1963,c.150 (C.34:11-56.26) unless the contractor is registered pursuant to this act. No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered. Applications for registration are available from: NEW JERSEY DEPARTMENT OF LABOR, DIVISION OF WAGE AND HOUR COMPLIANCE, PO BOX 389, TRENTON, NJ 08625-0389. The contractor shall submit a copy of the registration certificate with their bid. Failure to submit the certificate may be cause for rejection of the bid. Each contractor shall, after the bid is made and prior to the awarding of the contract, submit to the City of Trenton the certificates of registration for all subcontractors listed in the bid.

I. BUSINESS REGISTRATION OF PUBLIC CONTRACTORS

BUSINESS REGISTRATION

Pursuant to N.J.S.A. 52:32-44, The City of Trenton ("Contracting Agency") is prohibited from entering into a contract with an entity unless the bidder/proposer/contractor, and each subcontractor that is required by law to be named in a bid/proposal/contract has a valid Business Registration Certificate on file with the Division of Revenue and Enterprise Services within the Department of the Treasury.

Prior to contract award or authorization, the contractor shall provide the Contracting Agency with its proof of business registration and that of any named subcontractor(s).

Subcontractors named in a bid or other proposal shall provide proof of business registration to the bidder, who in turn, shall provide it to the Contracting Agency prior to the time a contract, purchase order, or other contracting document is awarded or authorized.

During the course of contract performance:

- (1) the contractor shall not enter into a contract with a subcontractor unless the subcontractor first provides the contractor with a valid proof of business registration.
- (2) the contractor shall maintain and submit to the Contracting Agency a list of subcontractors and their addresses that may be updated from time to time.
- (3) the contractor and any subcontractor providing goods or performing services under the contract, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury, the use tax due pursuant to the Sales and Use Tax Act, (N.J.S.A. 54:32B-1 et seq.) on all sales of tangible personal property delivered into the State. Any questions in this regard can be directed to the Division of Taxation at (609)292-6400. Form NJ-REG can be filed online at <http://www.state.nj.us/treasury/revenue/busregcert.shtml>.

Before final payment is made under the contract, the contractor shall submit to the Contracting Agency a complete and accurate list of all subcontractors used and their addresses.

Pursuant to N.J.S.A. 54:49-4.1, a business organization that fails to provide a copy of a business registration as required, or that provides false business registration information, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000, for each proof of business registration not properly provided under a contract with a contracting agency.

J. CONFLICT OF INTEREST

In accordance with 40:69A-163 no officer or employee elected or appointed in any municipality shall be interested directly or indirectly in any contract or job for work or materials, or the profits thereof, to be furnished or performed for the municipality.

Pay to Play (C.271): N.J.S.A. 19:44A-20.27

Annual disclosure requirements of business entities with contracts at or above \$50,000.00.

Any business entity making a contribution of money or any other thing of value, including an in-kind contribution, or pledge to make a contribution of any kind to a candidate for or the holder of any public office having ultimate responsibility for the awarding of public contracts, or to a political party committee, legislative leadership committee, political committee or continuing political committee, which has received in any calendar year \$50,000 or more in the aggregate through agreements or contracts with a public entity, shall file an annual disclosure statement with the New Jersey Election Law Enforcement Commission, established pursuant to section 5 of P.L.1973, c.83 (C.19:44A-5), setting forth all such contributions made by the business entity during the 12 months prior to the reporting deadline.

VIII. METHODS OF AWARD

A. All contracts shall be for a period of one (1) year unless otherwise noted in technical or supplemental specifications. Project completion 240 calendar days from "Notice to Proceed".

B. The OWNER may award the work on the basis of the Base Bid, combined with such Alternates as selected, until a net amount is reached which is within the funds available. The order of alternates must be expressly specified in the bid specifications for all contracts above \$500,000.00, per N.J.S.A. 40A:11-23.1(d)

C. If the award is to be made on the basis of Base Bids only, it will be made to that responsible bidder whose Base Bid, therefore, is the lowest. If the award is to be made on the basis of a combination of a Base Bid with Options, it will be made to that responsible bidder whose net bid on such combination is the lowest.

D. The OWNER may also elect to award the work on the basis of line items or unit prices.

E. The successful bidder will not assign any interest in this contract and shall not transfer any interest in the same without the prior written consent of the OWNER.

F. Pursuant to NJSA 40A:11-13(b), the OWNER reserves the right to consider the bidder's physical proximity to Trenton City Hall, 319 East State Street, Trenton, NJ, in awarding the contract when it is determined that the location of the bidder's business is a requisite to the efficient and economical performance of said contract.

G. Pursuant to NJSA 40A:11-24, the OWNER shall award the contract or reject all bids within the time as may be specified, but in no case more than 60 days, except that the bids of any bidders who consent thereto may, at the request of the contracting unit, be held for consideration for a longer period as may be agreed.

H. The OWNER may award the work in whole or in part whichever is most advantageous to the OWNER.

IX. REJECTION OF BIDS

A. Availability of Funds

Pursuant to statutory requirements, any contract resulting from this bid shall be subject to the availability and appropriation of sufficient funds annually.

B. Multiple Bids Not Allowed

More than one bid from an individual, a firm or partnership, a corporation or association under the same or different names shall not be considered.

C. Unbalanced Bids

Bids which are obviously unbalanced may be rejected.

D. Unsatisfactory Past Performance

Bids received from bidders who have previously failed to complete contracts within the time scheduled therefore, or who have performed prior work for the OWNER in an unacceptable manner, may be rejected.

E. FAILURE TO ENTER CONTRACT

Should the bidder, to whom the contract is awarded, fail to enter into a contract within 21 days, Sundays and holidays excepted, the OWNER may then, at its option, accept the bid of the next lowest responsible bidder.

F. The lowest bid substantially exceeds the estimates for goods and services.

G. The OWNER decides to abandon the project.

H. The OWNER decides to substantially review the specifications.

I. The purposes or provisions or both of P.L. 1971,c.198 (D.40A:11-1 et seq) are being violated;

J. The OWNER decides to utilize the State authorized contract pursuant to section 12 of P.L.1971,c.198(C.40A:11-12).

X. TERMINATION OF CONTRACT

A. If, through any cause, the successful bidder shall fail to fulfill in a timely and proper manner obligations under this contract or if the contractor shall violate any of the requirements of this contract, the OWNER shall there upon have the right to terminate this contract by giving written notice to the contractor of such termination and specifying the effective date of termination. Such termination shall relieve the OWNER of any obligation for balances to the contractor of any sum or sums set forth in the contract.

B. Notwithstanding the above, the contractor shall not be relieved of liability to the OWNER for damages sustained by the OWNER by virtue of any breach of the contract by the contractor and the OWNER may withhold any payments to the contractor for the purpose of compensation until such time as the exact amount of the damage due the OWNER from the contractor is determined.

C. The contractor agrees to indemnify and hold the OWNER harmless from any liability to subcontractors/suppliers concerning payment for work performed or goods supplied arising out of the lawful termination of the contract by the OWNER under this provision.

D. In case of default by the successful bidder, the OWNER may procure the articles or services from other sources and hold the successful bidder responsible for any excess cost occasioned thereby.

E. Continuation of the terms of this contract beyond the fiscal year is contingent on availability of funds in the following year's budget. In the event of unavailability of such funds, the OWNER reserves the right to cancel this contract.

XI. CONTRACT EXTENSION FOR SERVICE CONTRACTS

The contracting unit at its sole discretion and pursuant to the authority granted to it in accordance with N.J.S.A. 40A:11-15 may extend any contract for services other than professional services; the statutory length of which contract is for three years or less. Such contracts shall be limited to no more than one two-year extension or two one-year extensions and shall be subject to the limitations contained in this section. All multi-year contracts entered into pursuant to this section, including any two year or one year extensions, with the exception of those contracts identified in subsections (1),(9),(12),(16),(17),(18), (19),(24),(30),(31),(34),(35),(36)and (37) of N.J.S.A. 40A:11-15, shall be subject to the availability and annual appropriation of sufficient funds as may be required to meet the extended obligation and are subject to annual cancellation if said funds become unavailable.

RECORDS FOR THE NEW JERSEY STATE COMPTROLLER

Pursuant to N.J.S.A.52:15C-14(d), relevant records of private vendors or other persons entering into contracts with the City are subject to audit or review by the New Jersey Office of the State Comptroller. Therefore, the Contractor shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

P.L. 2012 BID OR PROPOSAL PROHIBITED

C.52:32-57 "p.l.2012, C.25 prohibits State and local public contracts with persons or entities engaging in certain investment activities in energy or finance sectors of Iran."

FINANCIAL STATEMENTS Pursuant to N.J.S.A:11-13(f)

No Financial Statement shall be required of vendors if either a guarantee, by the certified check, cashier's check, or bid bond, or surety company certificate is also required to be furnished by the bidder, unless any law or regulation of the United States imposes a condition upon the awarding of a monetary grant to be used for the purchase, which condition requires that a financial statement be submitted.

AMERICAN GOODS AND PRODUCTS TO BE USED WHERE POSSIBLE

Pursuant to N.J.S.A.40A:11-18, Each local unit shall provide, the specifications for all contracts for county or municipal work or for work for which it will pay any part of the cost, or work which by
BID2023-63 RE-ADVERTISEMENT CONSTRUCTION OF MARTIN LUTHER KING (MLK) PARKING LOT, SPLASH PAD AND RESTROOM 24
FACILITY FOR THE DEPARTMENT OF RECREATION, NATURAL RESOURCES AND CULTURE – BID OPENING DATE: DECEMBER 15, 2023, AT
11:00AM

contract or ordinance it will ultimately own and maintain, that only manufactured and farm products of the United States, wherever available.

40A:11-19. LIQUIDATED DAMAGES; \$500.00 PER DAY - VOID PROVISIONS AS TO CONTRACTOR'S REMEDIES

Any contract made pursuant to P.L.1971, c.198 (C.40A:11-1 et seq.) may include liquidated damages for the violation of any of the terms and conditions thereof or the failure to perform said contract in accordance with its terms and conditions, or the terms and conditions of P.L.1971, c.198 (C.40A:11-1 et seq.). Notwithstanding any other provision of law to the contrary, it shall be void, unenforceable and against public policy for a provision in a contract entered into under P.L.1971, c.198 (C.40A:11-1 et seq.) to limit a contractor's remedy for the contracting unit's negligence, bad faith, active interference, tortious conduct, or other reasons unanticipated by the parties that delay the contractor's performance, to giving the contractor an extension of time for performance under the contract. For the purposes of this section, "contractor" means a person, his assignees or legal representatives with whom a contract with a contracting unit is made.

40A:11-23.2. REQUIRED MANDATORY ITEMS FOR BID PLANS, SPECIFICATION

When required by the bid plans and specifications, the following requirements shall be considered mandatory items to be submitted at the time specified by the contracting unit for the receipt of the bids; the failure to submit any one of the mandatory items shall be deemed a fatal defect that shall render the bid proposal unresponsive and that cannot be cured by the governing body:

- a. A guarantee to accompany the bid pursuant to section 21 of P.L.1971, c.198 (C.40A:11-21);
- b. A certificate from a surety company pursuant to section 22 of P.L.1971, c.198 (C.40A:11-22);
- c. A statement of corporate ownership pursuant to section 1 of P.L.1977, c.33 (C.52:25-24.2);
- d. A listing of subcontractors pursuant to section 16 of P.L.1971, c.198 (C.40A:11-16);
- e. A document provided by the contracting agent in the bid plans, specifications, or bid proposal documents for the bidder to acknowledge the bidder's receipt of any notice or revisions or addenda to the advertisement or bid documents; and
- f. (Deleted by amendment, P.L.2009, c. .)

40A:11-16.6. VALUE ENGINEERING (NOT APPLICABLE)

All construction contracts issued by a contracting unit when the total price of the originally awarded contract equals or exceeds \$5,000,000, shall allow for value engineering construction change orders to be approved after the award of the contract.

c. Value engineering construction change orders shall be subject to the following provisions:

(1) Value engineering construction change orders shall not be used to impair any of the essential functions, or characteristics of the project, or any portion of the work involved.

(2) The contractor shall submit a value engineering construction proposal that completely describes the changes to the original specifications or proposal, impact on other project components, advantages and disadvantages of the proposed change, cost estimates and calculations on which they are based, any impact on the contract time schedule, and any other relevant information that the contracting unit may require in order to review the value engineering construction proposal. The contractor's cost for developing the value engineering construction proposal shall not be eligible for reimbursement by the contracting unit.

(3) The contractor shall be liable for all reasonable costs incurred by the contracting unit for the technical evaluation and engineering review of a value engineering construction proposal presented by the contractor.

(4) The contracting unit's engineer shall prepare a written report for the governing body that shall evaluate the value engineering construction proposal, make a recommendation on whether or not it should be accepted, rejected, or modified, and state to the contracting unit and contractor the amount of any projected cost savings.

(5) The proposal shall not be approved unless the engineer reports to the governing body that the proposal appears consistent with the required performance, quality, reliability, and safety of the project and does not impair any of the essential functions, or characteristics of the project, or any portion of the work involved.

(6) The contracting unit shall have the sole discretion to approve or disapprove a value engineering construction proposal.

(7) The contractor and the contracting unit shall equally share in the cost savings generated on the contract as a result of an approved value engineering construction change order. Once the project is completed, the contracting unit's engineer shall verify the cost savings to reflect the actual cost of the work, and such verified cost saving shall be the basis for the savings shared equally with the contractor.

(8) The contractor shall have no claim against the contracting unit as a result of the contracting unit's disapproval of a value engineering construction proposal.

(9) A contracting unit shall include in its bid specifications and contract documents procedures to regulate the value engineering construction change order process. Such procedures shall be based on procedures established by the New Jersey Department of Transportation, or any other appropriate State agency, or rules adopted by the director of the Division of Local Government Services.

d. This section shall not invalidate or impair rules regarding change orders adopted by the director of the Division of Local Government Services prior to the effective date of this act. Notwithstanding any provision of P.L.1968, c.410 (C.52:14B-1 et seq.) to the contrary, the director may adopt, immediately upon filing with the Office of Administrative Law, such rules and regulations as the director deems necessary to implement the provisions of P.L.2005, c.67 (C.40A:11-16.6) which shall be effective for a period not to exceed 12 months. The regulations shall thereafter be amended, adopted or readopted in accordance with the provisions of P.L.1968, c.410 (C.52:14B-1 et seq.).

N.J.S.A.40A:11-13(e)

Any prospective bidder who wishes to challenge a bid specification shall file such challenges in writing with the contracting agent no less than three business days prior to the opening of the bids. Challenges filed after that time shall be considered void and having no impact on the contracting unit or the award of a contract.

40A:11-17. Number of working days specified. (240 CALENDAR DAYS FROM "NOTICE TO PROCEED")

All specifications for the doing of any public work for a contracting unit shall fix the date before which the work shall be completed, or the number of working days to be allowed for its completion; and every such contract shall contain a provision for a deduction, from the contract price, or any wages paid by the contracting unit to any inspector or inspectors necessarily employed by it on the work, for any number of days in excess of the number allowed in the specifications.

40A:11-16.1. \$100,000 contracts for improvements to real property; retainage, security

Whenever any contract, the total price of which exceeds \$100,000.00, entered into by a contracting unit, for the construction, reconstruction, alteration or repair of any building, structure, facility or other improvement to real property, requires the withholding of payment of a percentage of the amount of the contract, the contractor may agree to the withholding of payments in the manner prescribed in the contract, or may deposit with the contracting unit registered book bonds, entry municipal bonds, State bonds or other appropriate bonds of the State of New Jersey, or negotiable bearer bonds or notes of any political subdivision of the State, the value of which is equal to the amount necessary to satisfy the amount that otherwise would be withheld pursuant to the terms of the contract. The nature and amount of the bonds or notes to be deposited shall be subject to approval by the contracting unit. For purposes of this section, "value" shall mean par value or current market value, whichever is lower.

If the contractor agrees to the withholding of payments, the amount withheld shall be deposited, with a banking institution or savings and loan association insured by an agency of the Federal government, in an account bearing interest at the rate currently paid by such institutions or associations on time or savings deposits. The amount withheld, or the bonds or notes deposited, and any interest accruing on such bonds or notes, shall be returned to the contractor upon fulfillment of the terms of the contract relating to such withholding. Any interest accruing on cash payments withheld shall be credited to the contracting unit.

C.40A:11-16.2

Any contract, the total price of which exceeds \$100,000.00, entered into by a contracting unit involving the construction, reconstruction, alteration, repair or maintenance of any building, structure, facility or other improvement to real property, shall provide for partial payments to be made at least once each month as the work progresses, unless the contractor shall agree to deposit bonds with the contracting unit pursuant to P.L.1979, c.152 (C.40A:11-16.1).

40A:11-16.3. WITHHOLDING OF PAYMENTS

a. With respect to any contract entered into by a contracting unit pursuant to (C.40A:11-16.2) for which the contractor shall agree to the withholding of payments pursuant to P.L.1979, c.152 (C.40A:11-16.1), 2% of the amount due on each partial payment shall be withheld by the contracting unit pending completion of the contract.

b. Upon acceptance of the work performed pursuant to the contract for which the contractor has agreed to the withholding of payments pursuant to subsection a. of this section, all amounts being withheld by the contracting unit shall be released and paid in full to the contractor within 45 days of

the final acceptance date agreed upon by the contractor and the contracting unit, without further withholding of any amounts for any purpose whatsoever, provided that the contract has been completed as indicated. If the contracting unit requires maintenance security after acceptance of the work performed pursuant to the contract, such security shall be obtained in the form of a maintenance bond. The maintenance bond shall be no longer than two years and shall be no more than 100% of the project costs.

40A:11-16. SEPARATE PLANS FOR VARIOUS TYPES OF WORK; BIDS; CONTRACTS

(NOT APPLICABLE)

a. In the preparation of plans and specifications for the construction, alteration or repair of any public building by any contracting unit, when the entire cost of the work will exceed the bid threshold, the architect, engineer or other person preparing the plans and specifications may prepare separate plans and specifications for

- (1) The plumbing and gas fitting and all kindred work;
- (2) Steam power plants, steam and hot water heating and ventilating and refrigeration apparatus and all kindred work;
- (3) Electrical work, including any electrical power plants, tele-data, fire alarm, or security system;
- (4) Structural steel and ornamental iron work

40A:11-16. e- f Fuel Price Adjustment (NOT APPLICABLE)

d. Any bid specification prepared pursuant to this section that includes the use of 1,000 or more tons of hot mix asphalt, shall include a pay item for any asphalt price adjustment reflecting changes in the cost of asphalt cement. Any bid specification prepared pursuant to this section that includes the use of less than 1,000 tons of hot mix asphalt, shall include a pay item for an asphalt price adjustment for any quantity of hot mix asphalt exceeding 1,000 tons that maybe used in the work in the event that performance of the work, including change orders, requires more than 1,000 tons of hot mix asphalt.

The asphalt price adjustment shall be calculated in accordance with the formula and relevant instructions published in the most recent edition of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction as revised by the "Standard Inputs" periodically issued by the department. All invoices for payment shall be accompanied by the calculation of any asphalt price adjustment and a showing of the current month's Asphalt Price Index, the Basic Asphalt Price Index.

- e. (1) Every bid specification prepared pursuant to this section may be eligible for a fuel price adjustment. Fuel that is eligible for a fuel price adjustment shall be the sum of the quantities of the eligible pay items in the contract times the fuel usage factors as determined by the Department of Transportation. The types of fuel furnished shall be at the option of the contractor.

(2) The fuel requirement for items not determined by the Department of Transportation to be eligible, and for pay items in the bid specifications calling for less than 500 gallons of fuel, shall not be eligible for a fuel price adjustment. If more than one pay item has the same nomenclature but with different thicknesses, depths, or types, each individual pay item must require 500 gallons or more of fuel to be eligible for a fuel price adjustment. If more than one pay item has the exact same nomenclature, similar pay items shall be combined and this combination must require 500 gallons or more of fuel to be eligible for the fuel price adjustment.

(3) Fuel price adjustments shall not be made in those months for which the monthly fuel price index has changed by less than five percent from the basic fuel price.

f. As used in subsections d. and e. of this section:

"Asphalt Price Index" means the Asphalt Price Index as determined and published by the New Jersey Department of Transportation.

"Basic Asphalt Price Index" means the Basic Asphalt Price Index as published by the New Jersey Department of Transportation in its "Standard Specifications for Road and Bridge Construction," as revised by the "Standard Inputs" periodically issued by the New Jersey Department of Transportation.

"Fuel Price Index" means the Fuel Price Index as determined and published by the New Jersey Department of Transportation.

"Pay Item" means a specifically described item of work for which the bidder provides per unit or lump sum price in a bid specification as determined and published by the New Jersey Department of Transportation.

CHANGED CONDITION CLAUSES N.J.S.A.40a:11-16.7

1. All construction contracts issued by a contracting unit for bids which were advertised on or after the effective date of P.L.2017, c.317 (C.40A:11-16.7 et seq.) shall include the changed conditions contract provisions set forth in this section, which provisions shall be deemed to be a part of any such contract even if not expressly incorporated therein, and which provisions may not be modified in any manner by the contracting unit.

a. A contract subject to this section shall include the following differing site conditions provisions:

(1) If the contractor encounters differing site conditions during the progress of the work of the contract, the contractor shall promptly notify the contracting unit in writing of the specific differing site conditions encountered before the site is further disturbed and before any additional work is performed in the impacted area.

(2) Upon receipt of a differing site conditions notice in accordance with paragraph (1) of this subsection, or upon the contracting unit otherwise learning of differing site conditions, the contracting unit shall promptly undertake an investigation to determine whether differing site conditions are present.

(3) If the contracting unit determines different site conditions that may result in additional costs or delays exist, the contracting unit shall provide prompt written notice to the contractor containing directions on how to proceed.

(4) (a) The contracting unit shall make a fair and equitable adjustment to the contract price and contract completion date for increased costs and delays resulting from the agreed upon differing site conditions encountered by the contractor.

(b) If both parties agree that the contracting unit's investigation and directions decrease the contractor's costs or time of performance, the contracting unit shall be entitled to a fair and equitable downward adjustment of the contract price or time of performance.

(c) If the contracting unit determines that there are no differing site conditions present that would result in additional costs or delays, the contracting unit shall so advise the contractor, in writing, and the contractor shall resume performance of the contract, and shall be entitled to pursue a differing site condition claim against the contracting unit for additional compensation or time attributable to the alleged differing site conditions.

(5) Execution of the contract by the contractor shall constitute a representation that the contractor has visited the site and has become generally familiar with the local conditions under which the work is to be performed.

(6) As used in this subsection, "differing site conditions" mean physical conditions at the contract work site that are subsurface or otherwise concealed and which differ materially from those indicated in the contract documents or are of such an unusual nature that the conditions differ materially from those ordinarily encountered and generally recognized as inherent in the work of the character provided for in the contract.

b. A contract subject to this section shall include the following suspension of work provisions:

(1) The contracting unit shall provide written notice to the contractor in advance of any suspension of work lasting more than 10 calendar days of the performance of all or any portion of the work of the contract.

(2) If the performance of all or any portion of the work of the contract is suspended by the contracting unit for more than 10 calendar days due to no fault of the contractor or as a consequence of an occurrence beyond the contracting unit's control, the contractor shall be entitled to compensation for any resultant delay to the project completion or additional contractor expenses, and to an extension of time, provided that, to the extent feasible, the contractor, within 10 calendar days following the conclusion of the suspension, notifies the contracting unit, in writing, of the nature and extent of the suspension of work. The notice shall include available supporting information, which information may thereafter be supplemented by the contractor as needed and as may be reasonably requested by the contracting unit. Whenever a work suspension exceeds 60 days, upon seven days' written notice, either party shall have the option to terminate the contract for cause and to be fairly and equitably compensated therefor.

(3) Upon receipt of the contractor's suspension of work notice in accordance with paragraph (2) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(4) (a) If the contracting unit determines that the contractor is entitled to additional compensation or time, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall proceed with the performance of the contract work, and shall be entitled to pursue a suspension of work claim against the contracting unit for additional compensation or time attributable to the suspension.

(5) Failure of the contractor to provide timely notice of a suspension of work shall result in a waiver of a claim if the contracting unit can prove by clear and convincing evidence that the lack of notice or delayed notice by the contractor actually prejudiced the contracting unit's ability to adequately investigate and defend against the claim.

c. A contract subject to this section shall include the following change in character of work provisions:

(1) If the contractor believes that a change directive by the contracting unit results in a material change to the contract work, the contractor shall so notify the contracting unit in writing. The contractor shall continue to perform all work on the project that is not the subject of the notice.

(2) Upon receipt of the contractor's change in character notice in accordance with paragraph (1) of this subsection, the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

(3) (a) If the contracting unit determines that a change to the contractor's work caused or directed by the contracting unit materially changes the character of any aspect of the contract work, the contracting unit shall make a fair and equitable upward adjustment to the contract price and contract completion date. The basis for any such price adjustment shall be the difference between the cost of performance of the work as planned at the time of contracting and the actual cost of such work as a result of its change in character, or as otherwise mutually agreed upon by the contractor and the contracting unit prior to the contractor performing the subject work.

(b) If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall continue the performance of all contract work and shall be entitled to pursue a claim against the contracting unit for additional compensation or time attributable to the alleged material change.

(4) As used in this subsection, "material change" means a character change which increases or decreases the contractor's cost of performing the work, increases or decreases the amount of time by which the contractor completes the work in relation to the contractually required completion date, or both.

d. A contract subject to this section shall include the following change in quantity provisions:

(1) The contracting unit may increase or decrease the quantity of work to be performed by the contractor.

(2) (a) If the quantity of a pay item is cumulatively increased or decreased by 20 percent or less from the bid proposal quantity, the quantity change shall be considered a minor change in quantity.

- (b) If the quantity of a pay item is increased or decreased by more than 20 percent from the bid proposal quantity, the quantity change shall be considered a major change in quantity.
- (3) For any minor change in quantity, the contracting unit shall make payment for the quantity of the pay item performed at the bid price for the pay item.
- (4) (a) For a major increase in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity in excess of 120 percent of the bid proposal quantity. If a mutual agreement cannot be reached on a negotiated price for a major quantity increase, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid.
- (b) For a major decrease in quantity, the contracting unit or contractor may request to renegotiate the price for the quantity of work performed. If a mutual agreement cannot be reached on a negotiated price for a major quantity decrease, the contracting unit shall pay the actual costs plus an additional 10 percent for overhead and an additional 10 percent for profit, unless otherwise specified in the original bid; provided, however, that the contracting unit shall not make a payment in an amount that exceeds 80 percent of the value of the bid price multiplied by the bid proposal quantity.
- (5) As used in this subsection, the term "bid proposal quantity" means the quantity indicated in the bid proposal less the quantities designated in the project plans as "if and where directed

REQUIRED EVIDENCE
AFFIRMATIVE ACTION REGULATIONS
N.J.S.A. 10:5-31 et seq., N.J.A.C. 17:27

If awarded a contract, all procurement and service contractors will be required to comply with the requirements of P.L.1975, C.127, (N.J.A.C. 17:27). Within seven (7) days after receipt of the notification of intent to award the contract or receipt of the contract, whichever is sooner, the contractor should present one of the following to the Purchasing Agent:

1. A photocopy of a valid letter from the U.S. Department of Labor that the contractor has an existing federally approved or sanctioned Affirmative Action Plan (good for one year from the date of the letter).

OR

2. A photocopy of approved Certificate of Employee Information Report.

OR

3. An Affirmative Action Employee Information Report (Form AA302)

OR

4. All successful construction contractors must submit within three days of the signing of the contract an Initial Project Manning Report (AA201) for any contract award that meets or exceeds the Public Agency bidding threshold (available upon request).

NO FIRM MAY BE ISSUED A CONTRACT UNLESS IT COMPLIES WITH THE
AFFIRMATIVE ACTION REGULATIONS OF P.L. 1975, c. 127 (N.J.A.C. 17:27)

The following questions must be answered by all bidders:

1. Do you have a federally approved or sanctioned Affirmative Action Program?
YES _____ NO _____

If yes, please submit a copy of such approval.

2. Do you have a Certificate of Employee Information Report Approval?
YES _____ NO _____

If yes, please submit a copy of such certificate.

The undersigned contractor certifies that he is aware of the commitment to comply with the requirements of P.L.1975, c.127 and agrees to furnish the required documentation pursuant to the law.

DATE: _____

COMPANY _____

SIGNATURE: _____

TITLE: _____

**Note: A contractor's bid must be rejected as non-responsive if a contractor fails to comply
with requirements of P.L. 1975, c.127, within the time frame.**

(REVISED 4/10)

EXHIBIT A

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE

N.J.S.A. 10:5-31 et seq. (P.L.1975, c.127)

N.J.A.C. 17:27 et seq.

GOODS, GENERAL SERVICES, AND PROFESSIONAL SERVICES CONTRACTS

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

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affection-al or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, up-grading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union of the contractor's commitments under this chapter and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

The contractor or subcontractor agrees to make good faith efforts to meet targeted county employment goals established in accordance with N.J.A.C. 17:27-5.2.

EXHIBIT A (Cont)

The contractor or subcontractor agrees to inform in writing its appropriate recruitment agencies including, but not limited to, employment agencies, placement bureaus, colleges, universities, and labor unions, that it does not discriminate on the basis of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, and that it will discontinue the use of any recruitment agency which engages in direct or indirect discriminatory practices.

The contractor or subcontractor agrees to revise any of its testing procedures, if necessary, to assure that all personnel testing conforms with the principles of job-related testing, as established by the statutes and court decisions of the State of New Jersey, and as established by applicable Federal law and applicable Federal court decisions.

In conforming with the targeted employment goals, the contractor or subcontractor agrees to review all procedures relating to transfer, upgrading, downgrading and layoff to ensure that all such actions are taken without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex, consistent with the statutes and court decisions of the State of New Jersey, and applicable Federal law and applicable Federal court decisions.

The contractor shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

Letter of Federal Affirmative Action Plan Approval.

Certificate of Employee Information Report; or

Employee Information Report Form AA-302 (electronically provided by the Division and distributed to the public agency through the Division's website at:
http://www.state.nj.us/treasury/contract_compliance.

The contractor and its subcontractors shall furnish such reports or other documents to the Division of Purchase & Property, CCAU, EEO Monitoring Program as may be requested by the office from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Division of Purchase & Property, CCAU, EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

Date:_____

Signature:_____

Company:_____

(REVISED 4/10)

EXHIBIT B

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE

N.J.S.A. 10:5-31 et seq. (P.L.1975, c.127)

N.J.A.C. 17:27-1.1 et seq.

CONSTRUCTION CONTRACTS

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

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality, or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality, or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures pre-scribed by the Program is satisfied that the contractor or subcontractor is employing workers

BID 2023-63 RE-ADVERTISEMENT CONSTRUCTION OF MARTIN LUTHER KING (MLK) PARKING LOT, SPLASH PAD AND RESTROOM FACILITY FOR THE DEPARTMENT OF RECREATION, NATURAL RESOURCES AND CULTURE. BID OPENING DATE: DECEMBER 15, 2023 AT 10:00AM

EXHIBIT B (Cont)

provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active “card carrying” members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or sub-contractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or sub-contractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:

(1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers.

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies.

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade.

EXHIBIT B *(Cont)*

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area.

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions.

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contractor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

EXHIBIT B (Cont)

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off the job programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be re-requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

EXHIBIT B *(Cont.)*

Date:_____

Signature:_____

Company:_____

NON-COLLUSION AFFIDAVIT

STATE OF NEW JERSEY
CITY OF TRENTON, COUNTY OF MERCER SS:

I, _____ of the City of _____,
in the County of _____, and the State of _____,

of full age, being duly sworn according to law on my oath depose and say that:

I am _____

of the firm of _____ bidder making the proposal for the above-named Contract, and that I executed the said proposal with full authority so to do; that said bidder has not, directly or indirectly, entered into any agreement, participate in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named Contract; and that all statements contained in said proposal and in this affidavit are true and correct, and made with full knowledge that the City of Trenton, County of Mercer relied upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the Contract for the said proposal.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such Contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, except bonafide employees or bonafide established commercial or selling agencies maintained by

(Name of Vendor)

Subscribed and sworn to before me

This _____ day of _____, 20____.
(Signature of Notary Public)

Notary Public of _____

My Commission expires _____, 20__

STATEMENT OF OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

MANDATORY

**This statement shall be completed, certified to, and included with all bid and proposal submissions.
Failure to submit the required information is cause for automatic rejection of the bid or proposal.**

Name _____ **of**
Organization: _____

Organization

Address: _____

Part I Check the box that represents the type of business organization:

- ☐ Sole Proprietorship (skip Parts II and III, execute certification in Part IV)
- ☐ Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)
- ☐ For-Profit Corporation (any type) ☐ Limited Liability Company (LLC)
- ☐ Partnership ☐ Limited Partnership ☐ Limited Liability Partnership (LLP)
- ☐ Minority Women Business Enterprise (MWBE) (50% or more ownership)
- ☐ Other (be specific): _____

Part II

- ☐ The list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. **(COMPLETE THE LIST BELOW IN THIS SECTION)**

OR

- ☐ No one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be. **(SKIP TO PART IV)**

(Please attach additional sheets if more space is needed):

Name of Individual or Business Entity	Home Address (for Individuals) or Business Address

Part III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. Attach additional sheets if more space is needed.

Website (URL) containing the last annual SEC (or foreign equivalent) filing	Page #'s

Please list the names and addresses of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II other than for any publicly traded parent entities referenced above. The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. Attach additional sheets if more space is needed.

Stockholder/Partner/Member Corresponding Entity Listed in Part II	and	Home Address (for Individuals) or Business Address

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Part IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder/proposer; that the *<name of contracting unit>* is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with *<type of contracting unit>* to notify the *<type of contracting unit>* in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the, permitting the *<type of contracting unit>* to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability

The CONTRACTOR and the OWNER do hereby agree that the provisions of Title II of the Americans with Disabilities Act of 1990 (the "ACT") (42 U.S.C. S12101 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant thereto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the OWNER pursuant to this contract, the CONTRACTOR agrees that the performance shall be in strict compliance with the Act. In the event that the Contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the CONTRACTOR shall defend the OWNER in any action or administrative proceeding commenced pursuant to this Act. The Contractor shall indemnify, protect, and save harmless the OWNER, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The CONTRACTOR shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the OWNER grievance procedure, the CONTRACTOR agrees to abide by any decision of the OWNER which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the OWNER or if the OWNER incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the CONTRACTOR shall satisfy and discharge the same at its own expense.

The OWNER shall, as soon as practicable after a claim has been made against it, give written notice thereof to the CONTRACTOR along with full and complete particulars of the claim. If any action or administrative proceedings is brought against the OWNER or any of its agents, servants, and employees, the OWNER shall expeditiously forward or have forwarded to the CONTRACTOR every demand, complaint, notice, summons, pleading, or other process received by the OWNER or its representatives.

It is expressly agreed and understood that any approval by the OWNER of the services provided by the CONTRACTOR pursuant to this contract will not relieve the CONTRACTOR of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the OWNER pursuant to this paragraph.

It is further agreed and understood that the OWNER assumes no obligation to indemnify or save harmless the CONTRACTOR, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the CONTRACTOR expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the CONTRACTOR'S obligations assumed in this Agreement, nor shall they be construed to relieve the CONTRACTOR from any liability, nor preclude the OWNER from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

DATE: _____

COMPANY NAME

SIGNATURE: _____

**STATE OF NEW JERSEY DEBARMENT NOTICE
(REQUIRED)**

Pursuant to N.J.S.A34:11-56.37 and 34:11-56.38 of the Prevailing Wage Act:

NO PUBLIC WORKS CONTRACT/S MAY BE AWARDED TO ANY CONTRACTORS AND SUBCONTRACTORS OR TO ANY FIRM, CORPORATION OR PARTNERSHIP IF THEIR NAME IS ON THE STATE OF NEW JERSEY, DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT DEBARMENT LIST OF CONTRACTORS AND SUB-CONTRACTORS.

I, the vendor/Respondent, certify that my company has not been "Debarred or Suspended" or otherwise ineligible for participation in a Public Works Contract with the State of New Jersey, Government or Municipality, as described in the N.J.S.A34:11-56.37 and 34:11-56.38 of the Prevailing Wage Act:

Potential Vendor: _____

Title of Authorized Representative: _____

Mailing Address: _____

Signature: _____

Date: _____

Subscribed and sworn to before me

This _____ day of _____, 20____.
(Signature of Notary Public)

Notary Public of _____

My Commission expires _____, 20__

STANDARD BID DOCUMENT REFERENCE	
Name of Form:	FEDERAL NON-DEBARMENT CERTIFICATION
Statutory Reference:	N.J.S.A. 52:32-44.1 (P.L. 2019, c.406)
Description:	Meets statutory criteria for certification of non-debarment by a federal government agency.

Summary of the Certification Requirements under N.J.S.A. 52:32-44.1

Pursuant to state law any natural person, company, firm, association, corporation, or other entity prohibited, or “debarred,” from contracting with the federal government agencies, shall also be prohibited from contracting for public work in the state of New Jersey. This prohibition also extends to any affiliate organization(s) held by or subject to the control of an entity of that prohibited person or entity.

Prior to awarding a contract for public work a local units must obtain written certification from the contracting person or entity through the form below, attesting to their non-debarment from contracting with federal government agencies. Contracting units are reminded that they must fill-in the boilerplate information in the certification sections of Parts II through IV regarding their name and type of contracting unit before using the form.

**CERTIFICATION OF NON-DEBARMENT
FOR FEDERAL GOVERNMENT CONTRACTS**
N.J.S.A. 52:32-44.1 (P.L. 2019, c.406)

This certification shall be completed, certified to, and submitted to the contracting unit prior to contract award, except for emergency contracts where submission is required prior to payment.

PART I: VENDOR INFORMATION	
Individual or Organization Name	
Physical Address of Individual or Organization	
Unique Entity ID (if applicable)	
CAGE/NCAGE Code (if applicable)	
Check the box that represents the type of business organization:	

- ☐ Sole Proprietorship (skip Parts III and IV) ☐ Non-Profit Corporation (skip Parts III and IV)
- ☐ For-Profit Corporation (any type) ☐ Limited Liability Company (LLC) ☐ Partnership
- ☐ Limited Partnership ☐ Limited Liability Partnership (LLP)
- ☐ Other (be specific): _____

PART II – CERTIFICATION OF NON-DEBARMENT: Individual or Organization			
<p>I hereby certify that the individual or organization listed above in Part I is not debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the <name of contracting unit> is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by <type of contracting unit> to notify the <type of contracting unit> in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the <type of contracting unit>, permitting the <type of contracting unit> to declare any contract(s) resulting from this certification void and unenforceable.</p>			
Full Name (Print):		Title:	
Signature:		Date:	

PART III – CERTIFICATION OF NON-DEBARMENT: Individual or Entity Owning Greater than 50 Percent of Organization	
Section A (Check the Box that applies)	
<input type="checkbox"/>	<p>Below is the name and address of the stockholder in the corporation who owns more than 50 percent of its voting stock, or of the partner in the partnership who owns more than 50 percent interest therein, or of the member of the limited liability company owning more than 50 percent interest therein, as the case may be.</p>

Name of Individual or Organization			
Physical Address			
OR			
<input type="checkbox"/>	No one stockholder in the corporation owns more than 50 percent of its voting stock, or no partner in the partnership owns more than 50 percent interest therein, or no member in the limited liability company owns more than 50 percent interest therein, as the case may be.		
Section B (Skip if no Business entity is listed in Section A above)			
<input type="checkbox"/>	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of the voting stock of the organization's parent entity, or of the partner in the partnership who owns more than 50 percent interest in the organization's parent entity, or of the member of the limited liability company owning more than 50 percent interest in organization's parent entity, as the case may be.		
Stockholder/Partner/Member Owning Greater Than 50 Percent of Parent Entity			
Physical Address			
OR			
<input type="checkbox"/>	No one stockholder in the parent entity corporation owns more than 50 percent of its voting stock, no partner in the parent entity partnership owns more than 50 percent interest therein, or no member in the parent entity limited liability company owns more than 50 percent interest therein, as the case may be.		
Section C – Part III Certification			
<p>I hereby certify that no individual or organization that is debarred by the federal government from contracting with a federal agency owns greater than 50 percent of the Organization listed above in Part I or, if applicable, owns greater than 50 percent of a parent entity of <name of organization>. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the <name of contracting unit> is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award <type of contracting unit> to notify the <type of contracting unit> in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the <type of contracting unit>, permitting the <type of contracting unit> to declare any contract(s) resulting from this certification void and unenforceable.</p>			
Full Name (Print):		Title:	
Signature:		Date:	

Part IV – CERTIFICATION OF NON-DEBARMENT: Contractor – Controlled Entities	
Section A	
<input type="checkbox"/>	Below is the name and address of the corporation(s) in which the Organization listed in Part I owns more than 50 percent of voting stock, or of the partnership(s) in which the Organization listed in Part I owns more than 50 percent interest therein, or of the limited liability company or companies in which the Organization listed above in Part I owns more than 50 percent interest therein, as the case may be.
Name of Business Entity	Physical Address
Add additional sheets if necessary	
OR	
<input type="checkbox"/>	The Organization listed above in Part I does not own greater than 50 percent of the voting stock in any corporation and does not own greater than 50 percent interest in any partnership or any limited liability company.

Section B (skip if no business entities are listed in Section A of Part IV)	
<input type="checkbox"/>	Below are the names and addresses of any entities in which an entity listed in Part III A owns greater than 50 percent of the voting stock (corporation) or owns greater than 50 percent interest (partnership or limited liability company).
Name of Business Entity Controlled by Entity Listed in Section A of Part IV	Physical Address
Add additional Sheets if necessary	
OR	
<input type="checkbox"/>	No entity listed in Part III A owns greater than 50 percent of the voting stock in any corporation or owns greater than 50 percent interest in any partnership or limited liability company.
Section C – Part IV Certification	
<p>I hereby certify that the Organization listed above in Part I does not own greater than 50 percent of any entity that that is debarred by the federal government from contracting with a federal agency and, if applicable, does not own greater than 50 percent of any entity that in turns owns greater than 50 percent of any entity debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the <name of contracting unit> is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by <type of contracting unit> to notify the <type of contracting unit> in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the <type of contracting unit>, permitting the <type of contracting unit> to declare any contract(s) resulting from this</p>	

certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

STANDARD BID DOCUMENT REFERENCE						Section 11
Name of Form:	DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN			Instruction Reference:		VII-F
Applicability		Y/N		Mandatory	Optional	N/A
	LPCL	Y	Goods and Services	X		
	PSCL	Y	Construction	X		
Source References:		N.J.S.A. 52:32-55 et seq. N.J.S.A. 40A:11-2.1 N.J.S.A. 18A:18A-49.4				
Supplemental Reference:						
Description:		N.J.S.A. 52:32-55, et seq., (P.L. 2012, c.25 and P.L. 2021, c.4) prohibits certain State and local public contracts with persons or entities engaging in certain investment activities in energy or finance sectors of Iran. Bidders must indicate if they comply with the law by certifying the form.				

LFN 2023-11 provided DLGS authoritative guidance concerning the procurement amount over which the Russia/Belarus and Iran investment disclosure forms are required. The guidance reads as follows:

“Given the threshold for vendor/contractor certification applied to State goods or services contracts, combined with the practical considerations of local purchasing, a contracting unit should rely on the advice of legal counsel in determining whether to apply its own local quote threshold to the Russia-Belarus certification; the Division will defer to contracting units on this point. However, be mindful that determinations of aggregation would apply here just as they would when determining whether a contract is subject to public bidding.”

Thus, contracting units should make an appropriate determination of threshold of when to require the Iran disclosure.

P.L. 2021, c.4 amended a section of the Iran Disclosure enabling law at N.J.S.A. 52:32-58(a) to clarify that the certification must be submitted to the contracting unit “...prior to the time a contract is awarded and at the time the contract is renewed.”

The Certification form requires the insertion of contracting unit identification information which should be filled in (in italics on the form) prior to its use.

Disclosure of Investment Activities in Iran

Person or Entity:	
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Part 1: Certification

BIDDERS ARE TO COMPLETE PART 1 BY CHECKING **EITHER BOX**.

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the N.J. Division of Purchase and Property website at www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Bidders must review this list prior to completing the below certification. Failure to complete the certification may render a bidder's proposal non-responsive. If a person or entity is found to be in potential violation of law, the matter shall be referred to the State Attorney General who shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

CHECK THE APPROPRIATE BOX:

<input type="checkbox"/>	I certify, pursuant to Public Law 2012, c. 25, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is <u>listed</u> on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. I will skip Part 2 and sign and complete the Certification below.
--------------------------	--

OR

<input type="checkbox"/>	I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as nonresponsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.
--------------------------	--

Part 2 – Additional Information

PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN. You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran on additional sheets provided by you.

Part 3: Certification

I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments there to the best of my knowledge are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity. I acknowledge that the Contracting Unit is relying on the information contained herein and thereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the Contracting Unit to notify the Contracting Unit in writing of any changes to the answers of information contained herein. I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the Contracting Unit and that the Contracting Unit at its option may declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

EQUIPMENT CERTIFICATION

The undersigned Bidder hereby certifies as follows:

1. The number and type of (*Type of Equipment or Vehicle, etc.*) intended to be used to fulfill all requirements of the Contract Documents with respect to the (*Scope of Work/Services*) are listed as Table 1 and 2 and attached hereto.

Note: If the Bidder owns or controls all the necessary equipment required, complete Paragraph 2 below. If the Bidder does not own or control all the necessary equipment required, complete Paragraph 3 below.

2. The bidder owns or controls all the necessary equipment shown in Table 1 and required to accomplish the work described in the Contract Documents during the Contract Term.

Name of Bidder: _____ By: _____
(signature)

3. The Bidder does not own or control all the necessary equipment required to accomplish the Work described in the Contract Documents during the Contract Term. The equipment actually owned or controlled by the Bidder is identified in Table 1.

The remaining equipment required to perform the Work described is noted in Table 2 together with the certification of the owner or person in control of such equipment.

Name of Bidder: _____ By: _____
(Signature)

TABLE 1
LIST OF EQUIPMENT
OWNED OR CONTROLLED BY BIDDER

Type of Equipment (Vehicle, Pump, Etc)	<u>Number</u>	<u>Make</u>	<u>Model</u>	Equipment <u>Age</u>
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(Attach additional sheets if necessary)

TABLE 2

**CERTIFICATION OF OWNER OR CONTROLLER OF EQUIPMENT
NOT OWNED OR CONTROLLED BY BIDDER**

This is to certify that I, the undersigned, own or control the equipment required and noted below and definitively grant the Bidder named below the control of said equipment during such time as may be required for that portion of the Work described in the Contract Documents for which said equipment is necessary for the term of the contract.

_____ (Name of Bidder) _____ (Name of Owner or Controller)

Name of Bidder: _____

By: _____
(Signature)

Name: _____

Title: _____

Type of Equipment
(Vehicle, Pump, Etc)

Number Make

Equipment
Model Age

(Attach additional sheets as necessary)

**NEW JERSEY PUBLIC WORKS CONTRACTOR REGISTRATION CERTIFICATE
(APPLIES IF APPLICABLE)**

The successful bidder/vendor will be required to submit and comply with N.J.S.A. 34:11-56.48, et seq.), which requires all contractors, subcontractors or lower tier subcontractors (including subcontractors listed in the bid proposal) who bid on or engage in the performance of any public work to register with the Department of Labor and Workforce Development. The Contractor Registration Certificate is issued to both the company and its responsible representative. Proof is in the form of a Contractor Registration Certificate.

For information regarding the registration process, please contact the Department of Labor and Workforce Development at www.nj.gov/labor (click on Wage & Hour then Registration & Permits) or call 609/292-9464.

Contractors and Sub-Contractors **must** be registered with the Department of Labor and Workforce Development, Wage and Hour prior to bid submittal.

A copy of the Public Contractors Registration Certificate for the Contractor and the Sub-Contractors is **required** prior to award of the contract.

**NOTICE OF INTENT TO SUBCONTRACT FORM
(MANDATORY IF APPLICABLE)**

This notice of intent must be completed and included as part of each bidder's proposal. Failure to submit this form will be cause for rejection of the bid as non-responsive.

Please check one of the below-listed boxes:

☐ If awarded this contract, I will engage subcontractors to provide certain goods and/or services.

ALL BIDDERS THAT INTEND TO ENGAGE SUBCONTRACTORS MUST ALSO SUBMIT A COMPLETED AND CERTIFIED SUBCONTRACTOR UTILIZATION PLAN WITH THEIR BID PROPOSALS. BIDDERS SHOULD ALSO SUBMIT A NEW JERSEY BUSINESS REGISTRATION CERTIFICATE FOR EACH SUBCONTRACTOR AS WELL AS ANY LICENSES HELD BY SUBCONTRACTORS WITH THEIR BID PROPOSAL.

☐ If awarded this contract, I do not intend to engage subcontractors to provide any goods and/or services.

**ALL BIDDERS THAT DO NOT INTEND TO ENGAGE SUBCONTRACTORS MUST ATTEST TO
THE FOLLOWING CERTIFICATION:**

I hereby certify that if the award is granted to my firm and if I determine at any time during the course of the contract to engage subcontractors to provide certain goods and/or services, I will submit the Subcontractor Utilization Plan for approval to the Business Administrator or his legal representative in advance of any such engagement of subcontractors. Additionally, I certify that in engaging subcontractors, I will make a good faith effort to achieve the subcontracting set-aside goals established for this contract, and I will attach to the plan documentation of such efforts.

Respectfully submitted by:

(Seal—if bid is by a
corporation)

Signature

Name, typed or printed

Title

Name of Firm

Business Address/Zip

Telephone

Fax

**PROVIDE A LIST SUB-CONTRACTORS
COPY OF LICENSES SUBMITTED WITH BID
(MANDATORY IF APPLICABLE)**

NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
TELEPHONE: _____
FAX NO. _____
TRADE _____
LICENSE NO. _____

NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
TELEPHONE: _____
FAX NO. _____
TRADE _____
LICENSE NO. _____

NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
TELEPHONE: _____
FAX NO. _____
TRADE _____
LICENSE NO. _____

NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
TELEPHONE: _____
FAX NO. _____
TRADE _____
LICENSE NO. _____

NAME _____
ADDRESS _____
CITY, STATE, ZIP _____
TELEPHONE: _____
FAX NO. _____
TRADE _____
LICENSE NO. _____

**PREVAILING WAGE STATEMENT
(APPLIES)**

As noted, and required, the successful bidder/vendor will be required to submit and comply with all federal and local New Jersey laws regarding payment of prevailing wage rates. To that end, I _____, an authorized representative of _____, accept that legal requirement and indicate by signing this document, the firm's intention and willingness to comply.

This project is subject to both New Jersey State and Federal Prevailing wage requirements. The higher of the two wage rates and fringe benefits for each worker classification shall be the wage rate used. The New Jersey wage and fringe benefits rate in effect on the date the contract is awarded will be the State rates for the duration of the project. All New Jersey predetermined rate increases at the time of the contract award also apply. The Federal wage rate and fringe benefits that are in effect ten (10) days prior to the bid opening date will be the Federal rates for the duration of the project, provided that the contract is executed within 90 days of the bid opening date.

Name of Firm

Signature

Title

Date

Immigration and Naturalization Laws and Criminal Background Check (As Applicable)

Vendors must comply with all Immigration and Naturalization Laws as are currently in force on each potential employee to work under this contract on City of Trenton. If the City requires a background check, the vendor must contact the New Jersey State Police to perform a Criminal Background Check **on each potential employee to work under this contract on City of Trenton property.**

A copy of the results of the Criminal Background Check must be provided to the **City of Trenton Department of Recreation, Natural Resources and Culture** at least ten (10) days prior to an employee being permitted access to property. The department will notify the vendor if a proposed vendor employee will not be permitted to work under this contract within ten (10) workdays following receipt of the results. If the City of Trenton does not notify the vendor of such exclusion within ten (10) days, the vendor may assign said employee to work under the contract.

The vendor must provide the results of a Criminal Background Check on its employees working under the contract on property every twelve (12) months.

Please access the following website for Instructions For Obtaining a Criminal History Record: http://www.state.nj.us/lps/njsp/about/serv_chrc.html

**PROVIDE THREE (3) REFERENCES
(REQUIRED)**

NAME_____

ADDRESS_____

CITY, STATE, ZIP_____

TELEPHONE:_____

FAX NO._____

DESCRIPTION OF WORK:_____

NAME_____

ADDRESS_____

CITY, STATE, ZIP_____

TELEPHONE:_____

FAX NO._____

DESCRIPTION OF WORK:_____

DESCRIPTION OF WORK:_____

NAME_____

ADDRESS_____

CITY, STATE, ZIP_____

TELEPHONE:_____

FAX NO._____

DESCRIPTION OF WORK:_____

CONTRACT AWARD

Upon opening bids, pricing shall remain firm for a period of sixty (60) calendar days. In the event that the award is not made within sixty (60) calendar days, bidders may hold their bid consideration beyond sixty days or until the contract is awarded.

☐ Check here if willing to hold the pricing consideration beyond sixty days or until the contract is awarded.

☐ Check here if not willing to hold the pricing consideration beyond sixty days or until the contract is awarded.

AUTHORIZED SIGNATURE

EMERGENCY SERVICES

In the event of an emergency, Vendor will provide priority service for the City of Trenton.

VENDOR EMERGENCY COMPLIANCE

YES ☐

NO ☐

In the event of an emergency, identify your company procedure for emergency delivery of services should your facility be affected by a critical disruption:

BID PROPOSAL FORM
VENDOR MUST COMPLETE

The undersigned bidder declares that he/she has read the Notice to Bidders, Instructions to Bidders, Affidavits and Specifications attached, that he/she has determined the conditions affecting the bid agrees, if this proposal is accepted, to furnish and deliver the following:

(SIGNATURE BY AUTHORIZED REPRESENTATIVE)

The undersigned is a Corporation, Partnership or Individual under the laws of the State of _____ having its principal office at _____

COMPANY _____

ADDRESS _____

ADDRESS _____

FED. ID # _____

NAME _____

TELEPHONE _____

FAX _____

EMAIL _____

DATE _____

IF AWARDED A CONTRACT, PLEASE PROVIDE CONTACT, ADDRESSES FOR PURCHASE ORDERS AND CHECK REMIT TO INFORMATION, COPY OF YOUR W9 AND UPON AWARD, FORWARD TO THE CITY OF TRENTON, ACCOUNTS AND CONTROL DEPARTMENT, 319 EAST STATE STREET, TRENTON, NJ 08608 (609) 989-3043.

CONTRACT

COMPANY

PURCHASE ORDER MAILED TO:

CHECK REMIT TO:

TELEPHONE

FAX

[illegible]

[illegible]

BID FORM - UNIT PRICES

CONSTRUCTION OF MARTIN LUTHER KING (MLK) SPLASH PAD AND OTHER IMPROVEMENTS
347 BRUNSWICK AVE.

CITY OF TRENTON, MERCER COUNTY, NEW JERSEY

BID SCHEDULE:

The undersigned proposes to furnish all labor, equipment and materials as indicated below and as outlined in the plans and/or specifications. The Contractor is responsible for the construction of all items shown on the plans and/or indicated within the project Manual unless identified as "By Others".

BID ITEM #	SECTION DESCRIPTION	UNIT MEASURE	ESTIMATE QUANTITY	UNIT PRICE	TOTAL PRICE
Base Bid					
1	Site Demolition - includes mobilization and all demolition required to complete the project as per the construction documents	LS	1	\$XX,XXX.xx	
2	Soil Erosion and Sediment Control Measures	LS	1	\$XX,XXX.xx	
3	Site Preparation And Earthwork	LS	1	\$XX,XXX.xx	
4	Precast Storm Inlet Type E	UNIT	2		
5	Precast Storm Doghouse Manhole	UNIT	1		
6	12" X 12" Yard Drain	UNIT	1		
7	Outlet Control Structure 2	UNIT	1		
8	Underground Stormbrixx System B	LS	1	\$XX,XXX.xx	
9	4" HDPE Pipe	LF	180		
10	10" HDPE Pipe	LF	40		
11	12" HDPE Pipe	LF	90		
12	15" HDPE Pipe	LF	15		
13	Storm Cleanout	UNIT	8		

14	Storm Drop Cleanout	UNIT	1		
15	1" Copper K5 Water Service Line	LF	50		
16	4" Ductile Iron Pipe	LF	165		
17	4" Shutoff Valve	UNIT	3		
18	6" PVC Schedule 80 Sanitary Sewer Pipe	LF	200		
19	6" Ductile Iron Pipe	LF	80		
20	Sanitary Cleanout	UNIT	4		
21	Drop Sanitary Cleanout	UNIT	1		
22	12' Wide Ornamental Double Swing Gate	UNIT	2		
23	8' Wide Ornamental Double Swing Gate	UNIT	1		
24	8' High Ornamental Fence	LF	700		
25	Cast-In-Place Concrete Stairs with Metal Handrail	L.S.	1	\$XX,XXX.xx	
26	Powder Coated Rail Barrier, 6' long Panel	LF	415		
27	Vertical Concrete Curb	LF	20		
28	Concrete Sidewalk	SF	3,500		
29	Landscape Synthetic Turf System	SF	1,400		
30	Composite Lounge Chair	UNIT	16		
31	Shade Canopy System	UNIT	1		

32	Concrete Hand Chair	UNIT	5		
33	Integrally Mixed Color Concrete Sidewalk	SF	2,000		
34	Stamped Concrete hand with Penetrating Stain Surface	UNIT	8		
35	Roadway Pavement Repair	SF	500		
36	Concrete Mow Strip	SF	1,000		
37	Spray Pad Equipment and Piping System (includes but is not limited to all spray apparatus and all improvements shown on the raindrop layouts within the construction details to make a working spray pad equipment system)	LS	1	\$XX,XXX.xx	
38	Modular Concrete Block Retaining Wall	LS	1	\$XX,XXX.xx	
39	Modular Concrete Block Retaining Seat Wall	LS	1	\$XX,XXX.xx	
40	6' High PVC Fence	LF	100		
41	4' wide PVC Fence Gate With Locking Hardware	UNIT	1		
42	Standing Seam Roof Pavilion and All Concrete Footings	UNIT	1		
43	Concrete Spray Equipment Slab - includes but is not limited to installation of the concrete spray slab and the concrete sump pit. The cost to install the concrete equipment slab with the sump pit shall include all labor and materials	SF	500		
44	Concrete spray Pad With penetrating Stain Surface	SF	4,750		

45	Electric Service - includes but is not limited to all electrical improvements shown on the electrical plans	LS	1	\$XX,XXX.xx	
46	Pole mounted Lighting Fixture C - included the furnishing and installation of the light fixture, the pole and the foundation. Electrical wiring and conduit installation is to be incorporated in the electric service bid item.	UNIT	4		
47	Pole mounted Lighting Fixture D - included the furnishing and installation of the light fixture, the pole and the foundation. Electrical wiring and conduit installation is to be incorporated in the electric service bid item.	UNIT	4		
48	Landscaping	L.S.	1	\$XX,XXX.xx	
49	Contingency Allowance	L.S.	1	XX,XXX.xx	\$200,000.00
Total Base Bid Amount:					

1. Total Base Bid Amount

\$ _____

(Write Price in Words)

SIGNATURE

DATE

NAME AND TITLE

COMPANY NAME

Add-Alternate A Bid

1	25' High Netting System	LF	150		
---	-------------------------	----	-----	--	--

1. Total Add-Alternate A Amount

\$ _____

(Write Price in Words)

SIGNATURE

DATE

NAME AND TITLE

COMPANY NAME

Add-Alternate B Bid

1	Site Demolition - includes mobilization and all demolition required to complete the project as per the construction documents	LS	1	\$XX,XXX.xx	
2	Soil Erosion and Sediment Control Measures	LS	1	\$XX,XXX.xx	
3	Site Preparation And Earthwork	LS	1	\$XX,XXX.xx	
4	Concrete Sidewalk	SF	1,500		
5	Vertical Concrete Curb	LF	900		
6	Concrete Trench Drain	LF	35		
7	Full Depth Bituminous Concrete Driveway	SF	8,100		
8	Porous Pavement with Underdrain - Includes but is not limited to the porous pavement, the 4" HDPE Porforated Underdrain Pipe, Cleanouts and Porous Pavement Inspection Ports	SF	4,400		
9	4' High Ornamental Fence	LF	450		
10	30' Wide Double Swing Gate	UNIT	1		
11	Park Space Stripping	LS	1	\$XX,XXX.xx	
12	Traffic Stripping Flow Arrow	UNIT	8		
13	ADA Compliant Parking Stalls and Symbol	LS	1	\$XX,XXX.xx	
14	Stop Bar, 24" Wide	LF	13		
15	Stop Sign and Typical Sign Post	UNIT	1		
16	Concrete Wheel Stop	UNIT	2		

17	ADA Compliant Sign and Breakaway Sign Post	UNIT	2		
18	Roadway Pavement Repair	SF	500		
19	Underground Stormbrixx System A	LS	1	\$XX,XXX.xx	
20	Outlet Control Structure 1	UNIT	1		
21	Stormfilter	UNIT	1		
22	8" HDPE Pipe	LF	20		
23	12" HDPE Pipe	LF	60		
24	15" HDPE Pipe	LF	110		
25	Precast Storm Inlet Type B	UNIT	4		
26	Detectable Warning Pad	UNIT	2		
27	Pole mounted Lighting Fixture A - included the furnishing and installation of the light fixture, the pole and the foundation. Electrical wiring and conduit installation is to incorporated in the electric service bid item.	UNIT	2		
28	Landscaping	L.S.	1	\$XX,XXX.xx	

1. Total Add-Alternate B Amount

\$ _____

(Write Price in Words)

SIGNATURE

DATE

NAME AND TITLE

COMPANY NAME

Notes

Allowances will only be used for work directed by the Engineer. All work paid under the allowance must be authorized by the Engineer prior to construction of such work. No payment shall be made for any unauthorized work.

It is understood that the Total Price for the entire contract stated by the undersigned in the schedule is based on the estimated quantities and will control in the awarding of the contract. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents.

It is further understood that the following procedure will be used to correct numerical discrepancies found in the BID SCHEDULE:

If it is found that the written Total Price for the entire contract is found to have been incorrectly computed, then changes will be made to the Total Price so as to attain conformity with said Unit Price before the contract is executed.

TECHNICAL SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

01 21 00	ALLOWANCES
01 26 00	CONTRACT MODIFICATION PROCEDURES
01 29 00	PAYMENT PROCEDURES
01 31 00	PROJECT MANAGEMENT AND COORDINATION
01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION
01 33 00	SUBMITTAL PROCEDURES
01 40 00	QUALITY REQUIREMENTS
01 42 00	REFERENCES
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 60 00	PRODUCT REQUIREMENTS
01 73 00	EXECUTION
01 77 00	CLOSE OUT PROCEDURES

DIVISION 03 - CONCRETE

03 30 00	CONCRETE WORK
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DIVISION 22 - PLUMBING

22 11 13	FACILITY WATER DISTRIBUTION PIPING
22 11 16	DOMESTIC WATER PIPING
22 11 19	DOMESTIC WATER PIPING SPECIALTIES
22 13 13	FACILITY SANITARY SEWER

DIVISION 31 - EARTHWORK

31 10 00	SITE CLEARING
31 20 00	EARTHWORK
31 23 19	DEWATERING
31 50 00	EXCAVATION SUPPORT AND PROTECTION

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 12 16	ASPHALT PAVING
32 13 13	CONCRETE PAVING
32 13 16	DECORATIVE CONCRETE PAVEMENT
32 13 73	CONCRETE PAVEMENT JOINTS
32 31 19	DECORATIVE METAL FENCE AND GATES
32 32 23	SEGMENTAL RETAINING WALLS
32 92 00	TURF AND GRASSES
32 93 00	PLANTS
32 96 00	SOIL EROSION AND SEDIMENT CONTROL
32 98 00	AUTOMATIC IRRIGATION SYSTEM

SECTION 33 UTILITIES

33 41 00	STORM UTILITY DRAINAGE PIPE
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SECTION 33 UTILITIES

34 00 00	SPRAY EQUIPMENT
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APPENDIX

REPORT OF SUBSURFACE EVALUATION AND GEOTECHNICAL ENGINEERING
ASSESSMENT FOR MARTIN LUTHER KING JR. PARK IMPROVEMENTS. DATED JUNE
10, 2022

END OF TABLE OF CONTENTS

INDEX OF SHEETS	
Sheet Number	Sheet Title
TS1.0	COVER SHEET
XC1.0	EXISTING CONDITIONS PLAN
D1.0	OVERALL BASE BID DEMOLITION PLAN
D1.1	DEMOLITION PLAN
C1.0	OVERALL BASE BID SITE PLAN
C1.1	SITE PLAN
C2.0	GRADING AND DRAINAGE PLAN
C3.0	UTILITY PLAN
C4.0	SOIL EROSION AND SEDIMENT CONTROL PLAN
C4.1	SOIL EROSION AND SEDIMENT CONTROL NOTES AND DETAILS
C5.0	CONSTRUCTION DETAILS A
C5.1	CONSTRUCTION DETAILS B
C5.2	CONSTRUCTION DETAILS C
C5.3	CONSTRUCTION DETAILS D
C5.4	CONSTRUCTION DETAILS E
C5.5	CONSTRUCTION DETAILS F
C5.6	CONSTRUCTION DETAILS G
C5.7	CONSTRUCTION DETAILS H
L1.0	LANDSCAPE PLAN
L1.2	LANDSCAPE NOTES AND DETAILS
L2.0	LIGHTING PLAN
L2.2	LIGHTING DETAILS
E1.0	ELECTRICAL SYMBOLS NOTES & ABBREVIATIONS
E1.1	ELECTRICAL SITE UTILITY PLAN
E2.0	ELECTRICAL EQUIPMENT POWER PLAN
E3.0	ELECTRICAL SINGLE LINE DIAGRAM, DETAILS & SCHEDULES
AAD1.0	ADD ALTERNATE DEMOLITION PLAN
AAC1.0	ADD ALTERNATE SITE PLAN
AAC2.0	ADD ALTERNATE GRADING AND DRAINAGE PLAN
AAC5.0	ADD ALTERNATE CONSTRUCTION DETAIL A
AAC5.1	ADD ALTERNATE CONSTRUCTION DETAIL B
AAL1.0	ADD ALTERNATE LANDSCAPE PLAN
AAL2.0	ADD ALTERNATE LIGHTING PLAN

Martin Luther King (MLK)
Splash Pad and Other Improvements

FPA # 18015.001

**Martin Luther King (MLK) Parking Lot, splash pad and restroom facility
347 Brunswick Ave.
Trenton, NJ**

**Special Notes
Date: October, 2023**

Note: These Special Notes supplement the Bid Drawings, Technical Specifications and other Bid Documents. In the event that there are inconsistencies between any of the other portions of the Bid Documents and these Special Notes, the Special Notes listed herein take precedence.

A. Notes relating to AIA Documents A201-2007 General Conditions of the Contract for Construction

1. Article 3.13 (Use of Site) states “The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations...” The Contractor is advised that the Owner currently operates its pool and other recreational facilities and activities on the site, in all areas immediately surrounding the work area and on the surrounding property. The Contractor is prohibited from interrupting those operations or the adjacent parking operations in any manner. The plan of action is to be approved by the owner prior to the Contractor performing the task.
2. Article 3.15 (Cleaning Up) states “The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract.” The Contractor is notified that the Owner currently operates its zoo and other recreational facilities and activities on the site, in all areas immediately surrounding the work area and on the surrounding property, and the Contractor must pay special attention to this requirement including policing and cleaning the perimeter of the site and all paths, access roads, etc. on a daily basis.
3. Article 6.1 (Owner’s Right to Perform Construction and to Award Separate Contracts) The Contractor is specifically notified that the Owner may award other contracts for maintenance or other work at the existing facility. The Contractor must not restrict access to other contractors, subcontractors or material deliveries, and shall coordinate its work with the work of the separate contractors in order to ensure that its own work is not affected. The Contractor shall not be entitled to any additional cost or time resulting from the work of the separate contractor.
4. Article 7.3 (Construction Change Directives) describes the method by which changes in the work are to proceed prior to agreement on adjustment in the Contract Sum or Contract Time. Section 7.3.6 allows for a reasonable allowance for overhead and profit. For this project, the markups allowed for changes in the work shall be as follows:
 - For work self-performed by the Contractor, a total markup of 15% for overhead and profit will be allowed.
 - For work performed by subcontractors, the subcontractor will be allowed a total markup of 10% for overhead and profit, and the Contractor will be allowed a markup of 5% for overhead and profit on the total subcontracted costs.
 - Sub-subcontractors will be allowed a total markup of 10% for overhead and profit, except that related companies shall only be entitled to one total markup of 10% for overhead and profit.
5. Articles 15.4.1, 15.4.1.1, 15.4.2 and 15.4.3 are deleted in their entirety.

6. The Architect/Owner may direct that a change in the Work be performed on a time and material basis. For any such work, time tickets must be submitted to the Construction Manager on a daily basis no later than noon on the day following the day on which the work was performed. Tickets may be handwritten or typed, but must be legible and fully describe the work performed, the number of man hours expended, and a detailed listing of any equipment or materials used in accordance with Section 7.3.7 of the AIA General Conditions of the Contract for Construction. The cost for any labor, equipment or materials not specifically identified on the time and material ticket will not be reimbursed.

Within fifteen days after the notice to proceed, the Contractor shall submit its proposed labor rates for review and approval. This submission shall include a detailed breakdown of the overall labor rates, including an itemization of base hourly rate and benefits, taxes, insurance and markups. The submission should also include a similar breakdown for overtime rates.

At the time that the Contractor submits its actual invoice for the time and material work, it must include a copy of the T&M ticket as signed by the Owner or its Construction Manager, as well as the detailed invoices and other supporting documentation for equipment and material charges as required in Section 7.3.7 of the AIA General Conditions of the Contract for Construction. Invoices that do not include all of the required supporting documentation will not be reviewed and will be returned to the Contractor for correction.

The Contractor is not permitted to include costs for supervision, tools, cleanup or other miscellaneous charges as a fixed percentage of its costs. Any such costs that are incurred should be specifically identified and included on the daily time and material tickets and will be reimbursed accordingly.

B. Miscellaneous Additional Notes

7. For any unit price work, the Contractor shall ensure that the unit price is inclusive of all work necessary to complete the specific item shown, and if the item is part of a system or affects adjoining construction, the unit price shall include all costs necessary for a complete and working installation.
8. The Contractor is to require that each of its subcontractors review and include in its bid the requirements of the complete set of Contract Documents, and specifically not only those documents which reflect its specific trade.
9. The Contractor shall hold subcontractor job meetings on a weekly basis. The owner or its representatives will attend these meetings.
10. Specification section 013200 Construction Progress Documentation addresses the preparation and submission of both a submittal schedule and a contractor's construction schedule. These documents are required to be provided within fifteen days after the notice to proceed. Specification section 013200 also requires that an updated CPM schedule be provided on a monthly basis, and that this be issued one week before the scheduled progress meeting. This updated CPM schedule is required to be submitted at the time that the monthly payment requisition is submitted. Two paper copies and one electronic file (CD) of all schedules are required to be provided. The processing of the monthly payment requisition is contingent upon receipt of the schedule updates.
11. No payment shall be made for materials purchased or stored on site and not incorporated in completed construction.

12. The Contractor shall provide all submittals within 30 days of the Notice to Proceed.
13. The Contractor must have a full-time responsible superintendent on site at all time when work crews are on site, including any overtime or weekend hours. The Contractor's superintendent is also required to be on site even when the work is being performed solely by subcontractors.
14. The Owner shall have the right to approve the Contractor's Project Manager and to require the change in this Project Manager at its discretion during the course of the work. The Contractor shall submit the resume of its proposed project manager for ECDPW review and approval.
15. The Contract Documents make reference to direction being provided by the Architect. This reference should be interpreted that the Architect, Owner or the Owner's Construction Manager may provide such direction with respect to contractual matters and correspondence. The specific levels of authority of the team representing the Owner and organization of all communications will be presented during the Project Kick-off meeting.
16. The contract documents describe overall soil erosion measures. The contractor is to install and maintain any additional soil erosion measures not shown in the contract documents as required to suit the phasing of the project.
17. At the completion of the project and the warranty period, the Owner will be required to competitively bid the future maintenance and service for all building systems and equipment. The Contractor is not permitted to install proprietary systems or equipment for which replacement parts cannot be obtained commercially.
18. The Contractor must meet and maintain all minimum temporary power and lighting standards as required by OSHA.
19. The drawings use varying terminology to describe the performance of the work, including references to different trades, subcontractors and general contractors. The Contractor is specifically advised that all work described in the contract documents is included in the scope of work, and that any reference to subcontractors, work by others or the division of work responsibilities is solely for the convenience of the Contractor. The Contractor itself is responsible for the completion of all work, and shall determine if or how any of the work is to be performed by subcontractors. This includes without limit the completion of painting, miscellaneous steel, etc. and any other work shown in the Contract Documents, whether or not such work is customarily considered as work under a specific trade.
20. The Contractor shall provide three paper copies and three electronic copies of all final as-builts, operating and maintenance manuals and emergency manuals.
21. The contractor is responsible for installing and maintaining high temporary fencing enclosing the complete project site. Fencing shall be 6 ft. high chain link with fabric mesh. Contractor is to install securely to prevent damage from wind.
22. The Contractor is responsible for the cost of all quality control testing related to materials and installation for the entire project including without limit concrete materials and placement, structural steel, reinforcing materials and installation, soils and soil compaction and asphalt and paving. The Owner is not responsible for the cost of any testing identified on the contract drawings and within the contract specifications. This requirement supersedes any language in the Contract Documents that may state otherwise.

23. The Contractor must procure these materials and provide submittals immediately upon issuance of the Notice to Proceed, and must identify the manufacturing location, lead time and confirmation that the materials will be delivered in sufficient time to meet the schedule requirements of the project. In the event that the Contractor proposes to substitute products of alternate manufacturers, it must provide all required documentation to comply with the requirements of Specification Section 012500 including providing samples within 15 days of the Notice to Proceed.
24. Section XII of the Instructions to Bidders and Statutory Requirements covers Time of Completion and Liquidated Damages. This Section XII is clarified to include the following additional requirements:

The entire work of the Project shall be completed in the time described in the front end section of the specifications. The construction of the MLK spray pad itself including all utilities and building services shall be substantially completed (Substantial Completion Milestone) in 10 calendar days prior to the completion date. Any such work that may need to be performed after substantial completion must be performed during off hours as determined by staff. Substantial completion requires that the Contractor provide a Temporary Certificate of Occupancy.

Liquidated damages shall be determined and calculated separately for both the Substantial Completion Milestone (including the building and related work) and for the completion of the entire work of the Project.

SECTION 012100– ALLOWANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to this Section.

1.2 SUMMARY

- A. Selected materials and equipment, and in some cases, installation are included in Contract Documents by allowances. Allowances are established to defer selection until more information is available. Other requirements will be issued by a Change Order.
- B. Types of allowances required include the following:
 - 1. Lump sum allowances.
 - 2. Contingency allowance.
- C. Procedures for submitting and handling Change Orders are included in Division 1 Section "Modification Procedures."
- D. Selection and Purchase: At the earliest feasible date after Contract award, advise the Architect of the date when selection and purchase of each product or system described by an allowance must be completed to avoid delay.
- E. Submittals: Submit proposals for purchase of products or systems included in allowances, in the form of Change Orders.
 - 1. Submit invoices or delivery slips to indicate quantities of materials delivered for use in fulfillment of each allowance.
- F. Contingency and Lump Sum Allowance: Do not include overhead and profit, bonding, insurance and general conditions' costs. These costs shall be included as part of the Contract Sum Base Bid and not part of the Allowance.
 - 1. Allowances shall include costs of specific products and materials ordered under the Allowance, including delivery. Allowances shall include installation costs unless indicated to be included as part of the Contract Sum Base Bid and not part of the Allowance.
 - 2. Allowances will only be used for work directed by the County Engineer. All work paid under the allowance must be authorized by the County Engineer prior to construction of such work. No payment shall be made for any unauthorized work.

3. At Project Closeout, credit unused amounts remaining in the Allowances to the Owner by Change Order.
- G. Unused Materials: Return unused materials for credit to the Owner, after installation has been completed and accepted.
1. If it is not feasible to return unused material, prepare unused material for the Owner's storage, and deliver to the storage space as directed. Otherwise, disposal is the Contractor's responsibility.
- H. Inspection: Inspect products covered by an allowance promptly upon delivery for damage or defects.
- I. Preparation: Coordinate materials and installation for each allowance with related materials and installations to ensure that each allowance item is integrated with related construction activities.
- J. SCHEDULE OF ALLOWANCE

1. Allowance No.1 Contingency (If and Where Directed by Owner): The Contractor shall allow the contingency sum of ten two hundred thousand dollars (\$200,000.00) for any unforeseen work above what is described in these construction documents. This allowance is not to be used for any work specified within or on the contract drawings and/or specifications. The work identified on the contract drawings and in the contract specifications are the sole responsibility of the contractor to complete and the cost are to be incorporated within the site preparation and earthwork bid item. This allowance can only be used if authorized and directed by the City of Trenton for labor and materials above and beyond what is described in the contract drawings and specifications.

END OF SECTION 01 21 00

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 1 Section “Unit Prices” for administrative requirements for using unit prices.
 - 2. Division 1 Section “Product Substitutions” for administrative procedures for handling requests for substitutions made after Contract award.

1.3 1.3 MINOR CHANGES IN THE WORK

- A. Engineer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on CSI Document 13.3A, “Clarification Notice”.

1.4 PROPOSAL REQUESTS

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

- a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include 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 and extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
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 an update Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, change in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product of system for product or system specified.
- C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by

final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerance, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure or count.
- B. Submit claims for increased costs because of a change in scope of nature of the allowances described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 14 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 14 days after such authorization.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher-or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Engineer will issue a Change Order for signatures of Owner and Contractor on EJCDC Document 1910-8-B.

1.7 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Engineer may issue a Work Change Directive on EJCDC Document 1910-8-F. 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 Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specified administrative and procedural requirements governing the Contractor's Applications for Payment.

1.2 1.2 SCHEDULE OF VALUES / COST BREAKDOWN

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values (Cost Breakdown) with other required administrative schedules and forms, including:
 - a. Contractor's Construction Schedule.
 - b. Application for Payment Forms; including Continuation Sheets.
 - c. List of subcontractors
 - d. Schedule of allowances.
 - e. Schedule of alternates.
 - f. List of products.
 - g. List of principal suppliers and fabricators.
 - h. Specification Section number (s) and where needed for clarity, the Article number (s) involved.
 - 2. Submit the Schedule of Values to the A/E at the earliest possible date but no later than 7 days before the date scheduled for submittal of the initial Applications for Payment.
- B. Format and Content:
 - 1. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description or Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.

- g. Dollar.
 - 1) Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
- 2. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of applications for payment and progress reports. Coordinate with the Project Manual table of contents. Break principal subcontract amounts down into several line items.
- 3. Round amounts to nearest whole dollar; that total shall equal the Contract Sum.
- 4. Provide a separate line item in the Schedule of Values of each part of the work where applications for payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
- 5. Provide separate line items in the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the work.
- 6. Unit-Cost Allowances: Show the line-item value of unit-cost allowances, as a product of the unit cost, multiplied by the measured quantity. Estimate quantities from the best indication in the Contract Documents.
- 7. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
- 8. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directive results in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the A/E and paid for by the Owner.
- B. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
 - 1. Payment-Application Times: The date for each progress is the 15th day of each month. The period covered by each Application for Payment starts on the day

following the end of the preceding period and ends 15 days prior to the date of each progress payment or as instructed by the County.

2. Payment-Application Forms: Use. EJCDC No. 1910-8-E Prepared by the Engineers Joint Contract Documents Committee.
- C. Transmittal: Submit 3 signed and notarized copies of each Application for Payment to the A/E by method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments, when required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the A/E.
- D. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:
1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of Values.
 4. Contractor's Construction Schedule.
 5. Schedule of principal products.
 6. Schedule of unit prices.
 7. Submittal Schedule.
 8. List of Contractor's staff assignments.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from governing authorities for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction meeting.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.

15. Data needed to acquire the Owner's insurance.
 16. Landlord's approval to proceed.
- E. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit the Application for Payment.
1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 2. Administrative actions and submittals that shall precede or coincide with the application include:
 - a. Occupancy permits and similar approvals.
 - b. Warranties (guarantees) and maintenance agreements.
 - c. Test/adjust/balance records.
 - d. Maintenance instructions.
 - e. Meter readings.
 - f. Startup performance reports.
 - g. Changeover information related to Owner's occupancy, use, operation, and maintenance.
 - h. Final cleaning.
 - i. Application for reduction of retainage and consent of surety.
 - j. Advice on shifting insurance coverage.
 - k. Final progress photographs.
 - l. List of incomplete Work, recognized as exceptions to A/E's Certificate of Substantial Completion.
- F. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
1. Completion of Project closeout requirements.
 2. Completion of items specified for completion after Substantial Completion.
 3. Ensure that unsettled claims will be settled.
 4. Ensure that incomplete Work is not accepted and will be completed without undue delay.
 5. Transmittal of required Project construction records to the Owner.
 6. Proof that taxes, fees, and similar obligations were paid.

7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish, and similar elements.
9. Change of door locks to Owner's access.
10. Releases as stated in the General Conditions.

PART 2 - PART 2 – PRODUCTS (Not Used)

PART 3 - PART 3 – EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - PART 1 – GENERAL

1.1 SUMMARY

- A. This section specified administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conferences.
 - 2. Pre-Installation Conferences.
 - 3. Coordination Meetings:
 - 4. (See Section 01 31 00, Project Management and Coordination).
 - 5. Progress Meetings.
 - 6. Meetings required by the individual Specifications Sections, Divisions 2 through

1.2 PRE-CONSTRUCTION CONFERENCE

- A. Owner's representative shall schedule a pre-construction conference and organizational meeting at place to be determined no later than 15 day after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The owner's representative, the A/E, the Contractor and its superintendent, major subcontractors and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.

1.3 PRE-INSTALLATION CONFERENCES

- A. When required the owner's representative shall conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The 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 the A/E of scheduled meeting dates.

1. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and A/E.

1.4 COORDINATION MEETINGS

- A. Owner's representative shall conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.
- B. Owner's representative shall record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.5 PROGRESS MEETINGS

- A. Owner's representative shall conduct progress meetings at the Project site at regularly scheduled intervals. Owner's representative shall notify affected Contractors of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Reporting: No later than 3 days after each progress meeting date, A/E shall distribute copies of minutes of the meeting to each party present and others affected. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - GENERAL PROJECT COORDINATION

2.1 DESCRIPTION OF WORK

- A. Minimum administrative and supervisory requirements necessary for coordination of work on the project to be fulfilled by the Contractor include but are not necessarily limited to the following:
 1. Coordination and meetings.
 2. Administrative and supervisory personnel.
 3. Records and reports.
 4. Limitations for use of site.

5. Special reports.
 6. General installation provisions.
 7. Cleaning and protection.
 8. Conservation and salvage.
- B. These coordination requirements must be participated in by each trade, where applicable, even though certain items of work may be assigned to a specific trade, and even though the Contractor may provide certain general work for overall coordination purposes.
- C. Language: Unless otherwise specified, the work of this section shall be performed by the Contractor. Paragraphs written in the imperative tense shall be deemed to have "The Contractor shall" prefaced to the paragraph. Reference to a trade or "Trade" shall be understood to mean that the Contractor will instruct the trade to do as specified.

2.2 COORDINATION AND COORDINATION MEETINGS

- A. General: Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each entity performing work at the project. Prepare similar memorandum for separate trades where interfacing of their work is required.
- B. Coordination Drawings: Prepare coordination drawings where work by separate entities requires fabrication off-site of products and materials which must accurately interface. Coordination drawings shall indicate how work shown by separate shop drawings will interface, and shall indicate installation sequence. Comply with all requirements of Composite Drawings.
1. Where coordination drawings cover primarily the work of one trade, with only minor amounts of work by other trades included, the trade with the major amount of work shall prepare coordination drawings as designated by the Contractor.
 2. Where coordination drawings cover substantial amounts of work by more than one trade, the Contractor shall designate the trade to prepare coordination drawings.
- C. Coordination Meetings: The Contractor shall schedule and hold general project coordination meetings bi-weekly, at regularly scheduled times convenient for the attendance of the trades and other parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Required attendance includes each trade and every other entity identified by any trade as being currently involved in coordination of planning for the work of the entire project. Conduct meetings in a manner that resolves coordination problems. The Contractor will preside at each meeting, and will record meeting results.

The Contractor shall distribute copies of the meeting result to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1. At the option of the Contractor, coordination meetings can be held integrally with progress meetings.

2.3 ADMINISTRATIVE / SUPERVISORY PERSONNEL

- A. General: In addition to administrative and supervisory personnel required for performance of the work, each Trade shall provide specific coordinating personnel as reasonably required for interfacing work with other work of total project.

2.4 LIMITATIONS ON USE OF THE SITE

- A. General: The Contractor will administer allocation of available space equitably among the separate trades and other entities needing access and space, so as to produce the best overall efficiency in performance of the total work of the project. Each trade shall schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
 1. Instruct the trades in the requirements of the phasing plan and coordinate the Work in this matter.
- B. The project site is in use and will be in continuous operation during the performance of the Work. The Work shall be conducted and completed without interruption of or change in the regular schedule of operations, including staffing and visitation of the adjoining buildings.
 1. Temporary Protection: Provide temporary protection to persons and material entering and leaving the buildings and site.
 2. Ambient Conditions: Maintain the ambient interior atmospheric conditions of spaces in the adjacent buildings to the work.
- C. Existing utilities and services affected by the Work shall be kept in active services at all times unless permitted otherwise by Owner. The Contractor shall be responsible for any damage done to existing construction, work in place, facilities, utilities, services and equipment, resulting from their operations in connection with the Work. Repair damage to facilities, services, connections, etc. immediately, to the satisfaction of the A/E.
- D. Do not disturb live circuits or working plumbing, heating, ventilation or air conditioning plant or equipment, mechanical piping, installations and connections, without specific direction and approval of the A/E.

1. Whenever such work is contemplated, the Contractor shall submit to the A/E a written request for scheduling such work. This written request shall be received five (5) working days prior to the date on which the proposed work will be performed.
 2. The shutting off and turning on of electrical current, active services, etc., in live circuits, or active plumbing and mechanical piping, water, steam, serving lines, etc., will be done by or under supervision of the employees of the Owner.
 3. Conduct the work in such a manner and with such precautions and safeguards as the Contractor finds advisable, and those the Owner and A/E may require.
 4. The Contractor shall work overtime, premium time, of special shift time as necessary, without additional compensation, to prevent interface with on-going operations. No time extensions will be allowed due to the inability of the Contractor to achieve unlimited use of facilities, utilities, or services.
- E. Existing feeders, machines or other apparatus shall not be removed or disconnected until the new parts have been installed to replace them, properly connected and ready for use. The changing over from old to new Work shall be done expeditiously and if possible so that no part of the building of premises shall be without adequate service. If this is not possible, the procedure shall be planned and submitted for review and approved by the A/E.

2.5 SPECIAL REPORTS

- A. Reporting Unusual Events: When an event of an unusual and significant nature occurs at the site, the Contractor will prepare and submit a special report. The report will list chain of events, persons participating, the response by the Contractor's personnel and by the personnel of the trades, and evaluation of the results of effects and similar pertinent information. It is the responsibility of the Contractor to advise the A/E in advance, when such events are known as predictable.
1. Submit special reports directly to the Owner within one day of an occurrence. Submit a copy of the report to the Architect and other entities affected by the occurrence.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Pre-Installation Conferences: The Contractor will schedule and hold a pre-installation meeting at the project site well before installation of each unit of work which requires coordination with other units of work. Trades involved in the unit of work as well as

the installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow shall attend this meeting.

1. The Contractor will record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. The Contractor will distribute the record of the meeting promptly to everyone concerned, including the Owner and Architect.
 2. Do not proceed with the unit of work if the pre-installation conference cannot be successfully concluded. The Contractor will initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest date.
- B. Installer's Inspection of Conditions: The Contractor shall require the installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The installer shall be required to report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- C. Manufacturer's Instructions: Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the Contract Documents.
- D. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.
- E. Provide attachment and connection devices and methods for securing work properly. Secure work true to line and level and within recognized industry tolerances. Allow for expansion and building movement. Provide uniform joint width in exposed work.
1. Conditions producing questionable visual effects or effects not shown or described in the Contract Documents shall be referred to the Architect for Evaluation.
- F. Recheck measurements and dimensions of the work, as an integral step of starting each installation.
- G. Install each unit-of-work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration.
- H. Enclosure of the Work: Contractor shall coordinate the closing-in of the work with required inspections and tests, so as to minimize the necessity of uncovering work for that purpose.

- I. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. The Architect will review and approve the mounting heights of all work not specifically shown or described in the Contract Documents.

3.2 CLEANING AND PROTECTION

- A. General: During handling and installation of work at the project site, each Trade shall clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is a required to ensure freedom from damage or deterioration at time of substantial completion.
- B. Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damage effects.
- C. Limiting Exposure of Work: To the extent possible through reasonable control and protection methods, each Contractor shall supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period.

3.3 CONSERVATION AND SALVAGE

- A. General: It is a requirement for Contractor's supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials. In addition, maximum consideration shall be given to salvaging materials and equipment involved in performance of the work but not incorporated therein. Refer to other sections for required disposition of salvage materials which are the Owner's property.

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Daily construction reports
 - 2. Material location reports
 - 3. Field condition reports.
 - 4. Special Reports.
 - 5. Construction photographs.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 2. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
 - 3. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.2 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experiences. Include lists or completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.
- B. Daily Construction Reports: Submit two copies at request of Engineer.
- C. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
- D. Special Reports: Submit two copies at time of unusual event.
- E. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.
 - 1. Format: 8 by 10 inch smooth surface matte prints on single-weight commercial-grade stock, punched for standard 3-ring binder.

2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of Project.
 - b. Name and address of Photographer.
 - c. Name of Engineer and Construction Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation of story of construction.
3. Negatives: Submit a complete set of photographic negatives in protective envelopes with each submittal of prints. Identify date photographs were taken.

1.3 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual of established reputation who has been regularly engaged as a professional photographer for not less than three years.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.2 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day 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, 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 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. Photographic Film: Medium-format, 2-1/4 by 2-3/4 inches.
- C. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
- D. Preconstruction Photographs: Before starting construction, take 12 color photographs of Project site and surrounding properties from different vantage points, as the contractor determines necessary, and approved by the owner's representative. Show existing conditions adjacent to property.
- E. Periodic Construction Photographs: Take 12 color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.
 - 1. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Engineer and Construction Manager.
- F. Final Completion Construction Photographs: Take 12 color photographs after date of Substantial Completion for submission as Project Record Documents. Engineer will direct photographer for desired vantage points.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Submittals are prepared by the Contractor. Drawings are general provisions of Contract, Division 1 requirements and contract requirements, should be used as the related documents for this requirement.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:
 - 1. Security Plan.
 - 2. Contractor's construction schedule.
 - 3. Submittal schedule.
 - 4. Shop drawings.
 - 5. Product data.
 - 6. Samples
 - 7. Quality assurance and quality control submittals, including calculations, mix designs and substantiating test results.
- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
 - 1. Permits.
 - 2. Application for Payment.
 - 3. Performance and Payment bonds.
 - 4. Insurance certificates.
 - 5. Monthly Subcontractors expense report.

6. Non-use of asbestos affidavits.

C. Related Sections: The following Section contain requirements that relate to this Section:

1. Section 01 77 00, "Close-out Procedures" specifies requirements for submittal of Project Record Documents and warranties at project close-out.

PART 2 - PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

A. Contractor shall be responsible for the following:

1. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - b. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals or resubmittals concurrently.
2. The E/A reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
 - a. Allow fourteen (14) calendar days for initial review. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow fourteen (14) calendar days for processing each resubmittal.

- d. No extension of Contract Time will be authorized because of failure to transmit submittals to the E/A sufficiently in advance of the Work to permit processing.
4. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - a. Provide a space approximately 4 inches by 5 inches (100 by 125 mm) on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
5. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date
 - c. Name and address of the Contractor's Engineer.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title or appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
6. Number of Copies:
 - a. Two (2) copies of the proposed Construction schedule and subsequent revisions are required.
 - b. Two (2) copies of the proposed Submittal schedule and subsequent revision are required.
 - c. Five (5) copies of Shop Drawings, Product, Product Samples, Quality Assurance and Quality Control submittals are required.
7. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the E/A through the Owner's Representative using a transmittal form (an example Transmittal Form is provided at the end of this section). The E/A will not accept submittals received from sources other than the Contractor.
 - a. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
 - b. Number transmittals in sequence for each Series of the Specifications thus: x-xxx. The number after the dash indicates the Section of the Specifications, and the number before the dash is the sequence number of

the transmittal. For example, the first item submitted related to Specification Item No. 506, "Manholes" would be labeled 1-506, the second item submitted would be labeled 2-506, etc. If the submittal item relates to a Special Provision or Special Specification, use SP506 or SS5061, for example, to indicate the applicable Specification Section. Identify resubmits; with a letter of the alphabet following the original sequence number, using "A" for the first resubmittal, "B" for the second resubmittal, etc. For example, the first resubmittal of the second item submitted for Specification SP506 would be labeled 2A-SP506.

3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, Contractor's construction schedule. Submit initial schedule prior to or at the Pre-construction conference, and submit updated schedules as specified by the E/A, usually at each regularly scheduled Project Meeting and with each pay application.
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values". Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 2. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 3. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the critical path items and the sequences necessary for completion of related portions of the Work.
 4. Indicate the phases of work in which subcontractors will be participating. Subcontractors shall be indicated by name.
 5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontractors, Submittal Schedule, progress reports, payment requests, and other schedules.
 6. Indicate substantial completion in advance of the date established for certification of Substantial and Final Completion.

- B. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.
- C. Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of Work performed as of the dates used for preparation of applications for payment.
- D. Distribution: Following response to the initial schedule submittal, print and distribute copies to the E/A, subcontractors, suppliers, and other parties required to comply with scheduled dates. Keep a copy at the Project Site at all times.
 - 1. When revisions are made, distribute 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 construction activities.
- E. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made and as requested by the E/A. Issue the updated schedule concurrently with the report of each meeting, or as requested by the E/A.

3.3 SUBMITTAL SCHEDULE

- A. Concurrently with the development of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the initial Submittal Schedule along with the Construction Schedule, at, or prior to, the Pre-construction Conference.
 - 1. Coordinate Submittal Schedule with the list of subcontractors, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
 - 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Schedule date for the first submittal.
 - b. Related Section number or Specification number.
 - c. Submittal category (Shop Drawings, Product Data, Calculations, Test Results, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date for completion of the E/A's review.
- B. Distribution: Following Owner's response to the initial submittal, print and distribute copies to the Owner's Representative, E/A, Owner, subcontractors, suppliers, and other parties required to comply with submittal dates indicated. Keep copies at the Project Site at all times.

1. When revisions are made, distribute 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 construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the update schedule concurrently with the report of each meeting, or as requested by the E/A.

3.4 CONSTRUCTION SEQUENCE PLANS

- A. The Contractor is required to submit construction sequence plans to the County at, or prior to, the pre-construction conference for approval. The Project shall be divided into phases according to the sequence of construction given in the Drawings and traffic control plans. The Contractor shall arrange his/her work schedule to complete all Work on each phase, including street repair, any valve casting or manhole adjustments, and street overlay before moving on to the next work area.

3.5 SHOP DRAWINGS

- A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific references to the Project is not a Shop Drawing.
- B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
 1. Dimensions.
 2. Identification of products and materials included by sheet and detail number.
 3. Compliance with specified standards.
 4. Notation of coordination requirements.
 5. Notation of dimensions established by field measurements.
 6. Sheet Size: Except for templates, patterns and similar full size Drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches but no larger than 24 inches by 36 inches.
 7. Do not use Shop Drawings without an appropriate stamp indicating action taken.

3.6 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, applicable certifications and performance curves.
1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurements.
 - f. Notation of coordination requirements.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
 - a. Do not proceed with installation until a copy of the final submission of Product Data is in the Installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.
 4. Water and Wastewater Items or Projects: The Contractor shall submit descriptive information and evidence that the materials and equipment the Contractor proposes for incorporation into the Work is of the kind and quality that satisfies the specified functions and quality. Water and Wastewater Utility Standard Products Lists (SPL) form a part of the Specifications. Contractors may, when appropriate, elect to use products from the SPL; however, submittal to the E/A is still required. Should the Contractor elect to use any materials from these lists, each product shall be completely and clearly identified by its corresponding SPL number when making the product submittal. This will expedite the review process in which the E/A, and, if necessary, the Water and Wastewater Utility Standard Products Committee, decides whether the product meets the Contract requirements and the specific use foreseen by the E/A in the design of this engineered Project. The purpose of the SPL's is to expedite review, by the E/A and, if necessary, the Water and Wastewater Utility Standard Products Committee, of Contractor product submittals. The SPL's should not be interpreted as being a pre-approved list of products necessarily meeting the requirements for a given construction Project. Items contained in the SPL Cannot

be substituted for items shown on the Drawings, or called for in the specifications, or specified in the Bidding Requirements, Contract Forms and Conditions of Contract, unless approved by the E/A in conjunction with the Water and Wastewater Utility Standard Products Committee. The Standard Product List current at the time of plan approval will govern.

3.7 SAMPLES

- A. Submit full-size, fully fabricated Samples cured and finished when specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts, or containers of materials, color range sets, and swatches showing color, texture and pattern.
1. Mount of display Samples in the manner to facilitate review of qualities indicated. Include the following:
 - a. Specification Section number and reference.
 - b. Generic description of the Sample.
 - c. Sample source.
 - d. Product name or name of the manufacturer.
 - e. Compliance with recognized standards.
 - f. Availability and delivery time.
 2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
 - b. Refer to other Specification Section for requirements of Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
 3. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.

- a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used by Owner for final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

3.8 QUALITY ASSURANCE AND QUALITY CONTROL SUBMITTALS

- A. Submit quality assurance and quality control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, materials test results, field testing and inspection reports, and other quality-control submittals as required under other Section of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material or installation complies with specified requirements, submit a certification from the manufacturer or responsible Engineer certifying compliance with specified requirements.
 - 1. Signature: Certification shall be signed by an officer of the corporation or other individual authorized to sign documents on behalf of the company.
- C. Calculations: When required in the technical specification, calculations shall be prepared and stamped by a Professional Engineer registered in the State of New Jersey.
- D. Concrete, Controlled Low Strength Material, Asphalt Stabilized Base and Hot Mix Asphaltic Concrete Mix Designs and Substantiating Test Data: Requirements for submittal of mix designs and substantiating test data are specified in the applicable Technical Specification Section. Each separate batch plant supplying ASB, HMAC and/or concrete shall submit mix designs to the Owner's Representative for review.

3.9 TECHNICAL SUBMITTALS REQUIRED

- A. For Technical submittals required. The Contractor shall refer to the Technical Specifications for additional requirements.

3.10 ENGINEER/ARCHITECT'S ACTION

- A. Except for submittals, for the record, or for information where action and return is not required, the E/A will review each submittal, mark to indicate action taken, and return within the time frame specified in Paragraph 3.1A.2.

1. Compliance with specified characteristics is the Contractor's responsibility.
- B. Action Stamp: The E/A will stamp each submittal with a uniform, action stamp. The E/A will mark the stamp appropriately to indicate the action taken, as follows:
1. "Reviewed": the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 2. "Reviewed with Comments": the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 3. "Revise and Resubmit" or "Rejected": do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations and resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Revise and Resubmit" or "Rejected" at the Project Site or elsewhere where Work is in progress.
 4. Other Action: Where a submittal is for information, or for record purposes, or for special processing, or for other activity, the E/A will return the submittal marked "Record Copy", "Action Not Required" or "No Action Taken".
- C. Calculations: When required in the technical specifications, calculations shall be prepared and stamped by a Professional Engineer registered in the State of New Jersey.
- D. Concrete, Controlled Low Strength Material, Asphalt Stabilized Base and Hot Mix Asphaltic Concrete Mix Designs and Substantiating Test Data: Requirements for submittal of mix designs and substantiating test data are specified in the applicable Technical Specification Section. Each separate batch plant supplying ASB, HMAC, and/or concrete shall submit mix designs to the Owner's Representative for review.

3.11 PREPARATION AND SUBMITTAL OF CONSTRUCTION RECORD DRAWINGS

- A. The Owner's Representative and the Contractor's Superintendent will each maintain a set of blueines noting any changes in ink during construction of the Project. The Owner's representative and the Contractor's Superintendent will compare blueines at least weekly (at a time mutually acceptable to both) to exchange information and compare notes to ensure all items installed and changes are documented. The following is a recommended minimum of items to be noted:

1. General
 - a. Notes should be sufficiently clear to allow a draftsman to easily make the necessary changes without the need for field checks and interpretation.
 - b. One complete set of Construction Record blueprints will be submitted prior to the final pay request and forwarded to the Owner.
2. STREET RECONSTRUCTION AND OVERLAY PROJECTS
 - a. Location, type, and quantity of all work added or deleted from the Project including repair areas, milled areas, sidewalk, ramps, curb and gutter, etc.
 - b. Deviations in street, sidewalk, curb and gutter location and grades from Drawings.
3. WATER/WASTEWATER PROJECTS
 - a. Type, name and model numbers of all valves (with # of turns to open/close), air release valves, drain and fire hydrants noted at locations installed.
 - b. Installed locations of all assignments, appurtenances and elevations which differ from those indicated on the Drawings.
 - c. Pipe manufacturer type and classification noted in sufficient detail to determine location and extent of each type or classification installed.
 - d. Modification to any standard or special details noted.
 - e. Location and description of pipe closures.
 - f. Thrust blocking locations and restrained pipe lengths, approximate dimensions and quantities noted.
 - g. Location, type and quantity of all additions and deletions.
 - h. Changes in grade.

The above list is not intended to be complete. Any information noted which could be used for future maintenance, location and construction projects is encouraged to be noted on the blueprints

3.12 CONSTRUCTION DIARIES

- A. The contractor shall prepare a daily construction diary recording as a minimum the following information concerning events at the site and submit duplicate copies to the Owner's Representative at weekly intervals. The copies are to be signed by the project Superintendent.
 1. Work performed.

2. Approximate count of Contractor's personnel, by classification, on the site.
3. List of subcontractors and personnel by classification on the site.
4. List of all equipment on the site by make and model.
5. High and low temperatures together with general weather conditions.
6. Start time and finish time of day's work.
7. Accidents and/or unusual events.
8. Meetings and significant decisions made.
9. Stoppages, delays, shortages and/or losses.
10. Meter readings and/or similar recordings.
11. Emergency procedures that may have been needed.
12. Orders and requests of governing authorities.
13. Change Orders received and implemented.
14. Services connected and/or disconnected.
15. Installed equipment and/or system tests and/or startups and results.
16. Partial completions and/or occupancies.
17. Date of substantial completion certified.

SHOP DRAWING TRANSMITTAL (SAMPLE)

January 3, 1996

Transmittal No. {See Specifications}
Previous Transmittal No.
Previous Submittal Date

City of Austin, Texas
Construction Inspection Division
Department of Public Works and Transportation
P.O. Box 1088
Austin, Texas 78767

Project Name: Austin Lakeside Drive

Attention: Owner's Representative

Enclosed are nine (9) copies of the following items for your review:

<u>Item No.</u>	<u>Description</u>	<u>Submittal Type</u>	<u>Specification Section</u>	<u>Subcontractor/ Supplier</u>
1.	6" DI Pipe	Product Data	510	ABC Company
2.	8" Resilient Seat Gate Valve	Product Data	511	DEF Company

NOTE: Item 1 above contains a deviation from the Specifications as indicated on the item.

Submitted by: _____
XYZ Company
101 Ranch Road 2974
Austin, Texas 78759

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. 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.
 - 2. Specific tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Engineer, Owner or authorities having jurisdiction are not limited by provisions of this Section.
- C. C. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.

- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required by 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 writer request for additional information to Engineer.

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in “Quality Assurance” Article to demonstrate their capabilities and experiences. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and Title.
 - 2. Description of test inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.

7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- D. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient 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.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing 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.

- B. Factor-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.
- C. 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.
- D. 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.
- 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 products that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities that are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, not interfere with local trade-union jurisdictional settlements and similar conventions.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspection indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the work.
 - c. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- I. 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 on location and of size indicated or, if not indicated, as directed by Engineer.
 2. Notify Engineer seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Engineer's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspection they are engaged to perform.
 2. Cost 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: unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

- a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that required testing or inspection will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Special Tests and inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. Testing agency will notify Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 5. Testing agency will retest and reinspect corrected work.
- D. 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.
- 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 revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer and Contractor promptly of irregularities of deficiencies observed in the 'Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- G. 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 inspection. 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.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality 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.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PART 2 PRODUCTS (NOT USED)

PART 3 - PART 3 EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
- 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 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - DEFINITIONS

1.1 GENERAL

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

1.2 INDICATED

- A. The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the references. There is no limitation on location.

1.3 APPROVED

- A. The term approved, when used in conjunction with the Owner's Representative's action on the CONTRACTOR'S submittals, applications, and requests, is limited to the Owner's Representative's duties and responsibilities as stated in the Conditions of the Contract. A stamp reading "No Exceptions Taken" shall have the same intent as "Approved".

1.4 REGULATIONS:

- A. The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

1.5 FURNISH:

- A. The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

1.6 INSTALL:

- A. The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protection, cleaning and similar operations.

1.7 PROVIDE:

- A. The term provide means to furnish and install, complete and ready for the intended use.

1.8 INSTALLER:

- A. An installer is the CONTRACTOR or another entity engaged by the CONTRACTOR, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in operations they are engaged to perform.

1.9 TRADES:

- A. Using terms such as carpentry is not intended to imply that certain construction activities must be performed as accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

1.10 PROJECT SITE:

- A. The space available to the CONTRACTOR for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

PART 2 - INDUSTRY STANDARDS

2.1 APPLICABILITY OF STANDARDS:

- A. Except where 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.

2.2 PUBLICATION DATES:

- A. Comply with the standards in effect as of the date of the Contract Documents.

2.3 CONFLICTING REQUIREMENTS:

- A. Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer to the Owner's Representative for a decision before proceeding.

2.4 COPIES OF STANDARDS:

- A. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

2.5 ABBREVIATIONS AND NAMES:

- A. Trade association names, titles of general standards, and names and titles of government agencies are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the “Encyclopedia of Associations”, published by Gale Research Co., available in most libraries.

- AA Aluminum Association
- AABC Associated Air Balance Council
- AAMA American Architectural Manufacturer’s Association
- AAN American Association of Nurserymen.
- AASHTO American Association of State Highway and Transportation Officials
- AATCC American Association of Textile Chemists and Colorists
- ACI American Concrete Institute
- ACIL American Council of Independent Laboratories
- ACPA American Concrete Pipe Association
- ADC Air Diffusion Council
- AFBMA Anti-Friction Bearing Manufacturers Association
- AGA American Gas Association
- AGC Associated General Contractors of America
- AGMA American Gear Manufacturers Association
- AHA American Hardboard Association
- AHAM Association of Home Appliance Manufacturers
- AL Asphalt Institute
- AIA American Institute of Architects
- AIHA American Industrial Hygiene Association
- AISC American Institute of Steel Construction
- AISI American Iron and Steel Institute
- AITC American Institute of Timber Construction
- ALCA Associated Landscape Contractors of America
- ALI Associated Laboratories, Inc.
- ALSC American Lumber Standards Committee
- AMCA Air Movement and Control Association
- ANSI American National Standards Institute

- AOAC Association of Official Analytical Chemists
- AOSA Association of Official Seed Analysts
- APA American Plywood Association
- API American Petroleum Institute
- AREA American Railroad Engineers Association
- ARI Air Conditioning and Refrigeration Institute
- ARMA Asphalt Roofing Manufacturers Association
- ASA Acoustical Society of America
- ASA American Standards Association
- ASC Adhesive and Sealant Council
- ASCE American Society of Civil Engineers
- ASHRAE American Society of Heating, Refrigerating & Air Conditioning Engineers
- ASME American Society of Mechanical Engineers
- ASPE American Society of Plumbing Engineers
- ASSE American Society of Sanitary Engineers
- ASTM American Society of Testing and Materials
- AWCMA American Window Covering Manufacturers Association
- AWG American Wire Gage
- AWI Architectural Woodwork Institute
- AWWPA American Wood Preservers Association
- AWPB American Wood Preservers Bureau
- AWPI American Wood Preservers Institute
- AWS American Welding Society
- AWWA American Water Works Association
- BHMA Builders Hardware Manufacturers Association
- BIA Brick Institute of America
- BIFMA Business Institutional Furniture Manufacturers Association
- CAGI Compressed Air and Gas Institute
- CAUS Color Association of the United States
- CBM Certified Ballast Manufacturers
- CCC Carpet Cushion Council
- CDA Copper Development Association
- CE Corps of Engineers
- CFR Code of Federal Regulations
- CGA Compressed Gas Association
- CISCA Ceiling and Interior Systems Construction Association
- CISPI Cast Iron Soil Pipe Institute
- CPSC Consumer Product Safety Commission
- CRI Carpet and Rug Institute
- CRSI Concrete Reinforcing Steel Institute
- CS Commercial Standard of NBS (U.S. Dept of Commerce)
- CTI Ceramic Tile Institute
- DFPA Douglas Fir Plywood Association

- DHI Door and Hardware Institute
- DLPA Decorative Laminate Products Association
- DOC U.S. Department of Commerce
- DOT Department of Transportation
- ECSA Exchange Carriers Standards Association
- EIA Electronic Industries Association
- EIMA Exterior Insulation Manufacturers Association
- EJMA Expansion Joint Manufacturer Association
- EPA Environmental Protection Agency
- FAA Federal Aviation Administration
- FCC Federal Communications Commission
- FGMA Flat Glass Marketing Association
- FHA Federal Housing Administration
- FM Factory Mutual Research Organization
- FS Federal Specifications
- FTIFacing Tile Institute
- GA Gypsum Association
- GSA General Services Administration
- HEI Heat Exchange Institute
- HI Hydronics Institute
- H.I. Hydraulic Institute
- HMA Hardwood Manufacturers Association
- HPMA Hardwood Plywood Manufacturers Association
- IBD Institute of Business Designers
- ICEA Insulated Cable Engineers Association, Inc.
- IEEE Institute of Electrical and Electronic Engineers, Inc.
- IESNA Illuminating Engineering Society of North America
- IGCC Insulating Glass Certification Council
- ILI Indiana Limestone Institute of America
- IMSA International Municipal Signal Association
- IRI Industrial Risk Insurers
- ISA Instrument Society of America
- ITE Institute of Transportation Engineers
- LIA Lead Industries Association, Inc.
- LPILighting Protection Institute
- MBMA Metal Building Manufacturer's Association
- MCAA Mechanical Contractors Association of America
- MFMA Maple Flooring Manufacturers' Association
- MIA Marble Institute of America
- ML/SFA Metal Lath/Steel Framing Association
- MSS Manufacturers Standardization Society of the Valve and Fittings Industry
- MUTCD Department of Transportation Manual on Uniform Traffic Control Devices
- NAAMM National Association of Architectural Metal Manufacturers

- NIMA North American Insulation Manufacturers Association
- NAPA National Asphalt Pavement Association
- NBFU National Board of Fire Underwriters
- NBGQA National Building Granite Quarries Association
- NBS National Bureau of Standards (U.S. Dept. of Commerce)
- NCMA National Concrete Masonry Association
- NCRPM National Council on Radiation Protection and Measurements
- NCSPA National Corrugated Steel Pipe Association
- NEC National Electrical Code (Published by NFPA)
- NECA National Electrical Contractors Association
- NEII National Elevator Industry, Inc.
- NEMA National Electrical Manufacturers Association
- NETA International Electrical Testing Association
- N.F.P.A. National Forest Products Association
- NFPA National Fire Protection Association
- NHLA National Hardwood Lumber Association
- NIST National Institute of Standards and Technology
- NLGA National Lumber Grades Authority
- NOFMA National Oak Flooring Manufacturers Association
- NPA National Particleboard Association
- NPCA National Paint and Coatings Association
- NRCA National Roofing Contractors Association
- NWMA National Woodwork Manufacturers Association
- OSHA Occupational Safety and Health Administration
- PCA Portland Cement Association
- PCI Precast/Prestressed Concrete Institute
- PDI Plumbing and Drainage Institute
- PE Professional Engineer
- REA Rural Electrification Administration
- RFCI Resilient Floor Covering Institute
- RMA Rubber Manufacturing Association
- RPLS Registered Professional Land Surveyor
- SDI Steel Deck Institute
- S.D.I. Steel Door Institute
- SFPA Southern Forest Products Association
- SGCC Safety Glazing Certification Council
- SIGMA Sealed Insulating Glass Manufacturers Association
- SJI Steel Joist Institute
- SMACNA Sheet Metal and Air Conditioning Contractors National Association
- SPIB Southern Pine Inspection Bureau
- SPRI Single Ply Roofing Institute
- SSPC Steel Structures Painting Council
- SSPMA Sump and Sewage Pump Manufacturers Association

- SWI Steel Window Institute
- SWPA Submersible Wastewater Pump Association
- TCA Tile Council of America
- TIMA Thermal Insulation Manufacturers Association
- TPITruss Plate Institute
- UL Underwriters Laboratory, Inc.
- USDA U.S. Department of Agriculture
- USPS U.S. Postal Service
- WCLIB West Coast Lumber Inspection Bureau
- WCMA Wallcovering Manufacturers Association
- WIC Woodwork Institute of California
- WLPDIA Western Lath, Plaster, Drywall Industries Association
- WRI Wire Reinforcement Institute
- WSC Water Systems Council
- WSFI Wood and Synthetic Flooring Institute
- WWPA Western Wood Products Association
- W.W.P.A. Woven Wire Products Association

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General Conditions and Division 1 requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 OFFICE AT THE WORK SITE (JOB SHACK)

- A. Not in Contract

3.2 WATER FOR CONSTRUCTION

- A. All water required for and in connection with the Work to be performed shall be furnished by and at the expense of the Contractor through meters installed on hydrants or by other methods approved by the water department or authority having jurisdiction. Water and meters may be available from Owner at standard rates. All costs for obtaining a water meter shall be the responsibility of the Contractor. The Contractor shall contract the Water and Wastewater Utility and arrange to pick up the meter. Contractor shall install a double-check valve assembly on the fire hydrant between the hydrant and the meter, to prevent backflow in the event of pressure failure. Contractor shall supply all necessary tools, hose and pipe, and shall make necessary arrangements for securing and transporting such water and shall take water in such a manner, and at such times, that will not produce a harmful drain or decrease of pressure in the Owner's water system. It shall be the Contractor's responsibility to make arrangements with the Water and Wastewater Utility for the metering and reporting of the amount of water used. Water shall not be used in a wasteful manner. Standard hydrant wrenches shall be used for opening and closing of fire hydrants. In no case shall pipe wrenches be used for this purpose. Temporary lines shall be removed when no longer required.

3.3 SANITARY FACILITIES

- A. Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing Work or furnishing services on the Project.

- B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet shall be furnished for each 20 employees. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

3.4 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. Contractor shall protect, shore, brace, support and maintain all underground pipes conduits, drains, and other underground construction uncovered or otherwise affected by the Contractor's operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards, parkways, and medians, shall be restored to their original condition, whether within or outside the easement/right-of-way. All replacements shall be made with new materials.
- B. Contractor shall be responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property, which may be caused by transporting equipment, materials, or men to or from the Work, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.
- C. All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

3.5 TREE AND PLANT PROTECTION

- A. All trees and other vegetation which must be removed to perform the Work shall be removed and disposed of by the Contractor; however, no trees or cultured plants shall be unnecessarily removed unless their removal is indicated on the Drawings. All trees and plants not removed shall be protected against injury from construction operations.
- B. No tree shall be removed outside of the project limits, except where authorized by the E/A. Whenever practicable, Contractor shall tunnel beneath trees in yards and parking lots when on or near the line of trenching operations. Hand excavations shall be employed as necessary to prevent injury to trees. Care shall be taken with exposed roots, unearthed during construction, so that roots do no dehydrate causing tree damage.
- C. Trees considered by the E/A to have any significant effect on construction operations are indicated on the Drawings and those which are to be preserved are so indicated.
- D. Contractor shall take extra measures to protect trees designated to be preserved, using methods shown on the Drawings.

3.6 SECURITY

- A. Contractor shall be responsible for protection of the site, and all Work, materials, equipment, and existing facilities hereon, against vandals and other unauthorized persons.
- B. No claim shall be made against Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to the Owner property resulting from Contractor's failure to provide security measures as specified.
- C. Security measures shall be at least equal to those usually provided by Owner to protect existing facilities during normal operations, and shall also include such additional security fencing, barricades, lighting, and other measures as required to protect the site. When required, the Contractor shall provide a security plan to the Owner for review as to appropriateness of the security measures proposed.

3.7 ACCESS ROADS

- A. Contractor shall establish and maintain temporary access roads to various parts of the site as required to complete the Project. Such roads shall be available for the use of all others performing Work or furnishing services in connection with the Project.

3.8 PARKING

- A. Contractor shall provide and maintain suitable parking areas for the use of all construction workers and others performing Work or furnishing services in connections with the Project, as required, to avoid any need for parking personal vehicles where they may interfere with public traffic, the OWNER's operations or construction activities.

3.9 DUST CONTROL

- A. Dust control during construction of this Project shall conform to State Soil Erosion Control Standards. No direct payment will be made for dust control. Dust Control shall be considered subsidiary work relating to various Bid items of the Contract.

3.10 TEMPORARY DRAINAGE PROVISIONS

- A. Contractor shall be responsible for providing for the drainage of stormwater and such water as may be applied or discharged on the site in performance of the Work. Contractor shall obtain E/A approval for temporary drainage facilities which will handle, carry through, or divert around his Work all drainage flow, including storm flow

and flows created by construction activity, to prevent silting of waterways or flooding damage to the property and adjacent property.

3.11 EROSION CONTROL

- A. See Specification Section 01570

3.12 POLLUTION CONTROL

- A. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and the substances resulting from construction activities. No sanitary waste will be permitted to enter any drain or watercourse. No sediment, debris or other substance will be permitted to enter sanitary sewers and reasonable measures shall be taken by Contractor to prevent such materials from entering any drain or watercourse.
- B. Contractor shall observe the rules and regulations of the State of New Jersey and agencies of the U.S. Government prohibiting the pollution of any lake, stream, river, or wetland by the dumping of any refuse, rubbish, dredge material, or debris therein.

3.13 NOISE CONTROL

- A. Contractor shall comply with the local Noise Ordinance. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound level in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

3.14 FENCES

- A. All existing fences affected by the Work shall be maintained by the CONTRACTOR until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across any construction easement, adequate gates shall be installed. Gates shall be kept closed and locked at all times when not in use.
- B. Upon completion of the Work across any tract of land, Contractor shall restore all fences to preconstruction, or to a better, condition and to their preconstruction location.

3.15 MAIL BOXES

- A. Contractor shall remove, reset temporarily, and relocate permanently all mail boxes that are within construction site limits conforming to requirements of United State Postal Service. Mailboxes shall not be laid on the ground, but shall be temporarily reset the same day as removed. Payment for removing and resetting of mail boxes will not be paid for directly, but will be considered subsidiary to the various Bid items. Any damage to mail boxes or posts shall be the responsibility of the Contractor.

3.16 EMERGENCY FACILITIES

- A. Free access shall be maintained at all times to fire lanes and emergency and utility control facilities such as fire hydrants, fire alarm boxes, police call boxes, and utility valves, manholes, junction boxes, etc. In the event that it is necessary to make one of these facilities temporarily inaccessible, Contractor shall obtain approval of such action, and schedule, of Work from the Owner. Contractor shall also provide at least 24 hours prior notice to the Fire Department, Police Department, and City Department governing the affected utility. The same Department(s) shall be promptly notified by the Contractor when such facilities are placed back in unobstructed service.

3.17 NOTIFICATION OF OWNERS

- A. Unless otherwise indicated, the OWNER will notify property owners abutting the right-of-way of impending construction. The Contractor shall exercise diplomacy and tact with individual property owners.

3.18 MAINTENANCE OF TRAFFIC

- A. It shall be sole responsibility of the Contractor to furnish, install, and maintain barricades, detour signs, warning signs, lights and all regulatory traffic control devices of the size and type specified, at locations indicated, or as directed or approved by the OWNER in accordance with the Manual on Uniform Traffic Control Devices, (MUTCD), Part VI, Traffic Control for Street and Highway Construction and Maintenance Operations and the NJDOT standards.
- B. Barricades placed in the roadway for the purpose of warning or directing traffic shall have Type "A" or Type "C" lights attached for use during hours of darkness.
- C. Throughout the life of the Contract, all existing roads and Traffic Control devices included in the Work shall be maintained by the Contractor to a condition, in the opinion of the Owner which is equal to or better than that which existed when Work commenced. Maintenance of existing roads and devices shall take priority over all other work items and shall be subject to a seven-day-a-week, 24-hours-per-day time frame. The Contractor shall provide a smooth and safe riding surface for all vehicles

along the route of this Project. This could include, but not be limited to, small cars, motorcycles, mopeds and bicycles. If the condition of the street surface deteriorates, for any reason, Contractor shall take necessary steps to insure immediate restoration.

- D. During construction of streets, drainage, and utility projects, if conditions of existing street surface require maintenance to upgrade from their state when the Work began, a separate pay item may be included in Bid; Otherwise, maintenance work will not be paid for directly but will be considered subsidiary to various Bid items of this Contract.
- E. In the event that Contractor fails, in opinion of Owner, to maintain a smooth surface for public comfort, fails to provide ingress and egress to private property, and/or does not provide and maintain proper traffic control devices, Owner may provide these services and deduct any cost thereof, including overtime and administrative expenses, from all estimates thereafter due the Contractor. Such action by the Owner shall not relieve the Contractor of his liability to protect the public at construction site.
- F. A permit must be obtained from New Jersey Department of Transportation (NJDOT), prior to Work being performed on state highway routes passing through the City.
- G. Contractor shall notify the Police Department, Fire Department, EMS, and Department of Public Works and Transportation, at least four Working Days in advance of beginning proposed Work with intention to close or partially any block street or any part thereof, or of any construction affecting free flow of traffic. The Contractor shall plan and adequately provide barricades and warning devices. The same parties shall be notified when normal traffic flow is restored.
- H. Should the Contractor, in his operations, reduce an existing two-way roadway to less than 20 feet in width, Contractor shall provide flagging operations and route traffic through the construction area one lane at a time.
- I. The Contractor's Flaggers shall be required any time it is necessary for the Contractor OR's equipment to move into or across an open traffic lane, or at other such times as directed by the Owners Representative. A flagger shall be utilized to aid exit of hauling equipment from Work area to open traffic lanes. Flaggers shall be dressed and conduct operations in accordance with Manual on Uniform Traffic Control Devices and the Transportation Criteria Manual. Flagging operations shall be the sole responsibility of the Contractor.
- J. The Contractor and Subcontractor shall confine their activities to the immediate area of the construction site and provide the following:
- K. Appropriate temporary fences, barricades, and/or Metal Beam Guard Fence if required, for site work involving excavation, utility extensions, remote construction work or other circumstances involving safety of public or protection of the work in progress.
- L. Warning lights at open trenches, excavations, etc. during hours from dusk to dawn each day. Protection of structures, utilities, sidewalks, pavements, and other facilities

immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.

END OF SECTION 01 50 00

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 1 Section "Allowances" for products selected under an allowance.
 - 2. Division 1 Section "References" for applicable industry standards for products specified.
 - 3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown, or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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

1.3 SUBMITTALS

- A. **Substitution Requests:** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. **Substitution Request Form:** Use form provided at end of Section.
 2. **Documentation:** Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.

- k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 10 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

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

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products to allow for inspection and measurement of quantity or counting of units.

6. Store materials in a manner that will not endanger Project structure.
 7. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

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.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicate, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specifications paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - a. Substitutions may be considered, unless otherwise indicated.
2. Manufacturer/Source: Where Specifications paragraphs or subparagraphs titled "Manufacturer" or "Source" name a single source or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
3. Products: Where Specifications paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
4. Manufacturers: Where Specifications paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions may be considered, unless otherwise indicated.
5. Basis-of-Design Product: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the

product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

a) Substitutions may be considered, unless otherwise indicated.

6. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.
7. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
8. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Engineer will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Engineer.
- B. Conditions: Engineer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include

- compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 4. Substitution request is fully documented and properly submitted.
 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 7. Requested substitution is compatible with other portions of the Work.
 8. Requested substitution has been coordinated with other portions of the Work.
 9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product.
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes general procedures requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section "Submittal Procedures" for submitting surveys.

1.2 SUBMITTALS

- A. Qualification Data: For land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Certified Surveys: Submit 5 copies signed by land surveyor.

- D. As-built Survey: Submit 10 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

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

PART 2 - PART 2 PRODUCTS (NOT USED)

PART 3 - PART 3 EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.

- b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine Roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. 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 and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Engineer. Include a detailed description of problems encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation".

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 Engineer promptly.

- B. General: Engage a land surveyor licensed in the State of New Jersey, to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Engineer when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer.

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 charge or relocate existing benchmarks or control points without prior written approval of Engineer. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Engineer 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 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.
- 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 sitework.
- E. As-built Survey: Prepare an as-built survey showing significant features and improvements for the Project. Include on the survey a certification, signed by land surveyor, that site and building improvements and levels of Project are accurately positioned as shown on the survey.
 1. Show survey control points, streets, site improvements, utilities as required by authority having jurisdiction, existing improvements and significant vegetation, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey".

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet in space without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

- G. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 1. Allow for building movement, including thermal expansion and contraction.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Progress cleaning requirements specified in this article are in addition to requirements specified in General Conditions, Supplementary General Conditions and Special Conditions.
- B. Clean Project Site and work areas daily, including common area. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg. F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- C. Site: Maintain Project site free of waste materials and debris.
- D. 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.
- E. 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.
- F. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- G. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 73 00

SECTION 01 77 00 – CLOSE OUT PROCEDURES

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Operation and maintenance manuals.
 - 4. Warranties.
 - 5. Instruction of Owner's personnel.
 - 6. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
 - 3. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. Complete startup testing of systems.
 9. Submit test/adjust/balance records.
 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 11. Advise Owner of changeover in heat and other utilities.
 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer 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 Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures".
 2. Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer 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.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Contractor.
 - e. Page Number.

1.5 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - c. Note related Change Orders, Record Drawings, and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: 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.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
 - 1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.

e. Piping diagrams.

2. Maintenance Data:

- a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.
 - h. Copies of warranties and bonds.
- B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL", Project name, and subject matter of contents.

1.7 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 by 11-inch 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.

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

PART 2 – PRODUCTS

2.1 MATERIALS

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

PART 3 – EXECUTION

3.1 DEMONSTRATION AND TRAINING

- A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.
 - 2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 - 3. Schedule training with Owner with at least seven days' advance notice.
 - 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instructions for the following:
 - 1. System and design operational philosophy.
 - 2. Review of documentation.
 - 3. Operations.
 - 4. Adjustments.
 - 5. Troubleshooting.
 - 6. Maintenance.
 - 7. Repair.

3.2 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average 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 portion of the Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

- C. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.
 - a. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - b. Replace parts subject to unusual operating conditions.
 - c. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - d. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - e. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - f. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - g. Leave Project clean and ready for occupancy.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner’s property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 03 30 00 – CONCRETE WORK

PART 1 – GENERAL

1.1 CODES AND STANDARDS

- A. ACI 301 "Specifications for Structural Concrete Buildings"; ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provisions except as otherwise indicated.

1.2 CONCRETE TESTING SERVICE

- A. Contractor will employ separate testing laboratory to evaluate concrete delivered to and placed at site.
- B. Certificates, signed by concrete producer and Contractor, may be submitted in lieu of material testing when acceptable to Engineer.
- C. Quality Control: The Contractor's testing laboratory will perform sampling and testing during concrete placement, which may include the following, as directed by Engineer. This testing does not relieve Contractor of responsibility of providing concrete in compliance with specifications. Contractor may perform additional testing as necessary, at no expense to Owner, to ensure quality of concrete.
 - 1. Sampling: ASTM C 172.
 - 2. Slump: ASTM C 143, one of test for each load at point of discharge.
 - 3. Air Content: ASTM C 173, one for each set of compressive strength specimens.
 - 4. Compressive Strength: ASTM C 39, one set for each 50 cu. yds. or fraction thereof of each class of concrete; one specimen tested at 7 days, one specimen tested 28 days, and one retained for later testing if required.

1.3 SUBMITTALS

- A. Test results will be reported in writing to Engineer, Contractor, and concrete producer within 24 hours after tests are made.
- B. Manufacturer's Data: Submit manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials and others as requested by Engineer.
- C. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs.
- D. Mix Proportions and Design: Proportion mixes complying with mix design procedures specified in ACI 301.

1. Submit written report to Engineer for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Engineer.
2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Engineer.
3. Use air-entraining admixture in all concrete, providing not less than 4 percent nor more than 6 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type as required.

2.2 AGGREGATES

- A. ASTM C 33, except local aggregates of proven durability may be used when acceptable to Engineer.

2.3 WATER

- A. Drinkable.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Water-Reducing Admixture: ASTM C 494; type as required to suit project conditions. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable.

2.5 RELATED MATERIALS

- A. Membrane-Forming Curing Compound: ASTM C 309, Type I.
- B. Joint Fillers: ASTM D 1751 unless otherwise noted.

2.6 FORM MATERIALS

- A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

- B. Exposed Concrete Surfaces: Suitable material to suit project conditions.

2.7 REINFORCING MATERIALS

- A. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.
- B. Welded Wire Fabric: ASTM A 185.

PART 3 - EXECUTION

3.1 READY MIX CONCRETE

- A. Ready-Mix Concrete: ASTM C 94.

3.2 FORMWORK

- A. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- B. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.
- C. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during concrete placement if required to eliminate mortar leaks.

3.3 REINFORCEMENT

- A. Position, support, and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- B. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.

3.4 JOINTS

- A. Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair strength and appearance of structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and random cracking.

3.5 INSTALLATION OF EMBEDDED ITEMS

- A. Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting diagrams, templates, and instructions provided by others for locating and setting.

3.6 CONCRETE PLACEMENT

- A. Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- B. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.
- C. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

3.7 CONCRETE FINISHES

- A. Exposed-to-view Surfaces: Provide a smooth finish for exposed concrete surfaces. Remove fins and projections, patch defective areas with cement grout, and rub smooth.
- B. Broom Finish: Apply non-slip broom finish to monolithic slab surfaces that are exposed-to-view and are subject to pedestrian traffic.

3.8 CURING

- A. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

END OF SECTION 03 30 00

SECTION 22 11 13 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes water-distribution piping and specialties outside the building for the following:
 - 1. Water services.
- B. Contractor furnished products as required by the approving Authority to construct and test a complete working water service system as indicated on the plans.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Water Piping Installation
 - 2. Piping specialties.
 - 3. Valves and accessories.
 - 4. Delete water meters below if provided by utility company.
 - 5. Water accessories.
- B. Shop Drawings: For the following:
 - 1. Water main piping and accessories.
 - 2. Valves
 - 3. Testing Procedures
- C. Coordination Drawings: For piping and specialties including relation to other services in same area. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- D. Field Quality-Control Test Reports: From Contractor.
- E. Operation and Maintenance Data: For specialties to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 include the following:
 - 1. Connections
 - 2. Valves.

- F. Record Drawings: At project closeout, submit record as-built drawings of installed water piping in accordance with contract requirements and authority having jurisdiction.

1.4 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size and dimensional requirements of piping and specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- B. 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 disinfecting.
 - 3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- C. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Comply with FM's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- G. NSF Compliance:
 - 1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.6 PROJECT CONDITIONS

- A. 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 Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

1.7 COORDINATION

- A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 Copper Tube and Fittings (Domestic water service line)

- A. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
 - 1. Copper Tube: ASME B16.18, cast-copper-alloy or ASME B 16.22, 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 Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

2.4 CPVC PIPING (Exterior use only to exterior waterers and ground hydrants)

- A. CPVC Pipe: ASTM F 441/F 441M, Schedule 80
 - 1. CPVC Socket Fittings: ASTM F 439 for Schedule 80
- B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.
- C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.5 DUCTILE-IRON PIPE AND FITTINGS

- A. Class 52 Ductile Iron Cement Lined (Double thickness) US Pipe Tylon.
 - 1. Joint with Fieldlok Gasket (US Pipe or equal) fittings shall be mechanical joint with retainer glands (Ebba Iron Series 1100 mega lugs). All pipes/fittings to be encased in 8 mil polyethylene encasement-Repcor-8 mil ASTM D1248-89 TYPE 1 Black.

2.6 CORROSION-PROTECTION ENCASEMENT FOR PIPING

- A. Encasement for Underground Metal Piping: PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.

2.7 GATE VALVES

- A. AWWA, Cast-Iron Gate Valves: or as per the approving authority.
 - 1. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Mueller Model No. A-2360-20 (mj) or A-2360-6 (f).
 - a. Minimum Working Pressure: 200 psig.
 - b. End Connections: Mechanical joint.
 - c. Interior Coating: Complying with AWWA C550.

2.8 GATE VALVE ACCESSORIES AND SPECIALTIES

- A. Tapping-Sleeve Assemblies: Comply with MSS SP-60. Include sleeve and valve compatible with drilling machine.
 - 1. 1. Ductile Iron Type – as approved by the Authority having jurisdiction Mueller Model No.
 - a. H-615 (sleeve) for DIP.
 - b. H-687 (valve)
 - c. H-619 (sleeve) for A.C. pipe.
 - d. Smith-Blair model 663 stainless steel sleeve w/304 s.s. nuts and bolts for A.C. pipe (16" diameter or larger)
- 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," bottom section with base of size to fit over valve, and approximately 5-inch diameter barrel. 5 ¼ shaft, 2 piece Bing HDM & Taylor fig. No. 4908 or Tyler pipe.

2.9 CHECK VALVES

- A. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.
- B. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.10 PIPING JOINING MATERIALS

- A. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.
 - 1. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Solvent cement and adhesive primer 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."

2.11 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.

- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Piping Specialties Products.
 - c. Ford Meter Box Company, Inc. (The).
 - d. JCM Industries.
 - e. Romac Industries, Inc.
 - f. Smith-Blair, Inc.; a Sensus company.
 - g. Viking Johnson.
- D. Plastic-to-Metal Transition Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. Harvel Plastics, Inc.
 - c. Spears Manufacturing Company.
 - 2. Description:
 - a. CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket end.
- E. Plastic-to-Metal Transition Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Colonial Engineering, Inc.
 - b. NIBCO Inc.
 - c. Spears Manufacturing Company.
 - 2. Description:
 - a. CPVC four-part union.
 - b. Brass threaded end.
 - c. Solvent-cement-joint plastic end.
 - d. Rubber O-ring.
 - e. Union nut.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earthworks" for excavating, trenching, and backfilling

3.2 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.
- B. Retain paragraph above if tap is made by utility company; retain paragraph below if tap is made by Contractor.
- C. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- D. Retain paragraph and subparagraphs below for tapping of pipe with connections larger than NPS 2 (DN 50).
- E. Retain first paragraph and subparagraphs below for tapping of pipe with connections NPS 2 (DN 50) and smaller.
- F. Install piping by tunneling, jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- G. 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 piping with caps, plugs, or flanges as required for piping material on plans.
- H. All pipe shall be laid on a solid, dry foundation. Pipe shall be laid true to the lines and grades shown on the Contract Drawings with the bell ends upstream. Each section of pipe shall rest upon the pipe bed the full length of its barrel and for a minimum of one-half its diameter with recesses excavated to accommodate bells and joints. Any pipe which has its grade or joints disturbed after laying shall be taken up and re-laid at the Contractor's expense. The Contractor shall close the ends of all unconnected pipe with a waterproof stopper. Bedding shall be in conformance with the standard detail.
- I. All pipes and joints shall be installed in accordance with the manufacturer's requirements. When the requirements contained in this specification exceed the manufacturer's specifications, the specifications contained herein shall govern.
- J. Piping and appurtenances shall be cleansed of foreign matter before being lowered into the trench and shall be kept clean during the laying operations by plugging or other approved means. Cutting of pipe shall be done in a neat and workmanlike manner with an approved type of mechanical cutter without damage to the pipe or lining so as to leave a smooth end at right angle to the axis of the pipe.
- K. All gaskets and mating surfaces shall be thoroughly cleaned and lubricated in accordance with the manufacturer's specifications. The pipe shall be aligned with the previously installed pipe

and, with gasket in place, put together. After pipes are put together, the joint shall be inspected to verify that the gasket is properly positioned and that the joint has been properly made and is tight.

- L. Underground installations for CPVC ASTM D2774 "Underground Installation of Thermoplastic Water Pressure Piping Systems"

3.3 JOINT CONSTRUCTION

- A. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
- B. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix

3.4 ANCHORAGE INSTALLATION

- A. Install anchorage for tees, plugs and caps, bends, crosses, valves, and hydrant branches.
- B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 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/FM 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. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- D. Water-Regulating Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.
- E. Relief Valves: Install aboveground with shutoff valve on inlet.

3.6 CONNECTIONS

- A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

- B. Piping installation requirements are specified in other Division 2 Sections. Drawings indicate general arrangement of piping and specialties.
- C. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve as required by jurisdiction having authority.
- D. Ground equipment according to Division 16 Section "Grounding and Bonding."
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.7 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently, if applicable. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. The Contractor shall provide for hydraulic pressure test of the water main before making the final connection into existing pipes as follows or as required by the authority having jurisdiction:
 - 1. Hydraulic pressure testing shall conform to AWWA Standard C-600.
 - 2. A hydrostatic test pressure shall be maintained in the pipeline for a minimum period of two (2) hours. At the end of the test period, if the test pressure has remained constant, the pipeline shall have passed the test. If the pipe does not hold pressure, the Contractor shall locate the leak, permanently repair the section of piping where the leak is occurring to the satisfaction of the Authority having jurisdiction, and retest the pipe line as specified above. This process shall be repeated until the pipeline has successfully passed the pressure test.
 - 3. Contractor shall make certain that all air is expelled from a pipeline before it is tested. All caps, plugs, and fittings shall be adequately braced and anchored to withstand the test pressures.
 - 4. Hydrostatic test pressure shall be 150 psi or 1.5 times the working pressure measured at the highest elevation in the pipeline under test, whichever is greater.
 - 5. The leakage test may be performed concurrently with the pressure test. If no pressure drop is seen during pressure test, the leakage test may be waived by the authority having jurisdiction.
 - 6. If leakage is encountered during the hydrostatic test, the Contractor shall begin this leakage test which shall be accomplished by increasing the hydrostatic pressure to a specified value and maintaining of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled.
 - 7. The hydrostatic pressure for the leakage test shall be 150 psi.
- C. Prepare reports of testing activities and submit to Owner and authority having jurisdiction.

3.8 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. See Division 2 Section "Earthwork" for underground warning tapes.

3.9 WATER SERVICE DISINFECTION

- A. All water pipelines shall be disinfected in conformance with the latest edition of AWWA Standard C-651 for disinfecting water mains prior to being put into service. Hypochlorite and liquid chlorine for use in disinfection shall conform to AWWA Standards B-300 and B-301, respectively.
- B. All pipelines shall be thoroughly flushed before introduction of chlorinating material which shall be done in an approved manner. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million. The chlorinated water shall be retained in the main for at least 24 hours during which time all hydrants and valves in the section treated shall be operated to be disinfected. The heavily chlorinated water shall then be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system. The Contractor shall then have samples taken by an approved testing laboratory and bacteriological analyses made. Should the initial treatment prove ineffective, disinfection shall be repeated until satisfactory samples must be obtained.
- C. After final flushing and before the water main is placed in service, a sample or samples shall be collected from the end of the line and along the length of the mains. If corporation stops for water services are not available or if additional ones are needed to perform bacteriological tests, the Contractor shall install them at no additional cost to the Owner. Upon successful completion of bacteriological tests, the additional corporation stops shall be shut off and abandoned. Samples shall be tested for bacteriological quality in accordance with Standard Methods, and shall show the absence of coliform organisms.
- D. Prepare reports of purging, disinfecting activities and provide bacteria test results and chain of custody documentation to the Owner and authority having jurisdiction.

END OF SECTION 22 11 13

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
 - 2. Encasement for piping.
 - 3. Specialty valves.
 - 4. Flexible connectors.

1.3 SUBMITTALS

- A. Product Data: For the following products:
 - 1. Specialty valves.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Flexible connectors.
 - 5. Water penetration systems.
- B. Water Samples: Specified in "Cleaning" Article.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 61 for potable domestic water piping and components.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not proceed with interruption of water service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
 - 1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
 - 2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
 - 3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
 - 4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
 - 5. Copper Pressure-Seal-Joint Fittings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Elkhart Products Corporation; Industrial Division.
 - 2) NIBCO INC.
 - 3) Viega; Plumbing and Heating Systems.
 - b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
- B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Copper Pressure-Seal-Joint Fittings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Elkhart Products Corporation; Industrial Division.
 - 2) NIBCO INC.
 - 3) Viega; Plumbing and Heating Systems.
 - b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.3 PIPING JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.4 SPECIALTY VALVES

- A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.
- B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 TRANSITION FITTINGS

- A. General Requirements:
 1. Same size as pipes to be joined.
 2. Pressure rating at least equal to pipes to be joined.
 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Dresser Piping Specialties.

- c. Ford Meter Box Company, Inc. (The).
- d. JCM Industries.
- e. Romac Industries, Inc.
- f. Smith-Blair, Inc; a Sensus company.
- g. Viking Johnson; c/o Mueller Co.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Hart Industries International, Inc.
 - d. Jomar International Ltd.
 - e. Matco-Norca, Inc.
 - f. McDonald, A. Y. Mfg. Co.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - h. Wilkins; a Zurn company.
 - 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Nipples:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Elster Perfection.
 - b. Grinnell Mechanical Products.
 - c. Matco-Norca, Inc.
 - d. Precision Plumbing Products, Inc.
 - e. Victaulic Company.
 - 2. Description:

- a. Standard: IAPMO PS 66
- b. Electroplated steel nipple. complying with ASTM F 1545.
- c. Pressure Rating: 300 psig at 225 deg F.
- d. End Connections: Male threaded or grooved.
- e. Lining: Inert and noncorrosive, propylene.

2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Flex-Hose Co., Inc.
 2. Flexicraft Industries.
 3. Flex Pression, Ltd.
 4. Flex-Weld, Inc.
 5. Hyspan Precision Products, Inc.
 6. Mercer Rubber Co.
 7. Metraflex, Inc.
 8. Proco Products, Inc.
 9. Tozen Corporation.
 10. Unaflex, Inc.
 11. Universal Metal Hose; a Hyspan company
- B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 1. Working-Pressure Rating: Minimum 200 psig.
 2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
 3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve immediately upstream of each dielectric fitting.
- D. Install domestic water piping level without pitch and plumb.
- E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- H. Install piping adjacent to equipment and specialties to allow service and maintenance.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."
- Q. Underground piping shall be installed with minimum 48" earth cover and bedding as recommended by the CDA. Joints underground shall be kept to a minimum.

- R. Piping installed in exterior walls shall be located on warm side of building insulation.

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- F. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."
 - 1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
 - 2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.5 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. NPS 1-1/2 and Smaller: Fitting-type coupling.

2. NPS 2 and Larger: Sleeve-type coupling.

3.6 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
 1. Vertical Piping: MSS Type 8 or 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 6. NPS 6: 10 feet with 5/8-inch rod.
 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.

- F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water piping with shutoff valve; extend and connect to the following:
 - 1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
 - 2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 IDENTIFICATION

- A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.11 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
4. Remove and clean strainer screens. Close drain valves and replace drain plugs.
5. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
6. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.13 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Under-building-slab and underground, domestic water piping, NPS 2 and smaller, shall be the following:
 1. Hard or soft copper tube, ASTM B 88, Type L; wrought-copper solder-joint fittings; and brazed joints.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

3.14 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 - 2. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Backflow preventers.
 - 2. Water pressure-reducing valves.
 - 3. Strainers.
 - 4. Hose stations.
 - 5. Hose bibbs.
 - 6. Wall hydrants.
 - 7. Water-hammer arresters.
 - 8. Air vents.
 - 9. Trap-seal primer systems.
 - 10. Specialty valves.
 - 11. Flexible connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
 - b. Cash Acme; a division of Reliance Worldwide Corporation.
 - c. Conbraco Industries, Inc.
 - d. FEBCO; a division of Watts Water Technologies, Inc.
 - e. Rain Bird Corporation.
 - f. Toro Company (The); Irrigation Div.
 - g. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
 - h. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
 - 2. Standard: ASSE 1001.
 - 3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: Threaded.
 - 6. Finish: Chrome plated.
- B. Hose-Connection Vacuum Breakers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Arrowhead Brass Products.
 - b. Cash Acme; a division of Reliance Worldwide Corporation.
 - c. Conbraco Industries, Inc.
 - d. Legend Valve.
 - e. MIFAB, Inc.
 - f. Prier Products, Inc.

- g. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
 - h. Woodford Manufacturing Company; a division of WCM Industries, Inc.
 - i. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
 - j. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
- 2. Standard: ASSE 1011.
 - 3. Body: Bronze, nonremovable, with manual drain.
 - 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 5. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers (RPZ-1 and RPZ-2):

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
 - b. Conbraco Industries, Inc.
 - c. FEBCO; a division of Watts Water Technologies, Inc.
 - d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
- 2. Standard: ASSE 1013.
- 3. Operation: Continuous-pressure applications.
- 4. Body: Bronze for NPS 2 and smaller; End Connections: Threaded for NPS 2 and smaller.
- 5. Configuration: Designed for horizontal, straight-throughflow.
- 6. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 WATER PRESSURE-REDUCING VALVES

A. Water Regulators (PRV):

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Cash Acme; a division of Reliance Worldwide Corporation.

- b. Conbraco Industries, Inc.
 - c. Honeywell International Inc.
 - d. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig
4. Size: 2" NPS.
5. Design Outlet Pressure Setting: 60 psig
6. Body: Bronze.
7. End Connections: Threaded.

2.4 HOSE STATION

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. ARCHON Industries, Inc.
 2. Armstrong International, Inc.
 3. Cooney Brothers, Inc.
 4. DynaFluid Ltd.
 5. Leonard Valve Company.
 6. Strahman Valves, Inc.
- B. Hot- and Cold-Water Hose Stations (HRF-1):
 1. Standard: ASME A112.18.1.
 2. Faucet Type: Blending valve.
 3. Body Material: Bronze with stainless-steel wetted parts.
 4. Body Finish: chrome plated.
 5. Mounting: Wall, with reinforcement.
 6. Supply Fittings: Two NPS 1/2 gate, globe, or ball valves and check valves and, water tubing. Omit check valves if check stops are included with fitting.
 7. Hose: 100 feetlong (Supplied separately with hose reel (HR-1).
 8. Nozzle: With hand-squeeze, on-off control.
 9. Vacuum Breaker: Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011.

2.5 HOSE BIBBS

- A. Hose Bibbs (HB-1).
 1. Standard: ASME A112.18.1 for sediment faucets.
 2. Body Material: Bronze.
 3. Seat: Bronze, replaceable.

4. Supply Connections: NPS 3/4 threaded joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Finished Rooms: Chrome or nickel plated.
9. Operation for Finished Rooms: Wheel handle.
10. Include integral all flange with each chrome- or nickel-plated hose bibb.

2.6 WALL HYDRANTS

A. Nonfreeze Wall Hydrants (FPWH):

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or designation or comparable product by one of the following:
 - a. Josam Company.
 - b. MIFAB, Inc.
 - c. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
2. Standard: ASME A112.21.3M for concealed outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounted with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze
12. Operating Keys(s): Two with each wall hydrant.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.

6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. Precision Plumbing Products, Inc.
 - e. Sioux Chief Manufacturing Company, Inc.
 - f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - g. Watts Drainage Products.
 - h. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.9 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F Float: Replaceable, corrosion-resistant metal.
3. Mechanism and Seat: Stainless steel.
4. Size: NPS 3/8 minimum inlet.
5. Inlet and Vent Outlet End Connections: Threaded.

2.10 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems (TP):

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Precision Plumbing Products, Inc.
 - b. Sioux Chief Manufacturing Company, Inc.
 - c. MIFAB, Inc.
2. Standard: ASSE 1044.
3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
4. Cabinet: Surface-mounted steel box with stainless-steel cover.
5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
 - a. 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.
6. Vacuum Breaker: ASSE 1001.
7. Number Outlets: Three.
8. Size Outlets: NPS 1/2.

PART 3 - EXECUTION

3.1 INSTALLATION

- #### **A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.**
1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
 - C. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve and backflow preventer.
 - D. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.
 - E. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.
 - F. Install water-hammer arresters in water piping according to PDI-WH 201.
 - G. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.
 - H. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- B. Fire-retardant-treated-wood blocking is specified in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Test each reduced-pressure-principle backflow preventer backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.

END OF SECTION 22 11 19

SECTION 22 13 13 – FACILITY SANITARY SEWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including general and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

- A. This Section includes sanitary sewerage outside the building.
- B. Related Sections include the following:
 - 1. Division 01 Specification Sections, Apply to this Section.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene-monomer rubber.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.5 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Connections to existing manhole structure.
 - 2. Connections to existing sanitary sewer main.
 - 3. Manhole structures
 - 4. Cleanouts and pipe material.
 - 5. Pipe and Structure Testing Methodology
- B. Delete paragraph below if not required.

- C. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
- D. Coordination Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and vertical scale of not less than 1-inch equal's 5 feet (1:50). Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- E. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Delete paragraph below if no structures or piping is to be closed and abandoned.
- C. Locate existing structures and piping to be closed and abandoned.
- D. 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 Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. PVC Backwater Valves and Cleanouts:

- a. Canplas, Inc.
- b. IPS Corp.
- c. NDS, Inc.
- d. Plastic Oddities, Inc.
- e. Sioux Chief Manufacturing Co., Inc.

2.2 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.3 PIPES AND FITTINGS

- A. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 (DN375) and Smaller: ASTM D3034, SDR 35, for solvent-cemented or gasketed joints.
 - a. ASTM F477, elastomeric seals.
 - b. Rubber ring gaskets in accordance with ASTM D-1869.

2.4 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Diameter: 48 inches (1200 mm) minimum, unless otherwise indicated.
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 5-inch (100-mm) minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 4. Riser Sections: 5-inch (100-mm) minimum thickness, and lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 229-mm) total thickness that matches frame and cover.
 8. Steps: Fiberglass or Aluminum, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch intervals. Steps: ASTM C 478 (ASTM C 478M), individual steps or ladder.

9. Pipe Connectors: Flexible rubber manhole sleeves or boot secured to pipe with stainless steel strapping or equal. PVC pipe to manhole seal shall be A-lok gasket or equal.
- B. Manhole Frames and Covers: ASTM A 48, Class 30B, Graycast-iron castings designed for heavy-duty service. Include indented top design with lettering as shown on the detail and as per the authority having jurisdiction.

2.5 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 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. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 deformed steel.
- C. Structure 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.
 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 2. Benches: Concrete, sloped to drain into channel.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water-cementitious materials ratio.
 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.6 PROTECTIVE COATINGS

- A. Description: One- or two-coat, coal-tar epoxy; 15-mil (0.38-mm) minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
 1. Concrete Manholes: On exterior and interior surfaces.
 2. Manhole Frames and Covers: On entire surfaces.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

1. PVC pipe shall be installed in accordance with ASTM sewer installation specifications D-2321 "underground installation of flexible thermoplastic sewer pipe".
Where requirements contained in this Specification exceed those in the manufacturer's specifications, or the ASTM specifications, this specification shall govern.
2. Pipe shall be protected during construction against possible flotation due to the pouring of concrete cradles or in case the trench becomes flooded prior to placing the backfill. Any flotation which does occur shall be the sole responsibility of the Contractor and shall be corrected by him without additional payment by the Owner.
3. All pipes, including laterals shall be constructed at least three (3) feet below the proposed grade (as measured from the top of the pipe to the finished elevations).
4. All pipe shall be carefully laid to its true alignment and grade. The Contractor shall carefully excavate the trench bottom to the proper elevations, and the maximum practical solid bearing area shall be provided throughout its entire length, prior to swinging the pipe into place.
5. Care shall be taken not to excavate below grade. Material excavated below adopted grade shall be replaced by material which meets with the approval of the Engineer, without any further payment.
6. All bedding, cradles and encasements shall be in allowance with the manufacturer's recommendations for each pipe material, depth and soil condition. The bedding shall not be less than the trench bedding as shown on the Construction Details Sheet.
7. All pipe shall be accurately centered and thoroughly driven home, prior to jointing. Where foundation conditions so require, the pipe shall be laid on broken stone, as indicated by the Engineer.
8. All trench excavations shall be dewatered prior to laying pipe. The Contractor shall place backfill materials by methods that will not disturb or damage the pipe. Do not permit compaction equipment to contact and damage the pipe. Before using heavy compaction or construction equipment directly over the pipe, place sufficient backfill. Immediately after the pipe is brought to final position, it shall be thoroughly secured and properly bedded, and ample support shall be provided to prevent settlement or disturbances.
9. The Contractor shall provide and securely install a mechanical plug in the upstream end of the last pipe laid on each working day.
10. The work to be performed in excavation shall include removal of all water to a point at least twenty-four (24") inches below the invert of any pipe laid. Complete dewatering of the trench includes stone or gravel used for control of water in the trench.
11. The price bid shall also include design, furnishing, placing and removal of any sheeting and shoring required, the dewatering, drainage, and pumping of all excavation, the protection of existing pipe lines and structures, and neatly cutting the pavement prior to excavation.
12. Trench Support- The contractor shall furnish, put in place, and maintain such trench support as necessary to support the sides of excavations and to prevent movement which could in any way injure the work or diminish the working spaces sufficiently to delay the work. Trench support shall be constructed as necessary for the protection of the work and for the safety of personnel and shall comply with the safety precautions outlined in the Code of Federal Regulations as required by the Federal Occupational and Safety Health Act of 1970 (OSHA) or latest edition. Sheeting shall be of a material that will not split

while being driven. Sheeting and bracing shall conform to the requirements of the "Construction Safety Code" of the Bureau of Engineering and Safety of the New Jersey Department of Labor and Industry. The Contractor shall have sole responsibility for safety measures at the job site.

13. Dewatering – When groundwater elevations are noted to be more than two feet above the trench, such that it may result in groundwater levels above the pipe bed, the contractor shall submit a dewatering plan prepared by a licensed dewatering contractor or New Jersey licensed Professional Engineer during shop print review for review and approval prior to construction.
14. The Contractor shall provide, operate, and maintain satisfactory facilities and equipment, including well points with which to collect and pump all water entering excavations or other parts of the work, to suitable places for disposal. All excavations shall be kept free of water to a point two feet below the inverts to prevent flooding and flotation until the work or structure to be built therein is completed and will not be damaged by the rising water level. Water shall be discharged through pipe or gutters, or any other suitable artificial means to catch basins, watercourses or ditches in such a manner as to avoid interference with business, pedestrian, and vehicular traffic and so as to prevent damage to property. Necessary precautions to prevent siltation of streams and watercourses will be required. In no case shall water be permitted to rise into or flow through a completed sanitary sewer.
15. Dewatering facilities and operations shall comply with all State and Federal laws and regulations governing the activity, including but not limited to, noise control, and discharge of pumped water.

B. Furnishing and placing bedding (including excavation)

1. The Contractor shall furnish, place, grade, and compact all broken stone for bedding and/or drainage as directed by the Engineer. Excavation for stone will be the responsibility of the Contractor.
2. Broken stone shall be clean, hard aggregate as approved by the Engineer; shall be accurately leveled to required grades, and shall be compacted by tamping or approved means.
3. In general, NJDOT Type I-9 will be required within roadways and ¾" stone bedding for the remaining areas. In special cases, where large volumes of water are encountered and the greater consolidation effects of broken stone may be considered of less importance, clean, sound screened NJDOT Stone No. 57 may, at the option of the Engineer, be permitted.
4. After compaction, the surface of the stone bedding material shall be thoroughly shaped to receive the pipe or other structure. Spaces shall be hollowed out to clear pipe bells so as to provide for maximum bearing.
5. Broken Stone Bedding shall be installed in accordance with the Bedding Detail or as directed by the Engineer. The Contractor will not be paid for broken stone installed in a trench which has been overexcavated by the Contractor, or for that stone which is being utilized for dewatering purposes, as opposed to bedding requirements, or in areas other than those specified by the Engineer.

- C. Backfill- All backfill shall consist of a suitable selected and approved earth generally from storage of approved excavated soil, free from rejected organic matter, boggy or peaty material, humus or other unsuitable material such as silt, rubbish, waste, ashes or cinders. If sufficient suitable material for backfill is not available from the excavated material, as deter

mined by the Engineer, the Contractor shall procure elsewhere a sufficient quantity of suitable material and shall furnish and place such material. No frozen earth shall be used as backfill, and all rocks larger than six (6) inches in the largest dimension shall be removed from acceptable earth and backfill. Unsuitable or excess backfill material shall be promptly removed from the site or spoiled where directed.

- D. Placing and Compacting Backfill – Backfill shall be placed to the slopes, grades, and elevations required. Backfill shall be compacted, in an approved manner to a density at least equal to that of the adjacent undisturbed soil, so as to avoid future unequal settlement.
- E. No backfill shall be placed until the structure has been inspected in place and approved. Backfilling shall be carried out as soon as possible after such approval. Trenches shall be backfilled under the pipe haunches, around the pipe and to a point at least twelve inches (12") over the top of the pipe. Material shall be placed in six inch thick (6") layers in a manner that will not disturb or damage the pipe.
- F. Each layer shall be leveled and thoroughly compacted by tamping to ninety-five percent (95%) Modified Proctor Density as determined by the latest ASTM Specification D-1556. In all cases the filling shall be carried up evenly on both sides of the pipe.
- G. In all improved streets, both existing and proposed, backfill between a plane 12 inches above the top of pipe and three feet (3') below the road surface shall be placed in successive 12 inch layers. Each layer shall be thoroughly compacted by approved methods and devices to obtain ninety percent (90%) of its Modified Proctor Density in accordance with latest ASTM Specification D-1556. From this point to the bottom of the road surface, a minimum 95% Proctor Density is required.
- H. In easement rights-of-way and paper streets, backfill between a plane twelve inches (12") above the top of pipe and the finished surface grade need not be placed in successive layers. However, backfill shall be compacted or consolidated to obtain ninety percent (90%) Modified Proctor Density. Settlement shall be kept to a minimum and proper grade shall be restored if such settlement might occur.

3.2 IDENTIFICATION

- A. Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

- A. General: Include watertight joints.

- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow piping. Use the following:
 - 1. NPS 4, NPS 6 and NPS 8 (DN 100 and DN150): PVC sewer pipe SDR-35 and fittings, solvent-cemented joints, or gaskets and gasketed joints.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 - 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping of same size, or with small difference in OD.
 - b. Increase/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushings type to join piping of different sizes where annular space between smaller piping's OD and larger piping's OD permits installation.

3.5 INSTALLATION, GENERAL

- A. PVC gravity sewer pipe and fittings shall be installed in accordance with ASTM Standard D-2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe". All pipes shall be laid, jointed and backfilled according to the manufacturer's installation specifications, having been approved by the Engineer, and all of which are made a part of these specifications. In the event the manufacturer has not issued any installation specifications, then the installation specifications of a reputable manufacturer of pipe shall be used, also upon approval by the Engineer. Any conflicts between the manufacturer's specifications and those contained herein shall be resolved by the Engineer
- B. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- C. 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 using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- D. Use 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. Install gravity-flow piping and connect to building's sanitary sewer, of sizes and in locations indicated.

1. Install piping pitched down in direction of flow, at a minimum slope of 1 percent, unless otherwise indicated.
- F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
- G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. PVC sewer pipe and fittings. As follows:
- C. 1. Join pipe and gasketed fittings with gaskets according to ASTM D2321.
- D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- F. Install with top surfaces of components, except piping, flush with finished surface.

3.7 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Form continuous concrete channels and benches between inlets and outlet.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches (76 mm) above finished surface elsewhere, unless otherwise indicated.
- D. Install precast concrete manhole sections with gaskets according to ASTM C 891.
- E. Construct cast-in-place manholes as indicated.

3.8 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use PVC schedule 40 soil pipe fittings in sewer pipes at branches for cleanouts and PVC schedule 40 soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches (450 by 450 by 300 mm) deep. Set with tops 1 inch (25 mm) above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.9 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures in accordance with the requirements of the local authority so finished Work complies as nearly as practical with requirements specified for new Work.
- B. Make branch connections to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connections. Cut end of connection pipe passing through the structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of 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.
 - 1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
 - 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
- C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. Place plug in end of incomplete piping at end of day and when work stops.
 - 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 93 percent of piping diameter.
 - c. 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.
- C. 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 authorities having jurisdiction.
 - 3. The Contractor shall notify the Engineer and the New Jersey State Department of Environmental Protection one (1) week prior to the time the system or any part thereof is ready for testing and/or final inspection. Copies of all test and final inspection reports are to be forwarded to the New Jersey Department of Environmental Protection.
 - 4. Schedule tests and inspections by owner's representative at least 24 hours' advance notice.
 - 5. Submit separate reports for each test.
 - 6. Perform tests as follows:
 - a. Gravity Sanitary Sewerage: Perform Infiltration test.
 - 1) The rate of infiltration shall not exceed 50 gallons per mile, per 24 hours, per inch of pipe diameter.
 - 2) The Contractor shall denote the line and conduct a satisfactory test to measure infiltration for at least 24 hours.
 - 3) The Contractor shall be responsible for the satisfactory watertight conditions of the line.
 - 4) The test shall be conducted on sections of pipe not to exceed 2,000 feet of pipe.
 - 5) Close opening in system and fill with water.
 - 6) Purge air and refill with water.
 - 7) Disconnect water supply.
 - 8) Test and inspect joints for leaks.
 - 9) Rates of infiltration shall be determined by means of V-notch weirs or pipe spigot in an approved manner. The Contractor shall provide and install weir plates or other material required and at such times and locations as may be directed by the Engineer.
 - 10) The Contractor shall satisfactory repair all joints or other parts not sufficiently watertight until the infiltration conforms to the requirements.
 - b. Gravity Sanitary Sewerage: Perform Exfiltration test.
 - 1) The exfiltration tests shall be conducted between manholes.
 - 2) The pipe is to be filled and additional water introduced into the manhole to raise the level two (2) foot above the top of the pipe in the upstream manhole.
 - 3) The quantity of water to maintain this level is to be measured.
 - 4) The test shall be maintained for a 24 hour period.

- 5) The rate of exfiltration shall not exceed 50 gallons per inch of the inside diameter, per mile of pipe, per 24 hours.
 - 6) The Contractor shall be responsible for the satisfactory watertight condition of the line.
 - 7) The Contractor shall satisfactorily repair all joints or other parts not sufficiently watertight, until the exfiltration conforms to the requirements.
- c. Testing for Vertical Deflection in Gravity Mains
- 1) All sanitary sewer from manhole to manhole shall be lamped for alignment. The applicants contractor shall pass a device through the pipe that will check for excessive vertical deflection. A pipe that has deflected more than 7% of its diameter has deflected excessively. The test shall be conducted a minimum of 30 days after installation.
 - 2) The device or mandrill for checking deflection shall be provided by the contractor. Details of the deflection device or mandrill shall be submitted to the Engineer and owner for approval, prior to it's use and shall be fabricated as follows: 8 inch pipe-Mandrill size : 7.48 inches I.D.: 7.92 inched O.D. 8.40 inches.
 - 3) The deflection device shall be pulled through the sanitary sewer pipe using only the force of one (1) man without the aid of any devices other than the rope/chain attached to the deflection device.
 - 4) Should any test section of the pipe fail to meet the testing criteria, the applicant's contractor shall, at his own expense, locate and replace defective pipe section until specified criteria are met.
- d. Gravity Sanitary Sewerage: Perform Low Pressure Air Test.
- 1) Equipment – Equipment shall be Cherne Air-Loc Equipment, as manufactured by Cherne Industrial, Inc. of Edina, Minnesota or approved equal. Equipment used shall meet the following minimum requirements:
 - a) Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 - b) Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
 - c) All air used shall pass through a single control panel.
 - d) Three individual hoses shall be used for the following connections:
From control panel to pneumatic plugs for inflation.
From control panel to sealed line for introducing the low pressure air.
From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.
 - 2) Procedures:
 - a) All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

- b) After a manhole to manhole reach of pipe has been backfilled and cleaned and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.
- c) After the stabilization period (3.5 psig minimum pressure in the pipe) the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes for the pressure decrease from 3.5 to 3.0 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameters in the following table:

<u>Pipe Diameter in Inches</u>	<u>Minutes</u>
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

- d) In areas where ground water is known to exist, the Contractor shall install a one-half inch diameter capped pipe nipple, approximately 10" long, through the manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the groundwater shall be determined by removing the pipe cage, blowing air through the pipe nipple into the ground so as to clear it and then connecting a clear plastic tube to the nipple. The hose shall be held vertically and a measurement of the height in feet of water over the invert of the pipe shall be taken after the water has stopped rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pound of pressure that will be added to all readings. (For example, if the height of water is 11 ½', then the added pressure will be 5 psig. This increases the psig to 8.5 psig and the 2.5 psig to 7.5 psig. The allowable drop of one pound and the timing remain the same).
- e) If the installation fails to meet this requirement, the Contractor shall, at his own expense, determine the source of leakage. He shall then repair or replace all defective materials and/or workmanship.
7. Manholes: Perform hydraulic test according to ASTM C969.
8. Leaks and loss in the pressure constitutes defects that must be repaired.
9. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 22 13 13

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing trees and vegetation to remain.
 - 2. Removing trees and other vegetation.
 - 3. Clearing and grubbing.
 - 4. Topsoil stripping.
 - 5. Removing above-grade site improvements.
 - 6. Disconnecting, capping or sealing, and abandoning site utilities in place.
 - 7. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections:
 - 1. Division 31 Section 31 20 00 "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.4 MATERIAL OWNERSHIP

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

1.5 INFORMATIONAL SUBMITTALS

- A. The contractor shall be responsible to provide photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing. The photographs or videotape must be submitted prior to any site clearing activity.

- B. Record drawings according to contract requirements.
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements of the Specifications.

1.7 PROJECT 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 traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
 - 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. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.

- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed.
 - 1. The Contractor shall coordinate with the Owner and the respective utility companies to arrange for the shut off of indicated utilities.
- B. 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 Owner and Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.3 CLEARING AND GRUBBING

- A. The contractor shall be responsible to remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
- 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 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.4 TOPSOIL STRIPPING

- A. Remove vegetation, sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and provide temporary seeding as per the soil erosion and sediment control standards.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
 - 4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. The Contractor to remove surplus soil material, unsuitable topsoil, unsuitable soils, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, fountain area, walks, pavements, landscaping, lawns and plantings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Subbase and base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling for utility trenches.
 - 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 31 Section "Site Clearing" for temporary erosion and sedimentation control measures, site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
 - 3. Division 32 Section "Plants" for finish grading, including preparing and placing topsoil and planting soil for lawns.

1.3 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: Course placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Course 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: Course supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

- F. Excavation: Removal of material encountered above subgrade elevations.
- G.
 - 1. This work shall include the removal of the existing rock and fill material as required to construct the proposed improvements, including the building, walls, utilities, foundations, roadways, sidewalk and all other structures that are constructed below existing grade.
- H. Fill: Soil materials used to raise existing grades.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. Yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,090 lbf and stick-crowd force of not less than 18,650 lbf; measured according to SAE J-1179.
 - 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 48,510-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- J. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows / 2 inches.
- K. 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.
- L. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- M. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- N. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Drainage and separation fabric.
- B. Samples: For the following:
 - 1. Forty (40) pound bag samples of each material to be used as backfill and bedding shall be submitted to the Soils Engineer two (2) weeks minimum prior to commencing fill operations. This material shall not be used as a compacted fill until approved by the

Splash Pad and Other Improvements

- Engineer. By submitting samples of this material, the Contractor agrees and guarantees that the fill material used for construction will conform with the samples (s) supplied. Final acceptance of fill material rests with the Engineer, whose decision shall be final and binding upon the Contractor. However, the acceptance of any material by the Engineer shall not relieve the Contractor of his responsibility to have the fill material used conform to the sample(s) approved by the Engineer.
2. The Contractor shall supply data on the compaction equipment to the Engineer not less than two (2) weeks prior to the intended use of the equipment and the equipment shall be approved by the Engineer prior to commencing compaction operations.
 - 3.
 4. 12-by-12-inch sample of drainage fabric.
 - 5.
 6. 12-by-12-inch sample of separation fabric
 - 7.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
- 1.
 2. Classification and grain size analysis according to ASTM D 2487 and ASTM D 422 of each on-site or borrow soil material proposed for fill and backfill.
- Select subparagraph above or below.
3. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.
- D. Blasting will not be permitted.

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: The Contractor is solely responsible for hiring an independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548 and responsible to provide the necessary testing and approval determinations as the soils engineer.
- B. Preexcavation Conference: Conduct conference at Project site to comply with requirements in specifications.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by the owner and then only after arranging to provide temporary utility services according to requirements indicated.
1. Notify owner not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

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:
1. Fill Classification:
 - a. Type "S" Fill – shall be structural fill consisting of clean sand and gravel to be used in general, for the support of foundations and new structures. This fill shall be imported from off the site and shall meet the following gradation requirement.
 - b.

U.S. Standard Sieve Size	Percent Finer By Weight
1 inch	100
3/8 inch	65-100
No. 10	40-85
No. 30	20-65
No. 60	10-45
No. 200	5-12
 2. b. Type "G" Fill – shall be a granular fill consisting of a clean sand and gravel to be used, in general, for backfilling around and between structures and underneath paved areas, pipelines and utilities. This fill shall be imported from off the site and shall meet the gradation requirements as listed below. If suitable Type "G" materials are found on the site and is accepted by the Engineer, it shall be stored for use.
 11. U.S. Standard Sieve Size Percent Finer By Weight
 12. 2 inch 100
 13. 1 inch 80-100
 14. 3/8 inch 70-100
 15. No. 10 50-100
 16. No. 30 30-85
 17. No. 60 15-65
 18. No. 200 5-15
 19. c. Type "W" Fill – shall be a structural fill consisting of clean stone conforming to New Jersey Department of Transportation coarse aggregate size No. 57, used to facilitate dewatering while providing a firm workmat subgrade onto which foundations may be constructed as well as providing a drainage blanket and pipe bedding. The fill material shall be imported from off-site and shall meet the following gradation requirements.
 20. U.S. Standard Sieve Size Percent Finer By Weight
 21. 1 1/2 inch 100
 22. 1 inch 95-100
 23. 1/2 inch 25-60
 24. No. 4 0-10
 25. No. 8 0-5
 26. Unsatisfactory soils include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

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 as follows:
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as per authority having jurisdiction, or as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. The contractor shall be advised that the upper 2 ft+/- of the project site is a loose and saturated condition, refer to the geotechnical report. The Contractor must remove the upper 2 feet of loose material within the paved areas, building area and all structural areas. The remainder of the project site, the Contractor must remove the upper 1 foot of loose material. The Contractor needs to strip off the vegetation and root matter and separate from the loose fill material. In order to reuse the loose soil material, the Contractor shall be required to moisture condition the soil such that it is placed and compacted at a moisture content that is within approximately two percent of the optimum moisture content as determined by the proctor test, ASTM D-698. The Contractor is responsible for the means and methods to moisture condition the soil, which may include stripping and spreading, additional and blending of granulated lime and/or removal of soil off-site and import of clean fill material in accordance with specifications in the geotechnical report. This work shall be included within the lump sum bid item for the Site Preparation and Earthwork.
- C. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Division 2 Section "Site Clearing."
- D. Protect and maintain erosion and sedimentation controls, which are specified in Division 2 Section "Soil Erosion and Sediment Control", during earthwork operations.
- E. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system, specified in Division 2 Section "Dewatering", to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include boulders, cobbles, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Rock Excavation: In the event that bedrock is encountered within the limits of excavation to establish subgrade, then the Contractor must advise the Owner to verify and confirm that the bedrock encountered meets the definition of rock as per the specifications. Once it is confirmed that the bedrock meets the definition of rock per the specifications, then the contractor shall perform the rock excavation. Removal, offsite disposal, transportation, and all cost with the work shall be included in the unit price for bid item "Rock Excavation". If the contractor removes any bedrock without the owners verifying the excavation material and consent to remove the required portion, he will not be entitled to any compensation under the rock excavation bid item.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. 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.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. All excavations shall be in accordance with OSHA requirements.
- B. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- C. 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.
- D. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

- A. Notify Engineer when excavations have reached required subgrade.
- B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 5 mph.

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2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed, without additional compensation.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Owner.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

- C. 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. 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 utility pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Backfill voids with satisfactory soil while installing and removing shoring and bracing, and as sheeting is removed.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs or as directed by the utility company or authority having jurisdiction.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. 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.
 - 6.
 - 7.

3.14 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Compacting of prepared subgrade under Type "S", Type "G", and Type "W" Fills – after excavation to the required subgrade, the subgrade shall be compacted by approved equipment

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and methods to develop to a depth of at least twelve (12) inches below ground surface at least 95% of maximum dry density as determined by the Engineer in conformance with ASTM Standard D1557. Any soft or weak spots detected during the compaction operation or proof-rolling of subgrade must be removed and replaced with controlled fill as directed by the Engineer. The compaction shall be checked by the Engineer and lean concrete or fill shall not be placed until compaction of the existing subgrade is approved by the Engineer

- B. Placement of Type “S”, “G”, and “W” Fills – No backfill shall be placed until the excavation and subgrade has been approved by the Engineer and until backfill materials to be used are approved by the Engineer, and no backfill shall be placed on frozen or thawing ground. Fill shall be placed in uniform horizontal layers not more than twelve (12) inches in thickness and shall be compacted with a high energy self-propelled vibratory roller. Lift thickness may be adjusted in the field by the Engineer if required soil density is not being achieved.
- C. Compaction of Types “S”, “G”, and “W” Fills – the backfill shall be compacted near optimum moisture content by means of vibratory compactors to not less than 95% of the maximum density determined in accordance with ASTM Standard D1557. The Engineer shall check the obtained in-place density of the compacted fill using the method of ASTM Standards D 1556 or D 2922 for in place density tests. Should the obtained density of the compacted fill be less than specified, the Contractor shall recompact the area until the required maximum density is reached. Only hand held compaction equipment shall be used within four (4) feet of foundation walls and structures.
- D. Moisture Control – the moisture-density curve for the fill used shall be used as a guide in controlling moisture to achieve the required degree of compaction. If, in the opinion of the Engineer, fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Engineer prior to commencing or continuing compaction operations. Likewise, if the opinion of the Engineer, the fill material becomes too dry for the required compaction, the fill shall be moistened by a method approved by the Engineer prior to commencing or continuing compaction operations
- E. Drainage of the Site – at all times, Contractor shall maintain and operate proper and adequate surface and subsurface drainage in order to keep the construction site dry and in such condition that placement and compaction of fill may proceed unhindered by saturation of the area.
- F. Backfill of Excavations – any excavation (e.g., utilities, walls, footings, etc.) made within the compacted fill areas shall be backfilled with the same type of fill as removed and in accordance with Specifications herein. Where compacted fill is placed adjacent to walls, if the difference in elevation of the top of the fill on either side of the wall is more than one (1) foot, the wall is to be adequately braced. Any excavation made in virgin material shall be backfilled with Type “G” fill as herein specified unless otherwise shown on the Contract Drawings or directed by the Engineer.
- G. Final Approval – immediately before the Contractor shall place foundations or floor slabs on compacted fills or virgin soil, the Engineer will inspect the foundation and floor slab subgrade. The Contractor shall remove any soft fill and replace with properly compacted material. The pouring of foundations or floor slab shall commence within twenty-four (24) hours of approval. Rain, frost and other factors (which in the opinion of the Engineer are potentially damaging to the fill or virgin material), occurring after the final approval, but before or during pouring, shall require an additional inspection of the compacted fill or virgin material for approval by the Engineer. The Contractor shall correct any deficiencies found at this time, at his own expense.

- H. Maintenance of Fills – all vehicles passing over the fill areas shall use diverse routes to insure uniform compaction of the fill.
- I. Before shutdown of the work for any cause, and at the conclusion of work for the day, fill shall be bladed to a grade which will insure drainage away from the unfinished surface of the fill.
- J. Excess materials shall be stored as directed by the Owner, and following completion of the work shall be removed from the site.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch
 - 2. Walks: Plus or minus 1 inch
 - 3. Pavements: Plus or minus 1/2 inch
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
 - 1. Place base course material over subbase course under.
 - 2. Shape subbase and base course to required crown elevations and cross-slope grades.
 - 3. Place subbase and base course 6 inches or less in compacted thickness in a single layer, unless otherwise directed.
 - 4. Place subbase 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.
 - 5. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- D.

3.18 DRAINAGE COURSE

- 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 6 inches or less in compacted thickness in a single layer, unless otherwise noted.
 - 2. 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.
 - 3. 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.
 - 4.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: The contractor is responsible to engage a qualified independent testing agency to perform field quality-control testing and approval determinations as the soils engineer. The contractor is to cooperate with the soils consultant in all respects and shall provide samples of each type of fill material used so that various tests may be performed to ascertain compliance with the specifications.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. 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/Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft or less of paved area or building slab, but in no case fewer than 3 tests.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least 1 test for each 100 feet or less of wall length, but no fewer than 2 tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
- 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 to depth required; recompact and retest until specified compaction is obtained with no additional compensation from the owner.
- F.

3.20 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
 - 2.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.
 - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes construction dewatering.
- B. Related Requirements:
 - 1. Division 31 Section 31 20 00 "Earthwork" for excavating, backfilling, and site grading.

1.3 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, provide, test, operate, monitor, and maintain a dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.
 - 1. Work includes removing dewatering system when no longer needed.
 - 2. Contractor to maintain dewatering operations to ensure erosion is controlled, stability of excavations and constructed slopes is maintained, and flooding of excavation and damage to structures are prevented.
 - 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 4. Accomplish dewatering without damaging existing buildings and site improvements adjacent to excavation.

1.4 SUBMITTALS

- A. Shop Drawings: For dewatering system, where applicable show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water.
 - 1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.
- C. Record drawings at Project closeout identifying and locating capped utilities and other subsurface structural, electrical, or mechanical conditions.

- D. Field Test Reports: Before starting excavation, submit test results and computations demonstrating that dewatering system is capable of meeting performance requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: The Contractor shall Engage an experienced installer to assume engineering responsibility and perform dewatering who has specialized in installing dewatering systems similar to those required for this Project and with a record of successful in-service performance.
- B. Regulatory Requirements: Comply with water disposal requirements of authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Owner and/or Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
- B. The contractor shall make test borings and/or conduct other exploratory operations as required to design the dewatering system, if necessary.

PART 2 - PRODUCTS (NOT APPLICABLE)

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 earthwork operations.
 - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

3.2 DEWATERING

- 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.
- B. Before excavation below ground-water level, place system into operation to lower water to specified levels and then operate it continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to 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.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.
- E. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner to avoid inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on a continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense.
 - 1. 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.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

END OF SECTION 31 23 19

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Requirements:
 - 1. Division 31 Section 31 20 00 "Earthwork" for excavating and backfilling.

1.3 PERFORMANCE REQUIREMENTS

- A. Design, provide, monitor, and maintain an anchored and braced excavation support and protection system capable of resisting soil and hydrostatic pressure and supporting sidewalls of excavations.
 - 1. Work includes removing excavation support and protection systems when no longer needed.
 - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
 - 3. Install excavation support and protection systems without damaging existing buildings, pavements, and other improvements adjacent to excavation.

1.4 SUBMITTALS

- A. Shop Drawings: Prepared by or under the supervision of a qualified professional engineer for excavation support and protection systems. System design and calculations must be acceptable to authorities having jurisdiction.
 - 1. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by excavation support and protection systems.

1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Owner and/or Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
- B. Make test borings and/or conduct other exploratory operations as necessary.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials need not be new but must be in serviceable condition.
- B. Structural Steel: ASTM A 36.
- C. Steel Sheet Piling: ASTM A 328 or ASTM A 572
- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of 3 inches.

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 that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.
- B. Locate excavation support and protection systems clear of permanent construction and to permit forming and finishing of concrete surfaces.
- C. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure excavation support and protection systems remain stable.
- D. Promptly repair damages to adjacent facilities caused by the use of excavation support and protection systems.

END OF SECTION 31 50 00

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Hot-mix asphalt paving.
 - 2. Pavement marking paint.
- B. Related Requirements:
 - 1. Division 31 Section "Earthwork" for aggregate sub-base and base courses and aggregate pavement shoulders.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship and other applicable requirements for the standard specifications for the state or of authorities having jurisdiction.
- B. Standard Specification: As indicated.

1.4 SUBMITTALS

- A. Product Data: For each product specified, include technical data and tested physical and performance properties.
- B. Job Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners and other information specified.
- D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with specified requirements.

- E. Installer Qualifications: Engage an experience installer who has complete hot-mix asphalt paving similar in material, design and extent to that indicated for this Project and with a record of successful in-service performance.
- F. Firm shall be a registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which the project is located.
- G. Asphalt-paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements related to asphalt paving including, but not limited to, the following:
 - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - 2. Review condition of substrate and preparatory work performed by other trades.
 - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - 4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel and equipment required to execute the Work without delays.
 - 5. Review inspection and testing requirements, governing regulations and proposed installation procedures.
 - 6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture and directions for storage.
- B. Store pavement-marking materials in a clean, dry protected location and within temperature range by manufacturer. Protect stored materials from direct sunlight.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt material if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 60 deg f at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 BASE COURSE

- A. All Hot-mix Asphalt shall be constructed on a dense graded aggregate base course as shown on the plans.

2.2 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound, angular crushed stone, crushed gravel, complying with ASTM D 692.
- C. Fine Aggregate: Sharp edged natural sand or sand prepared from stone, gravel or combinations thereof, complying with ASTM D 1073.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

2.3 ASPHALT MATERIALS

- A. Asphalt Cement: ASTM D 3381 for viscosity graded material.
- B. Prime Coat: Asphalt emulsion prime conforming to state DOT requirements.
- C. Tack Coat: ASTM D 977; emulsified asphalt for ASTM D2397, cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
- D. Water: Potable.

2.4 AUXILIARY MATERIALS

- A. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- B. Pavement-Marking Paint: Alkyd resin type, ready mixed, complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.
 - 1. Color: As indicated on plans and details or as directed by the Owner.
- C. Glass Beads: AASHTO M-247.

2.5 MIXES

- A. Hot-mix Asphalt: Provide dense, hot laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI's "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - a. Base Course: Bituminous Stabilized Base Course Mix I-2.
 - b. Surface Course: Bituminous Concrete Surface Course Mix I-5.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that sub-grade is dry and in suitable condition to support paving and imposed loads.
- B. Proof roll sub-base using heavy, pneumatic-tired rollers to located areas that are for unstable areas and require further compaction.
- C. Notify Engineer and Owner in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 SURFACE PREPARATION

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

3.3 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated. The Hot-Mix base course must remain in place for a minimum of 2 months, or as directed by the owner, prior to placement of the asphalt surface course.
 - 2. Place hot-mix asphalt surface course in single Lift.
 - 3. Spread mix at minimum temperature of 250 deg F.
 - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surface and apply tack coat.
 2. Offset longitudinal joints in successive courses a minimum of 6 inches.
 3. Offset transverse joints in successive course a minimum of 24 inches.
 4. Construct transverse joints by bulkhead method or sawed vertical face method as described in AI's "The Asphalt Handbook."
 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt and re-rolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

- F. Repairs: Remove paved areas that are defective or contaminated with foreign material. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch.
 - 2. Surface Course: 1/8 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 PAVEMENT MARKING

- A. Do not apply pavement marking paint until layout, colors, and placement have been verified with the Engineer and Owner.
- B. Sweep and clean surface to eliminate loose material and dust.
- C. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of 6 lb/gal.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: The contractor is solely responsible engage a qualified independent testing agency to perform field inspections and tests and prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

- C. Thickness: In-place compacted thickness of hot-mix asphalt course will be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
 - 1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement will be determined by testing core samples according to AASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
 - 3. The Contractor shall be responsible to remove and replace or install additional hot-mix asphalt where test results or measurement indicate that it does not comply with specified requirements and with no additional compensation from Owner.

3.9 TRAFFIC AND LANE MARKINGS

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Striping: Use chlorinated rubber base traffic lane marking paint, factory mixed, quick drying, and nonbleeding.
- C. Do not apply traffic and lane marking paint until layout and placement have been verified with Engineer and the Owner.
- D. Apply paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

END OF SECTION 32 12 16

SECTION 32 13 13 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Driveways.
 - 2. Roadways.
 - 3. Parking lots.
 - 4. Curbs and gutters.
 - 5. Walkways.
- B. Related Sections:
 - 1. Division 31 Section "Earthwork" for subgrade preparation, grading, and subbase course.
 - 2. Division 32 Section "Concrete Pavement Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
 - 3. Division 32 Section "Decorative Concrete Pavement" for decorative concrete applications, installation, product and testing.
 - 4. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

- A. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples: 10-lb (4.5-kg) sample of exposed aggregate.

- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or adhesive.
 - 8. Joint fillers.
- F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work 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. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- C. Testing Agency Qualifications: The Contractor is solely responsible for providing an independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."
 - 1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:

- a. Contractor's superintendent.
- b. Independent testing agency responsible for concrete design mixes.
- c. Ready-mix concrete producer.
- d. Concrete subcontractor.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

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

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.
- D. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- E. Epoxy-Coated Reinforcement Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars.
- F. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.
- G. Plain Steel Wire: ASTM A 82, as drawn.
- H. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A coated, plain steel.
- I. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

- J. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.
- K. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- L. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- M. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.
- N. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.
 - 1. Fly Ash: ASTM C 618, Class F or C.
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Blended Hydraulic Cement: ASTM C 595M, Type IS, portland blast-furnace slag cement.
- D. Blended Hydraulic Cement: ASTM C 595M, Type IP portland pozzolan cement.
- E. Blended Hydraulic Cement: ASTM C 595M, Type I (PM) pozzolan-modified portland cement.
- F. Blended Hydraulic Cement: ASTM C 595M, Type I (SM) slag-modified portland cement.
- G. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4S.
 - 2. Class: 4M.
 - 3. Class: 1N.
 - 4. Maximum Aggregate Size: 1 inch (25 mm) nominal.
 - 5. Do not use fine or coarse aggregates containing substances that cause spalling.

- H. Exposed Aggregate: Selected, hard, and durable; washed; free of material that reacts with cementitious material or causes staining; from a single source, with gap graded coarse aggregate as follows:
 - 1. Aggregate Sizes: 1/2 to 3/4 inch (13 to 19 mm) nominal.
- I. Water: ASTM C 94.

2.4 AD MIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1 inch (13 to 25 mm) long.
- B. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1 inch (13 to 25 mm) long.
- C. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Fibrillated Fibers:
 - a. Fibrasol F; Axim Concrete Technologies.
 - b. Fibermesh; Fibermesh, Div. of Synthetic Technologies.
 - c. Forta CR; Forta Corporation.
 - d. Grace Fibers; W. R. Grace & Co., Construction Products Div.
 - 2. Monofilament Fibers:
 - a. Fibrasol IIP; Axim Concrete Technologies.
 - b. Fiberstrand 100; Euclid Chemical Co.
 - c. Fibermix Stealth; Fibermesh, Div. of Synthetic Industries.
 - d. Forta Mono; Forta Corporation.
 - e. Grace MicroFiber; W. R. Grace & Co., Construction Products Div.
 - f. Polystrand 1000; Metalcrete Industries.

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- E. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- G. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
- H. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- I. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Evaporation Retarder:
 - a. Cimfilm; Axim Concrete Technologies.
 - b. Finishing Aid Concentrate; Burke Group, LLC (The).
 - c. Spray-Film; ChemMasters.
 - d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
 - e. Sure Film; Dayton Superior Corporation.
 - f. Eucobar; Euclid Chemical Co.
 - g. Vapor Aid; Kaufman Products, Inc.
 - h. Lambco Skin; Lambert Corporation.
 - i. E-Con; L&M Construction Chemicals, Inc.
 - j. Confilm; Master Builders, Inc.
 - k. Waterhold; Metalcrete Industries.
 - l. Rich Film; Richmond Screw Anchor Co.
 - m. SikaFilm; Sika Corporation.
 - n. Finishing Aid; Symons Corporation.
 - o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
 - 2. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound:
 - a. AH Curing Compound #2 DR; Anti-Hydro International, Inc.
 - b. Res-X Cure All Resin; Burke Group, LLC (The).
 - c. RX Cure; Conspec Marketing & Manufacturing Co., Inc.
 - d. Day-Chem Rez Cure; Dayton Superior Corporation.
 - e. Kurez DR; Euclid Chemical Co.
 - f. Nitocure S; Fosroc.

- g. #64 Resin Cure; Lambert Corporation.
 - h. L&M Cure DR; L&M Construction Chemicals, Inc.
 - i. 3100-Clear; W. R. Meadows, Inc.
 - j. Seal N Kure FDR; Metalcrete Industries.
 - k. Rich Cure; Richmond Screw Anchor Co.
 - l. Resi-Chem C309; Symons Corporation.
 - m. Horncure 30; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - n. Uni Res 150; Unitex.
 - o. Certi-Vex RC; Vexcon Chemicals, Inc.
3. 3. Clear Waterborne Membrane-Forming Curing Compound:
- a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
 - b. Aqua Resin Cure; Burke Group, LLC (The).
 - c. Safe-Cure Clear; ChemMasters.
 - d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
 - e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
 - f. Nitocure S; Fosroc.
 - g. Aqua Kure-Clear; Lambert Corporation.
 - h. L&M Cure R; L&M Construction Chemicals, Inc.
 - i. 1100 Clear; W. R. Meadows, Inc.
 - j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
 - k. Rich Cure E; Richmond Screw Anchor Co.
 - l. Resi-Chem Clear Cure; Symons Corporation.
 - m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - n. Hydro Cure; Unitex.
 - o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.
4. White Waterborne Membrane-Forming Curing Compound:
- a. AH Curing Compound #2 WB WP; Anti-Hydro International, Inc.
 - b. Aqua Resin Cure; Burke Group, LLC (The).
 - c. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
 - d. Thinfilm 450; Kaufman Products, Inc.
 - e. Aqua Kure-White; Lambert Corporation.
 - f. L&M Cure R-2; L&M Construction Chemicals, Inc.
 - g. 1200-White; W. R. Meadows, Inc.
 - h. White Pigmented Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
 - i. Rich Cure White E; Richmond Screw Anchor Co.
 - j. Resi-Chem High Cure; Symons Corporation.
 - k. Horncure 200-W; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - l. Hydro White 309; Unitex.

2.7 RELATED MATERIALS

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

- B. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Color: As selected by Owner from manufacturer's full range.
- C. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.
- D. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.
 - 1. Color: As indicated.
- E. Glass Beads: AASHTO M 247.
- F. Wheel Stops: Precast, air-entrained concrete; 2500-psi (17.2-MPa) minimum compressive strength; approximately 6 inches (150 mm) high, 9 inches (225 mm) wide, and 84 inches (2130 mm) long. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate.
- G. Dowels: Galvanized steel, diameter of 3/4 inch (19 mm), minimum length 10 inches (254 mm).
- H. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- I. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- J. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch (9.5-mm) sieve and 85 percent retained on a No. 8 (2.36-mm) sieve.
- K. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type: Class I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 2. Type: Class IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.8 CONCRETE MIXES

- 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 as indicated on plans with the following properties:

1. Compressive Strength (28 Days): 4500 psi (Class B).
- D. Compressive Strength (28 Days): 4000 psi (Class C).
- E. Slump Limit at point of placement: 3 inches
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.
- G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.
- H. Coloring Agent: Add coloring agent to mix according to manufacturer's written instructions.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
 1. 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.
- B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixers of 1 cu. yd. (0.76 cu. m) or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixers of capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 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.
 - 1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric 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 (50-mm) overlap to adjacent mats.

3.4 JOINTS

- A. General: Construct construction, isolation, 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 pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

3. Provide tie bars at sides of pavement strips where indicated.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. 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. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch (6 mm).
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete 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: 1/4 inch (6 mm).

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, or during placement.
- 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. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- I. Screed pavement 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 or spreading dry-shake surface treatments.
- J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

- K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- M. 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 frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- N. N.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 subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the 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. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

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

3.7 SPECIAL FINISHES

- A. Monolithic Exposed Aggregate Finish: Expose coarse aggregate to pavement surfaces as follows:
 1. Immediately after floating, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
 2. Cover with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon bristle broom.
 4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
- B. Seeded Exposed Aggregate Finish: Immediately after floating, broadcast a single layer of aggregate uniformly onto the pavement surface. Tamp seeded aggregate into plastic concrete, and float to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).
 1. Spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
 2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon bristle broom.
 4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
 5. There should be a minimum of 1/4 inch exposure.
 6. The contractor shall provide 18" x 18" samples for the owner to select the desired exposed aggregate finish. The contractor shall be responsible for providing a maximum of 5 samples.
- C. Slip-Resistant Aggregate Finish: Before final floating, apply slip-resistant aggregate finish to pavement surfaces according to manufacturer's written instructions and as follows:
 1. Uniformly spread 25 lb/100 sq. ft. (12 kg/10 sq. m) of dampened nonslip aggregate over the surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose nonslip aggregate.
- D. Rock-Salt Finish: After initial floating, uniformly seed 5 lb/100 sq. ft. (0.2 kg/10 sq. m) over the concrete surface.
 1. Cover surface with 1-mil- (0.025-mm-) thick polyethylene sheet and remove when concrete has hardened and seven-day curing period has elapsed.
 2. Embed rock salt into plastic concrete, power float concrete, and trowel finish.

3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt.

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. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears 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.

3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 1. Elevation: 1/4 inch (6 mm).
 2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
 3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: The contractor is responsible to engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Architect may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
- C. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project

identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.11 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by 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 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 days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 16 - DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Colored cement concrete pavement.
 - 2. Stamped/Imprinted cement concrete pavement (Integraly colored concrete)
- B. Related Sections include the following:
 - 1. Division 31 Section "Earthwork" for subgrade preparation, grading, and subbase course.
 - 2. Division 32 Section "Concrete Pavement" for cast-in-place concrete pavement with other finishes.
 - 3. Division 3 Section "Cast in Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated, includes the manufacturer's complete technical data sheets for the following:
 - 1. Color Admixture
 - 2. Imprinting / Texture Tools and Procedures.
 - 3. Dry-shake colored hardener.
 - 4. Curing Compound.
- B. Design Mixtures: For each decorative cement concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors, imprints and textures available.

- D. Qualification Data: for firms indicated in "Quality Assurance" Article, including list of completed, recent projects.
- E. Material Certificates: For the following materials, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer with 10 years experience in production of specific products.
- B. Installer Qualifications: An installer with 5 years of experience with work of similar scope and quality and approved by manufacturer of decorative cement concrete pavement systems.
- C. Ready-Mix-Concrete Producer 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. Producer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- D. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- E. Source Limitations: Obtain decorative cement concrete pavement products and each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate through one source.
- F. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Mockups: Cast mockups of [full-size sections] [sections approximately 8 by 8 feet of decorative cement concrete pavement to demonstrate typical pattern, texture, surface finish, color, joints, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Engineer.
 2. In presence of Engineer, damage part of the exposed surface of decorative cement concrete pavement for each finish, color, and texture required, and demonstrate materials and techniques proposed for repair to match adjacent undamaged surfaces.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
1. Before submitting design mixtures, review decorative cement concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and decorative cement concrete pavement construction practices. Require representatives of each entity directly concerned with decorative cement concrete pavement to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Decorative cement concrete pavement Installer.
 - e. Manufacturer's representative of decorative cement concrete pavement system.
- 1.6 DELIVERY, STORAGE AND HANDLING
- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
 - B. Deliver products in original factory unopened, undamaged packing bearing identification of product, manufacturer, batch number and expiration data as applicable.
 - C. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
 - D. Avoid placing concrete if rain, snow or frost is forecasted within 24 hours. Protect fresh concrete moisture and freeze.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Products: Subject to compliance with requirements, provide one of the products specified.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 1. Use flexible or curved forms for curves of a radius 100 feet or less.
- B. Forms for Textured Finish Concrete: Units of face design, size, arrangement, and configuration indicated. Provide solid backing and form supports to ensure stability of textured form liners.
- C. 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 of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- D. Plain Steel Wire: ASTM A 82, as drawn.
- E. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the same type, brand, and source, throughout Project:
- B. Portland Cement: ASTM C 150, Type I or II Supplement with the following:
 1. Fly Ash: ASTM C 618, Class C or F.
 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

- C. Normal-Weight Aggregates: ASTM C 33, Class 4, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum Aggregate Size: nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: Potable and complying with ASTM C 94/C 94M.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 3. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

2.5 COLOR MATERIALS

- A. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Available Manufacturers:
 - a. Bon Tool Co.
 - b. Butterfield Color.
 - c. ChemMasters.
 - d. Conspec Marketing and Manufacturing Co., Inc.
 - e. Davis Colors.
 - f. Decorative Concrete Supply Inc.
 - g. Dynamic Color Solutions, Inc.
 - h. Elementis Pigments, Inc.
 - i. Hoover Color Corporation.
 - j. Increte Systems Inc.
 - k. Lambert Corporation.
 - l. QC Construction Products.
 - m. Scofield, L. M. Company.
 - n. Solomon Colors.
 - o. Southern Color Company, Inc.
 - p. Specialty Concrete Products, Inc.
 - q. Stampcrete International Ltd.
 - r. Superstone, Inc.
 - s. Symons Corporation.
- B. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of Portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. Available Products:

- a. Advanced Surfaces, Inc.; Color Hardener.
 - b. Artcrete, Inc.; Faux Brick Color Hardener.
 - c. Bomanite Corporation; Color Hardener.
 - d. Bon Tool Co.; True Color Hardener.
 - e. Butterfield Color; Perma-Cast.
 - f. Cobblecrete International; Color Hardener.
 - g. Coloration Systems, Inc.; Color Hardener.
 - h. Conspec Marketing and Manufacturing Co., Inc.; Conshake 600 Colortone.
 - i. Dayton Superior Chemical Division; Quartz Tuff.
 - j. Decorative Concrete Finishes, Inc.; Dry Shake Color Hardener.
 - k. Decorative Concrete Supply Inc.; HardBright Color Hardener.
 - l. Euclid Chemical Company (The); Surflex.
 - m. Increte Systems Inc.; Color Hardener.
 - n. Lambert Corporation; Colorhard.
 - o. L&M Construction Chemicals, Inc.; Quartz Plate FF.
 - p. MBT Protection and Repair, Div. of ChemRex; Mastercron.
 - q. Metalcrete Industries; Floor Quartz.
 - r. QC Construction Products; Dynamicast Color Hardener.
 - s. Rafco Products; Brickform Color Hardener.
 - t. Scofield, L. M. Company; Lithochrome Color Hardener.
 - u. Sonneborn, Div. of ChemRex; Harcol.
 - v. Southern Color Company, Inc.; Read-Chrome Color Hardener.
 - w. Specialty Concrete Products, Inc.; Chrome-Hard Color Hardener.
 - x. Stampercrete International Ltd.; Color Hardener.
 - y. Stencil Systems; Color Hardener.
 - z. Superstone, Inc.; Color Hardener.
 - aa. Symons Corporation; Color Hardener.
- C. Pigmented-Powder Release Agent: Factory-packaged dry combination of surface-conditioning and dispersing agents interground with coloring pigments that facilitates release of stamp mats. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.
- 1. Available Products:
 - a. Advanced Surfaces, Inc.; Release Agent.
 - b. Artcrete, Inc.; Faux Brick Powdered Release Agent.
 - c. Bomanite Corporation; Release Agent.
 - d. Bon Tool Co.; True Color Release Agent.
 - e. Butterfield Color; Perma-Cast Antiquing Release.
 - f. Cobblecrete International; Release Agent.
 - g. Coloration Systems, Inc.; Release Agent.
 - h. Decorative Concrete Finishes, Inc.; Antiquing Powder Release Agent.

- i. Decorative Concrete Supply Inc.; Decosup Release Powder.
 - j. Increte Systems Inc.; Release Agent.
 - k. QC Construction Products; Release Agent.
 - l. Rafco Products; Brickform Antique Release Agent.
 - m. Scofield, L. M. Company; Antiquing Release.
 - n. Southern Color Company, Inc.; Antique Release.
 - o. Specialty Concrete Products, Inc.; Antique Release Agent.
 - p. Stampcrete International Ltd.; Release Agent.
 - q. Stencil Systems; Release Agent.
 - r. Superstone, Inc.; Color Release Powder.
 - s. Symons Corporation; Color Release.
- D. Liquid Release Agent: Manufacturer's standard clear, evaporating formulation that facilitates release of stamp mats and texture rollers.
- 1. Available Products:
 - a. Artcrete, Inc.; Faux Brick Liquid Release Agent.
 - b. Bon Tool Co.; Liquiform Release Agent.
 - c. Decorative Concrete Supply Inc.; Decosup Liquid Release.
 - d. Increte Systems Inc.; Liquid Release.
 - e. Rafco Products; Brickform Liquid Release Agent.
 - f. Southern Color Company, Inc.; Clear Liquid Release Agent.
 - g. Superstone, Inc.; Bubble Gum Liquid Release.
 - h. Symons Corporation; Clear Liquid Release.
- E. Antiquing Agent: Manufacturer's standard transparent, water-based antiquing agent that produces an antique finish on concrete surfaces.
- 1. Available Products:
 - a. Advanced Surfaces, Inc.
 - b. Bomanite Corporation
 - c. Bon Tool Co.
 - d. Butterfield Color
 - e. Cobblecrete International
 - f. Coloration Systems, Inc.
 - g. Concrete Accessories, Inc; Proline Concrete Tools
 - h. Increte Systems, Inc.
 - i. Matcrete Stamped Concrete Tools
 - j. Patterned Concrete Industries, Ltd.
 - k. Rafco Products
 - l. Scofield, L.M. Company
 - m. Specialty Concrete Products, Inc.
 - n. Stampcrete International Ltd.
 - o. Superstone, Inc.
 - p. Symons Corporation
 - q. Tabco Mats, Inc.

2.6 IMPRINTING TOOLS

- A. Stamp Mats: Semirigid polyurethane mats with projecting textured and ridged underside capable of imprinting texture and joint patterns on plastic concrete.
 - 1. Available Manufacturers:
 - a. Advanced Surfaces, Inc.
 - b. Bomanite Corporation.
 - c. Bon Tool Co.
 - d. Butterfield Color.
 - e. Cobblecrete International.
 - f. Coloration Systems, Inc.
 - g. Concrete Accessories, Inc.; Proline Concrete Tools.
 - h. Increte Systems Inc.
 - i. Matcrete Stamped Concrete Tools.
 - j. Patterned Concrete Industries, Ltd.
 - k. Rafco Products.
 - l. Scofield, L. M. Company.
 - m. Specialty Concrete Products, Inc.
 - n. Stampcrete International Ltd.
 - o. Superstone, Inc.
 - p. Symons Corporation.
 - q. Tabco Mats, Inc.
- B. Stamp Tools: Open-grid, aluminum or rigid plastic stamp tool capable of imprinting joint patterns on plastic concrete.
 - 1. Available Manufacturers:
 - a. Bomanite Corporation.
 - b. Bon Tool Co.
 - c. Cobblecrete International.
 - d. Coloration Systems, Inc.
 - e. Increte Systems Inc.
 - f. Matcrete Stamped Concrete Tools.
 - g. Patterned Concrete Industries, Ltd.
 - h. Rafco Products.
 - i. Scofield, L. M. Company.
 - j. Stampcrete International Ltd.
 - k. Superstone, Inc.
 - l. Symons Corporation.
- C. Rollers: Manually controlled, water-filled aluminum rollers with projecting ridges on drum capable of imprinting texture and joint patterns on plastic concrete.
 - 1. Available Manufacturers:
 - a. Bomanite Corporation.
 - b. Bon Tool Co.

- c. Cobblecrete International.
- d. Coloration Systems, Inc.
- e. Increte Systems Inc.
- f. Patterned Concrete Industries, Ltd.
- g. Quick Imprint Systems, Inc.
- h. Rafco Products.
- i. Scofield, L. M. Company.
- j. Stampcrete International Ltd.
- k. Superstone, Inc.
- l. Symons Corporation.

- D. Texture Rollers: Manually controlled, abrasion-resistant polyurethane rollers capable of imprinting texture on plastic concrete.

1. Available Manufacturers:

- a. Artcrete, Inc.
- b. Bomanite Corporation.
- c. Bon Tool Co.
- d. Cobblecrete International.
- e. Rafco Products.

2.7 STENCIL MATERIALS

- A. Stencils: Manufacturer's standard moisture-resistant paper or reusable plastic stencils, designed for use on plastic concrete.

1. Available Manufacturers:

- a. Advanced Surfaces, Inc.
- b. Artcrete, Inc.
- c. Bomanite Corporation.
- d. Bon Tool Co.
- e. Cobblestone Paving USA.
- f. Coloration Systems, Inc.
- g. Specialty Concrete Products, Inc.
- h. Stencil Systems.
- i. Symons Corporation.

2.8 STAIN MATERIALS

- A. Reactive Stain: Acidic-based stain with wetting agents and high-grade, UV-stable metallic salts that react with calcium hydroxide in cured concrete to produce permanent, variegated or translucent color effects.

1. Available Products:

- a. Advanced Surfaces, Inc.; Acid Stain.
- b. Artcrete, Inc.; Faux Brick Concrete Stain.

- c. Bomanite Corporation; Chemical Stain.
- d. Bon Tool Co.; True Etch Acid Stain.
- e. Decorative Concrete Finishes, Inc.; Renaissance Concrete Chemical Stain.
- f. Decorative Concrete Supply Inc.; ChemTone Acid Stain.
- g. Increte Systems Inc.; Stain-Crete.
- h. Kemiko; Stone Tone Stains.
- i. QC Construction Products; Patina Stain.
- j. Quick Imprint Systems, Inc.; QI Concentrated Acid Stain.
- k. Rafco Products; Brickform Blush-Tone Acid Stain.
- l. Scofield, L. M. Company; Lithochrome Chemstain.
- m. Southern Color Company, Inc.; Redi-Tone Concrete Stain.
- n. Specialty Concrete Products, Inc.; Chrome-Etch Acid Stain.
- o. Stampcrete International Ltd.; Patina Stains.
- p. Stencil Systems; Tex-Stain.
- q. Superstone, Inc.; ChlorStain.
- r. SureCrete Design Products; SureStain Chemical (Acid) Stain.
- s. Symons Corporation; Patina Stain.
- t. Triple-S Chemical Products, Inc.; Concrete Stain.

B. Penetrating Stain: Water-based, acrylic latex, penetrating stain with colorfast pigments.

1. Available Products:

- a. Advanced Surfaces, Inc.; Concrete Stain (Water Base).
- b. Americrete; Concrete Stain.
- c. Bomanite Corporation; Con-Color.
- d. Decorative Concrete Supply Inc.; DecoTone Concrete Dye.
- e. Duckback Products, Inc.; Mason's Select.
- f. H&C Concrete Care Products; Shield Plus Concrete Stain.
- g. Increte Systems Inc.; Acrylic Latex Concrete Stain.
- h. Specialty Concrete Products, Inc.; Dye Stain.
- i. Stampcrete International Ltd.; WB Coloration Dyes.
- j. Superstone, Inc.; Concrete Dye.

2.9 CURING AND SEALING MATERIALS

A. Curing Paper: Nonstaining, waterproof paper, consisting of two layers of kraft paper cemented together and reinforced with fiber, complying with ASTM C 171.

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Available Products:

- a. Axim Concrete Technologies; Cimfilm.
- b. Burke by Edoco; BurkeFilm.
- c. ChemMasters; Spray-Film.
- d. Conspec Marketing and Manufacturing Co., Inc.; Aquafilm.
- e. Dayton Superior Chemical Division; Sure Film.

- f. Euclid Chemical Company (The); Eucobar.
 - g. Increte Systems Inc.; Increte Delay.
 - h. Kaufman Products, Inc.; Vapor Aid.
 - i. Lambert Corporation; Lambco Skin.
 - j. L&M Construction Chemicals, Inc.; E-Con.
 - k. MBT Protection and Repair, Div. of ChemRex; Confilm.
 - l. Meadows, W. R., Inc.; Sealtight Evapre.
 - m. Metalcrete Industries; Waterhold.
 - n. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - o. Sika Corporation, Inc.; SikaFilm.
 - p. Symons Corporation; Finishing Aid.
 - q. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
- C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, specifically manufactured for colored concrete.
 - 1. For integrally colored concrete, curing compound shall be pigmented type approved by coloring admixture manufacturer.
 - 2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.
 - 3. Available Products:
 - a. Increte Systems Inc.; Cure Crete.
 - b. QC Construction Products; Color Cure.
- D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. Available Products:
 - a. Burke by Edoco; Cureseal 1315.
 - b. ChemMasters; Spray-Cure & Seal Plus.
 - c. Conspec Marketing and Manufacturing Co., Inc.; Sealcure 1315.
 - d. Dayton Superior Chemical Division; Day-Chem Cure and Seal (J-22 U.V.).
 - e. Euclid Chemical Company (The); Super Diamond Clear.
 - f. Kaufman Products, Inc.; Sure Cure 25.
 - g. Lambert Corporation; UV Super Seal.
 - h. L&M Construction Chemicals, Inc.; Lumiseal Plus.
 - i. Meadows, W. R., Inc.; CS-309/30.
 - j. Metalcrete Industries; Seal N Kure 30.
 - k. Sonneborn, Div. of ChemRex; Kure-N-Seal 25.
 - l. Tamms Industries, Inc.; LusterSeal 300.
 - m. Unitex; Solvent Seal 1315.
 - n. Vexcon Chemicals, Inc.; Certi-Vex AC 1315.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A, specifically manufactured for use with colored concrete.
 - 1. Available Products:
 - a. Burke by Edoco; Cureseal 1315 WB.

- b. ChemMasters; Polyseal WB.
 - c. Conspec Marketing and Manufacturing Co., Inc.; Sealcure 1315 WB.
 - d. Euclid Chemical Company (The); Super Diamond Clear VOX.
 - e. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
 - f. Lambert Corporation; UV Safe Seal.
 - g. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - h. Meadows, W. R., Inc.; Vocomp-30.
 - i. Metalcrete Industries; Metcure 30.
 - j. Symons Corporation; Cure & Seal 31 Percent E.
 - k. Tamms Industries, Inc.; LusterSeal WB 300.
 - l. Unitex; Hydro Seal 25.
 - m. Vexcon Chemicals, Inc.; StarSeal 1315.
- F. Clear Acrylic Sealer: Manufacturer's standard waterborne, membrane-forming, medium-gloss, acrylic copolymer emulsion solution, specifically manufactured for colored concrete, containing not less than 15 percent solids by volume, nonyellowing, and UV resistant.
- 1. Available Products:
 - a. Advanced Surfaces, Inc.; Clear Sealer - Water Base.
 - b. Bomanite Corporation; Sealer - Water-Based.
 - c. Cobblecrete International; Acrylic Sealer Water Based.
 - d. Increte Systems Inc.; Water Based Clear Seal.
 - e. Kemiko; Stone Tone Sealer.
 - f. Rafco Products; Satinseal.
 - g. Scofield, L. M. Company; Cementone Clear Sealer.
 - h. Southern Color Company, Inc.; Redi Color Seal Plus.
 - i. Stampcrete International Ltd.; WB 6000.
 - j. Symons Corporation; Decorative Sealer WB.
- G. Slip-Resistant Additive: Manufacturer's standard finely graded aggregate or polymer additive, designed to be added to clear acrylic sealer, to result in a slip-resistant surface.
- 1. Available Products:
 - a. Advanced Surfaces, Inc.; Skid Guard.
 - b. Bon Tool Co.; Gator Grip.
 - c. H&C Concrete Care Products; SharkGrip.
 - d. Increte Systems Inc.; Shur-Grip.
 - e. Southern Color Company, Inc.; Redi-Grip.
 - f. Stampcrete International Ltd.; Shark-Skin.
 - g. Superstone, Inc.; Super Grip.
 - h. Symons Corporation; Grip Aid.

2.10 RELATED MATERIALS

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

- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
 - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- D. Polyethylene Film: ASTM D 4397, 1 mil thick, clear.

2.11 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days).
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: Select slump limit from options in subparagraph below or revise to suit Project.
 - 3. Slump Limit: plus or minus 1 inch.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 2.5 to 4 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- F. Color Pigment: Add color pigment, colored water-reducing admixture to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.12 CONCRETE MIXING

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with tolerances for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
 2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 2 Section "Earthwork."
- C. Proceed with decorative cement concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Protect adjacent construction from discoloration and spillage during application of color hardeners, release agents, stains, curing compounds, and sealers.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

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

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

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. 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 2-inch overlap to adjacent mats.

3.5 JOINTS

- A. General: Construct construction, isolation, 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 pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.
 - 3. Butt Joints: Use bonding agent [at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 5. Dowelled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated.

2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. 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: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover 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 will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.

- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Screed pavement surfaces with a straightedge and strike off.
- J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- L. 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, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- M. Hot-Weather Placement: Comply with ACI 301 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. 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 subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

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

3.8 INTEGRALLY COLORED CONCRETE FINISH

- A. Integrally Colored Concrete Finish: After final floating, apply a hand-trowel finish followed by a smooth broom finish to concrete, and as per manufacturer's recommendation to provide specified finish.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.9 STENCILING

- A. Cut stencils to slab width and lay on wet concrete. Overlap mortar joint on trailing edge of each section of stencil onto leading mortar joint of previous section.
- B. Slightly embed paper stencil into concrete by rolling with stencil roller.
- C. Trim stencils to fit slab and special patterns
- D. Apply pigmented mineral dry-shake hardener materials to concrete surfaces according to manufacturer's written instructions.
- E. Apply release agent according to manufacturer's written instructions prior to applying texture roller to surface of concrete.
- F. Remove stencils when concrete has sufficiently cured to bear weight. Do not leave stencils in concrete overnight.
- G. Apply antiquing agent over liquid release agent according to manufacturer's written instructions.
- H. Remove debris with mechanical blower prior to application of curing compound. If pigmented-powder release agent is applied, delay removal of debris for 24 hours, then flood area with low-pressure water hose, wetting pigmented-powder release agent, and follow by cleaning surface with pressure washer.

3.10 PIGMENTED MINERAL DRY-SHAKE HARDENER

- A. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply pigmented mineral dry-shake materials to pavement surfaces according to manufacturer's written instructions and as follows:
 - 1. Uniformly apply pigmented mineral dry-shake hardener at a rate of 100 lb/100 sq. unless greater amount is recommended by manufacturer to match pavement color required.
 - 2. Uniformly distribute approximately two-thirds of pigmented mineral dry-shake hardener over the concrete surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second pigmented mineral dry-shake

- hardener application, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed by power floating.
3. Do not add water to surface.
 4. After final floating, apply a hand-trowel finish followed by a broom finish to concrete.
 - a. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - b. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.
 - c. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
- B. Pigmented-Powder Release Agent: Uniformly distribute onto pigmented mineral dry-shake hardened and still-plastic concrete at a rate of 3 to 4 lb/100 sq. ft..
- C. Liquid Release Agent: Uniformly mist surface of pigmented mineral dry-shake hardened and still-plastic concrete at a rate of 5 gal/1000 sq. ft..

3.11 STAMPING

- A. Mat Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load mats and press into concrete to produce required imprint pattern and depth of imprint on concrete surface. Remove stamp mats immediately. Hand stamp edges and surfaces unable to be imprinted by stamp mats.
1. Remove unembedded release agent no fewer than three days after stamping concrete. High pressure wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.
- B. Tool Stamping: While initially finished concrete is plastic, cover surface with polyethylene film, stretch taut to remove wrinkles, lap sides and ends 3 inches, and secure to edge forms. Lightly broom surface to remove air bubbles. Accurately align and place stamp tools in sequence and tamp into concrete to produce required imprint pattern and depth of imprint on concrete surface. Remove stamp tools immediately. Hand stamp edges and surfaces unable to be imprinted by stamp tools. Unroll and remove polyethylene film immediately after tool stamping.
1. Antiquing Agent: Apply over liquid release agent according to manufacturer's written instructions.
- C. Roller Stamping: While initially finished concrete is plastic, cover surface with polyethylene film, stretch taut to remove wrinkles, lap sides and ends 3 inches, and secure to edge forms. Lightly broom surface to remove air bubbles. Accurately align roller and repeat rolling operation to produce required imprint pattern and depth of imprint on concrete surface. Hand stamp surfaces inaccessible to roller. Unroll and remove polyethylene film immediately after roller stamping.

1. Antiquing Agent: Apply over liquid release agent according to manufacturer's written instructions.

3.12 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Compound: Apply curing compound immediately after final finishing. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after application. Maintain continuity of coating and repair damage during curing period.
 1. Cure integrally colored concrete with a pigmented curing compound.
 2. Cure concrete finished with pigmented mineral dry-shake hardener with a pigmented curing compound.
- F. Curing and Sealing 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
- G. Curing Paper: Cure with unwrinkled curing paper in pieces large enough to cover the entire width and edges of slab. Do not lap sheets. Fold curing paper down over pavement edges and secure with continuous banks of earth to prevent displacement or billowing due to wind. Immediately repair holes or tears in paper.

3.13 STAINING

- A. Newly placed concrete shall be at least 14 days old.
- B. Prepare surfaces according to manufacturer's written instructions and as follows:
 1. Clean concrete thoroughly by scraping, applying solvents or stripping agents, sweeping and pressure washing, or scrubbing with a rotary floor machine and detergents acceptable to stain manufacturer. Rinse until water is clear.
 - a. Do not use acidic solutions to clean surfaces.

2. Test surfaces to receive stain with droplets of water. If water beads and does not penetrate surface, or only penetrates in some areas, profile surfaces by manufacturer's recommendations. Retest and continue profiling surface until water droplets immediately darken and uniformly penetrate concrete surfaces.
 3. Apply acidic solution to dampened concrete surfaces, scrubbing with uncolored, acid-resistant nylon bristle brushes until bubbling stops and concrete surface has texture of 120-grit sandpaper. Do not allow solution to dry on concrete surfaces. Rinse until water is clear. Control, collect, and legally dispose of runoff.
 4. Neutralize concrete surfaces and rinse until water is clear. Test surface for residue with clean white cloth. Test surface with pH pencil to ensure reading between 7 and 8.
- C. Scoring: Score decorative jointing in concrete surfaces 1/16 inch deep with diamond blades to match pattern indicated. Rinse until water is clear.
1. Joint Width: 3/8 inch
- D. Allow pavement surface to dry before applying stain. Test surfaces to receive stain by tightly taping 18 by 18 inches, 4-mil-thick polyethylene sheet to concrete surface. Apply stain only if no moisture has accumulated under sheet after 16 hours.
- E. Reactive Stain: Apply reactive stain to pavement surfaces according to manufacturer's written instructions and as follows:
1. Apply stain by uncolored bristle brush, roller, or high-volume, low-pressure sprayer and immediately scrub into concrete surface with uncolored, acid-resistant nylon bristle brushes in continuous, circular motion. Do not spread stain after fizzing stops. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup panel.
 2. Remove stain residue after four hours by wet scrubbing with commercial-grade detergent acceptable to stain manufacturer. Rinse until water is clear. Control, collect, and legally dispose of runoff.
- F. Penetrating Stain: Apply penetrating stain to pavement surfaces according to manufacturer's written instructions and as follows:
1. Apply first coat of stain to dry, clean surfaces by airless sprayer, or high-volume low-pressure sprayer.
 2. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup panel.
 3. Rinse until water is clear. Control, collect, and legally dispose of runoff.

3.14 SEALER

- A. Clear Acrylic Sealer: Apply uniformly in two coats in continuous operations according to manufacturer's written instructions. Allow first coat to dry before applying second coat, at 90-degrees to the direction of the first coat using same application methods and rates.
1. Begin sealing dry surface no sooner than 14 days after concrete placement.
 2. Allow stained concrete surfaces to dry before applying sealer.

3. Mix slip-resistant additive thoroughly in sealer before application according to manufacturer's written instructions. Stir sealer occasionally during application to maintain even distribution of additive.

3.15 PAVEMENT TOLERANCES

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

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

3.16 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least 1 composite sample for each 50cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064/C 1064M; 1 test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and 1 test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days for information and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

- C. Strength of each concrete mix will be satisfactory if every average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.
- F. Remove and replace decorative cement concrete pavement where test results indicate that it does not comply with specified requirements.
- G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.17 REPAIRS AND PROTECTION

- A. Remove and replace decorative cement concrete pavement that is broken, damaged, or does not comply with requirements in this Section in complete sections from joint to joint, unless otherwise approved by Architect.
- B. Detailing: Grind concrete "squeeze" left from tool placement. Color ground areas with slurry of color hardener mixed with water and bonding agent. Remove excess release agent with high-velocity blower.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 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 decorative cement concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep decorative cement concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 16

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Expansion and contraction joints within portland cement concrete pavement.
 - 2. Joints between portland cement concrete and asphalt pavement.
- B. Related Requirements:
 - 1. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 2. Division 32 Section "Concrete Paving" for constructing joints in concrete paving.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Compatibility and Adhesion Test Reports: From joint sealant manufacturer indicating the following:

1. Materials forming joint substrates and joint-sealant backer materials have been tested for compatibility and adhesion with joint sealants.
 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: From a qualified testing agency indicating joint sealants comply with requirements, based on comprehensive testing of current product formulations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency, based on testing current sealant formulations within a 36-month period.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 2. Test joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. Preconstruction Compatibility and Adhesion Testing: Submit to joint sealant manufacturer, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - a. Perform tests under environmental conditions replicating those that will exist during installation.
 2. Submit not fewer than nine pieces of each type of material, including joint substrates, joint-sealant backer materials, secondary seals, and miscellaneous material.
 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

4. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if joint sealant manufacturer submits joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
- B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than that allowed by joint sealant manufacturer for application indicated.
- C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: Match Architect's samples.

- C. Colors of Exposed Joint Sealants: As indicated by referencing manufacturer's designations.
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:
 - 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
 - 2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
 - 3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
- B. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
- C. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
- D. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- E. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.
- F. Available Products: Subject to compliance with requirements, cold-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
- G. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Multicomponent Jet-Fuel-Resistant Sealant for Concrete:
 - a. Vulkem 202; Mameco International.
 - b. SEALTIGHT GARDOX; W.R. Meadows, Inc.

- c. Urexpam NR-300; Pecora Corporation.
 - d. Sonomeric 2; Sonneborn Building Products Div., ChemRex, Inc.
- 2. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete:
 - a. Vulkem 200; Mameco International.
 - b. Sonomeric 1; Sonneborn Building Products Div., ChemRex, Inc.
- 3. Type NS Silicone Sealant for Concrete:
 - a. Roadsaver Silicone-SL; Crafcro Inc.
 - b. 888; Dow Corning.
- 4. Type SL Silicone Sealant for Concrete and Asphalt:
 - a. 890-SL; Dow Corning.
- 5. Multicomponent Low-Modulus Sealant for Concrete and Asphalt:
 - a. SOF-SEAL; W.R. Meadows, Inc.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Jet-Fuel-Resistant Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3569.
- B. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete: Single-component formulation complying with ASTM D 3581.
- C. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
- D. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.
- E. Available Products: Subject to compliance with requirements, hot-applied joint sealants that may be incorporated into the Work include, but are not limited to, the following:
- F. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Jet-Fuel-Resistant Elastomeric Sealant for Concrete:
 - a. Superseal 444/777; Crafcro, Inc.
 - b. POLY-JET 3569; W.R. Meadows, Inc.
 - 2. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete:

- a. SUPERSEAL 1614A; Crafcro Inc.
 - b. POLY-JET 1614; W.R. Meadows, Inc.
 - c. POLY-JET 3406; W.R. Meadows, Inc.
 - d. POLY-JET 3569, W.R. Meadows, Inc.
- 3. Elastomeric Sealant for Concrete:
 - a. Superseal 444/777; Crafcro, Inc.
 - b. POLY-JET 3406; W.R. Meadows, Inc.
- 4. Sealant for Concrete and Asphalt:
 - a. ROADSAVER 221; Crafcro Inc.
 - b. Product #9005; Koch Materials Company.
 - c. Product #9030; Koch Materials Company.
 - d. SEALTIGHT HI-SPEC; W.R. Meadows, Inc.

2.4 JOINT-SEALANT BACKER MATERIALS

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

2.5 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint- sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions applicable for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 1. Remove excess joint sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 32 13 73

SECTION 32 13 19 – DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Decorative metallic-coated steel tubular picket fences.
 - 2. Decorative metallic-coated steel wire fences.
 - 3. Decorative metallic-coated steel security fences.
 - 4. Decorative steel fences.
 - 5. Decorative aluminum fences.
 - 6. Swing gates.
 - 7. Horizontal-slide gates.
 - 8. Gate operators, including controls.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for site excavation, fill, and backfill where decorative metal fences and gates are located.

1.3 PERFORMANCE REQUIREMENTS

- A. Lightning-Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples: For each fence material and for each color specified.

1. Provide Samples 12 inches (300 mm) in length for linear materials.
 2. Provide Samples 12 inches (300 mm) square for wire mesh bar grating and sheet or plate materials.
- D. Welding certificates.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for decorative metallic-coated steel tubular picket fences, including finish, indicating compliance with referenced standard and other specified requirements.
- F. Maintenance Data: For gate operators to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
- 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. UL Standard: Provide gate operators that comply with UL 325.
- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.
- F. Mockups: Build mockups to set quality standards for fabrication and installation.
1. Include 10-foot (3-m) length of fence complying with requirements or specify length on construction plans.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
- C. Tubing: ASTM B 429, Alloy 6063-T6.

- D. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.2 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Tubing: ASTM A 500, cold formed steel tubing.
- D. Bar Grating: NAAMM MBG 531.
 - 1. Bars: Hot-rolled steel strip, ASTM A 1011/A 1011M, Commercial Steel, Type B.
 - 2. Wire Rods: ASTM A 510 (ASTM A 510M).
- E. Uncoated Steel Sheet: Hot-rolled steel sheet, ASTM A 1011/A 1011M, Structural Steel, Grade 45 (Grade 310) or cold-rolled steel sheet, ASTM A 1008/A 1008M, Structural Steel, Grade 50 (Grade 340).
- F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50 (Grade 340), with G90 (Z275) G60 (Z180) coating.
- G. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50 (Grade 340), with AZ60 (AZM180) coating.
- H. Castings: Either gray or malleable iron unless otherwise indicated.
 - 1. Gray Iron: ASTM A 48/A 48M, Class 30.
 - 2. Malleable Iron: ASTM A 47/A 47M.

2.3 COATING MATERIALS

- A. Shop Primers for Steel: Provide primers that comply with "Division 09 Section "High-Performance Coatings."
- B. Epoxy Zinc-Rich Primer for Steel: Complying with MPI #20 and compatible with coating specified to be applied over it.
 - 1. Use primer with a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Epoxy Primer for Galvanized Steel: Complying with MPI #101 and compatible with coating specified to be applied over it.

1. Use primer with a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
 1. Use product with a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
 1. Use product with a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Division 03 Section "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size or dry, packaged, normal-weight concrete mix complying with ASTM C 387 mixed with potable water according to manufacturer's written instructions.
- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

2.5 GROUNDING MATERIALS

- A. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
 1. Material above Finished Grade: Aluminum.
 2. Material on or below Finished Grade: Copper.
 3. Bonding Jumpers: Braided copper tape, 1 inch (25 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- B. Grounding Connectors and Grounding Rods: Comply with UL 467.
 1. Connectors for Below-Grade Use: Exothermic-welded type.
 2. Grounding Rods: Copper-clad steel.
 - a. Size: 5/8 by 96 inches (16 by 2440 mm).

2.6 DECORATIVE METALLIC-COATED STEEL TUBULAR PICKET FENCES

- A. Decorative Metallic-Coated Steel Tubular Picket Fences: Comply with ASTM F 2408, for residential light industrial (commercial) industrial application (class) unless otherwise indicated.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Ameristar Fence Products.
 - b. Fortress Iron; a division of Woodmark International, LP.
 - c. Iron Eagle Industries, Inc.
 - d. Master Halco.
 - e. Merchants Metals; a division of MMI Products, Inc.
 - f. Payne Fence Products; a division of Payne Metal Works, Inc.
 - g. Xcel Fence.
- B. Metallic-Coated Steel Sheet: Galvanized-steel sheet or aluminum-zinc alloy-coated steel sheet.
- C. Interior surface of tubes formed from uncoated steel sheet shall be hot-dip zinc coated same as exterior or coated with zinc-rich thermosetting coating to comply with ASTM F 2408.
- D. Posts:
 - 1. End and Corner Posts: Square tubes 3 by 3 inches (76 by 76 mm) or as shown on the construction plans formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 - 2. Swing Gate Posts: Square tubes 3 by 3 inches (76 by 76 mm) formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 - 3. Swing Gate Posts: Square steel tubing 3 by 3 inches (76 by 76 mm) or as shown on the construction plans wall thickness, hot-dip galvanized.
 - 4. Horizontal-Slide Gate Post, Openings up to 12 Feet (3.7 m): Square steel tubing 3 by 3 inches (76 by 76 mm) or as shown on the construction plans with 3/16-inch (4.76-mm) or as shown on the construction plans wall thickness, hot-dip galvanized.
 - 5. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet (3.7 m): Square steel tubing 4 by 4 inches (102 by 102 mm) with 3/16-inch (4.76-mm) wall thickness, hot-dip galvanized.
 - 6. Guide Posts for Class 1 Horizontal-Slide Gates: Square tubes 3 by 3 inches (76 by 76 mm) formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication; installed adjacent to gate post to permit gate to slide in space between.
 - 7. Guide Posts for Class 1 Horizontal-Slide Gates: Square steel tubing 3 by 3 inches (76 by 76 mm) or as shown on the construction plans with 3/16-inch (4.76-mm) wall thickness, hot-dip galvanized; installed adjacent to gate post to permit gate to slide in space between.
- E. Post Caps: Aluminum castings.

- F. Rails: Square tubes.
 - 1. Size: 1-1/2 by 1-1/2 inches (38 by 38 mm).
 - 2. Metal and Thickness: 0.079-inch (2.01-mm) nominal-thickness, metallic-coated steel sheet or 0.075-inch (1.90-mm) nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
- G. Pickets: Square tubes.
 - 1. For termination and picket spacing, Please refer to construction plans.
- H. Fasteners: Manufacturer's standard concealed fastening system.
- I. Fasteners: Manufacturer's standard tamperproof, corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.
- J. Galvanizing: For components indicated to be galvanized and for which galvanized coating is not specified in ASTM F 2408, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- K. Finish: Powder coating.

2.7 DECORATIVE ALUMINUM FENCES

- A. Decorative Aluminum Fences: Fences made from aluminum extrusions.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Alumi-Guard, Inc.
 - b. Ameristar Fence Products.
 - c. Carfaro, Inc.
 - d. Delair Group, L.L.C.
 - e. Elegant Aluminum Products, Inc.
 - f. Elite Fence Products, Inc.
 - g. Iron Eagle Industries, Inc.
 - h. Japra Group International.
 - i. Jerith Manufacturing Company, Inc.
 - j. Master Halco.
 - k. Merchants Metals; a division of MMI Products, Inc.
 - l. Royal Aluminum and Steel, Inc.
 - m. Specrail; a division of Porcelen LLC.
- B. Posts: Square extruded tubes.

1. Line Posts: 2-1/2 by 2-1/2 inches (64 by 64 mm) or as shown on the construction plans wall thickness.
 2. End and Corner Posts: 3 by 3 inches (76 by 76 mm) or as shown on the construction plans with 0.080-inch (2.03-mm) wall thickness.
 3. Swing Gate Posts: 3 by 3 inches (76 by 76 mm) or as shown on the construction plans with 0.250-inch (6.35-mm) wall thickness.
- C. Post Caps: Aluminum castings that project at least 1/4 inch (6 mm) beyond posts.
- D. Rails: Extruded-aluminum channels, As shown on the construction plans.
- E. Pickets: Extruded-aluminum tubes, 1 inch (25 mm) square, with 0.062-inch (1.57-mm) wall thickness.
1. Termination of pickets and picket spacing as shown on the construction plans.
- F. Fasteners: Manufacturer's standard concealed fastening system.
- G. Fasteners: Manufacturer's standard tamperproof, corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers.
- H. Fabrication: Assemble fences into sections by fastening pickets to rails.
1. Fabricate sections with clips welded to rails for fastening to posts in field.
 2. Drill clips for fasteners before finishing.
- I. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.
- J. Finish: Baked enamel or powder coating.

2.8 SWING GATES

- A. Gate Configuration: indicated.
- B. Gate Frame Height: As indicated.
- C. Gate Opening Width: As indicated.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- E. Steel Frames and Bracing: Fabricate members from square steel tubing 1-1/2 by 1-1/2 inches (38 by 38 mm) with 1/8-inch (3.2-mm) wall thickness.
- F. Aluminum Frames and Bracing: Fabricate members from square extruded-aluminum tubes 1-1/2 by 1-1/2 inches (38 by 38 mm) with 0.100-inch (2.54-mm) 0.125-inch (3.18-mm) 0.140-inch (3.56-mm) 0.154-inch (3.91-mm) wall thickness.

- G. Frame Corner Construction: Welded or assembled with corner fittings and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider.
- H. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- I. Infill: Comply with requirements for adjacent fence.
- J. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
 - 1. Treillage: Provide iron castings of pattern indicated between each pair of pickets. Finish as specified for adjacent fence gates.
- K. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet (1.52 m) wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.
- L. Spring Hinges: BHMA A156.17, Grade 1, suitable for exterior use.
 - 1. Function: 320 - Gate spring pivot hinge. Adjustable tension.
 - 2. Material: Malleable iron.
- M. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
 - 1. Function: 39 - Full surface, triple weight, antifriction bearing.
 - 2. Material: Wrought steel, forged steel, cast steel, or malleable iron.
- N. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.
 - 1. Function: 621 - Latchbolt by key from outside and by turn from inside. Latchbolt is held retracted by device from inside 622 - Deadbolt by key from outside and by turn from inside 629 - Deadlocking latchbolt by key from outside and by turn from inside 626 - Interlocking deadbolt operated by key from either side 627 - Interlocking deadbolt operated by key from outside and by turn from inside.
 - 2. Material: Cast, forged, or extruded brass or bronze.
 - 3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch- (3.2-mm-) thick, aluminum plate.
- O. Mortise Locks: BHMA A156.13, Grade 1, suitable for exterior use.
 - 1. Function: F06 - Holdback lock F07 - Storeroom or closet lock.
 - 2. Material: Brass or bronze.
 - 3. Levers: Cast, forged, or extruded brass or bronze.
 - 4. Mounting Box: Configuration necessary to enclose locks. Fabricate from 1/8-inch- (3.2-mm-) thick, aluminum plate.
- P. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 1/2-inch- (12.7 -mm-) diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.

- Q. Finish exposed welds to comply with NOMMA Guideline 1, Finish #4 - good-quality, uniform undressed weld with minimal splatter.
- R. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- S. Metallic-Coated Steel Finish: High-performance coating.
- T. Steel Finish: Primed.
- U. Aluminum Finish: Baked enamel or powder coating.

2.9 METALLIC-COATED STEEL FINISHES

- A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a zinc-phosphate conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Powder Coating: Immediately after cleaning and pretreating, apply TGIC polyester powder-coat finish, with a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.
- D. Powder Coating: Immediately after cleaning and pretreating, apply 2-coat finish consisting of zinc-rich epoxy prime coat and TGIC polyester topcoat, with a minimum dry film thickness of 2 mils (0.05 mm) for topcoat. 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 F 2408 except change corrosion-resistance requirement to 3000 hours without failure.
- E. High-Performance Coating: Apply epoxy primer, epoxy 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 areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 1. Construction layout and field engineering are specified in Division 01 Section "Execution"

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening rails and infill panels to posts.
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than 24 inches (600 mm) plus 3 inches (75 mm) for each foot (300 mm) or fraction of a foot (300 mm) that fence height exceeds 4 feet (1200 mm).
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts and sleeves and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches (50 mm) above grade. Finish and slope top surface to drain water away from post.
 - b. Concealed Concrete: Top 2 inches (50 mm) below grade as indicated on Drawings to allow covering with surface material. Slope top surface of concrete to drain water away from post.
 - 3. Posts Set in Concrete: Extend post to within 6 inches (150 mm) of specified excavation depth, but not closer than 3 inches (75 mm) to bottom of concrete.

4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least 3/4 inch (20 mm) larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
 - a. Extend posts at least 5 inches (125 mm) into sleeve.
 - b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
5. Posts Set into Voids in Concrete: Form or core drill holes not less than 3/4 inch (20 mm) larger than outside diagonal dimension of post.
 - a. Extend posts at least 5 inches (125 mm) into concrete.
 - b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
6. Mechanically Driven Posts: Drive into soil to depth of 36 inches (914 mm). Protect post top to prevent distortion.
7. Space posts uniformly at 8 feet (2.44 m) or as indicated o.c.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation for Concrete Bases: Hand-excavate holes for bases, in firm, undisturbed soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated.

3.6 GROUNDING AND BONDING

- A. Fence Grounding: Install at maximum intervals of 1500 feet (450 m) except as follows:
 1. Fences within 100 Feet (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 feet (225 m).
 - a. Gates and Other Fence Openings: Ground fence on each side of opening.

- 1) Bond metal gates to gate posts.
 - 2) Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches (460 mm) below finished grade.
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet (45 m) on each side of crossing.
- C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.
- D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches (150 mm) below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.
- E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
- F. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- G. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.7 FIELD QUALITY CONTROL

- A. Grounding-Resistance Testing: Engage a qualified testing agency to perform tests and inspections.
 1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.

2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
3. Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.8 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 32 3119

SECTION 32 32 23 - SEGMENTAL RETAINING WALLS

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 single- and multiple- depth segmental retaining walls with and without soil reinforcement.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving" for excavation for segmental retaining walls.

1.3 PERFORMANCE REQUIREMENTS

- A. Basis of Design: Design of segmental retaining walls is based on products indicated. If comparable products of other manufacturers are proposed, provide engineering design for proposed products, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Delegated Design: Design segmental retaining walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Performance: Engineering design shall be based on the following loads and be according to NCMA's "Design Manual for Segmental Retaining Walls."
 - 1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated.
 - 2. Superimposed loads (surcharge) indicated on Drawings.
- D. Seismic Performance: Engineering design shall be based on the following loads and factors and be according to NCMA's "Segmental Retaining Walls - Seismic Design Manual."
 - 1. Gravity loads due to soil pressures resulting from grades and sloped backfill indicated.
 - 2. Superimposed loads (surcharge) indicated on Drawings.

3. Horizontal Peak Ground Acceleration (A) for Project:

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform the following preconstruction testing:
 1. Test soil reinforcement and backfill materials for pullout resistance according to ASTM D 6706.
 2. Test soil reinforcement and backfill materials for coefficient of friction according to ASTM D 5321.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For concrete units.
- C. Samples for Verification: For each color and texture of concrete unit required. Submit full-size units.
 1. Include one full-size unit for each type of concrete unit required.
- D. Delegated-Design Submittal: For segmental retaining walls 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. Compliance Review: Qualified professional engineer responsible for segmental retaining wall design shall review and approve submittals and source and field quality-control reports for compliance of materials and construction with design.
- E. Qualification Data: For qualified professional engineer and testing agency.
- F. Product Certificates: For segmental retaining wall units and soil reinforcement, from manufacturer.
 1. Include test data for shear strength between segmental retaining wall units according to ASTM D 6916.
 2. Include test data for connection strength between segmental retaining wall units and soil reinforcement according to ASTM D 6638.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for segmental retaining wall units and soil reinforcement.
 1. Include test data for freeze-thaw durability of segmental retaining wall units.

2. Include test data for shear strength between segmental retaining wall units according to ASTM D 6916.
 3. Include test data for connection strength between segmental retaining wall units and soil reinforcement according to ASTM D 6638.
- H. Preconstruction test reports.
- I. Source quality-control reports.
- J. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects.
1. Build mockup of segmental retaining wall approximately 72 inches long by not less than 36 inches high above finished grade at front of wall.
 - a. Include typical soil reinforcement.
 - b. Include typical base and cap or finished top construction.
 - c. Include backfill to typical finished grades at both sides of wall.
 - d. Include typical end construction at one end of mockup.
 - e. Include 36-inch return at 1 end of mockup, with typical corner construction.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to segmental retaining walls including, but not limited to, the following:
 - a. Structural load limitations.
 - b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Field quality-control procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle concrete units and accessories to prevent deterioration or damage due to contaminants, breaking, chipping, or other causes.
- B. Store geosynthetics in manufacturer's original packaging with labels intact. Store and handle geosynthetics to prevent deterioration or damage due to sunlight, chemicals, flames, temperatures above 160 deg F or below 32 deg F, and other conditions that might damage them. Verify identification of geosynthetics before using and examine them for defects as material is placed.

PART 2 - PRODUCTS

2.1 SEGMENTAL RETAINING WALL UNITS

- A. Concrete Units: ASTM C 1372, Normal Weight, except that maximum water absorption shall not exceed 7 percent by weight and units shall not differ in height more than plus or minus 1/16 inch from specified dimension.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by available manufacturers offering products that may be incorporated into the Work include, but are not limited to, licensees of one of the following:
 - a. Allan Block Corporation.
 - b. Anchor Wall Systems, Inc.
 - c. GeoWestern, Inc.
 - d. ICD Corporation.
 - e. Keystone Retaining Wall Systems, Inc.; a Contech company.
 - f. Risi Stone Systems; a division of Rothbury International.
 - g. Rockwood Retaining Walls, Inc.
 - h. Tensar Earth Technologies, Inc.
 - i. Versa-Lok Retaining Wall Systems; a division of Kiltie Corporation.
 - 2. Provide units that comply with requirements for freeze-thaw durability.
 - 3. Provide units that interlock with courses above and below by means of integral lugs or lips pins clips or hollow cores filled with drainage fill.
- B. Color: As selected by Architect from manufacturer's full range.
- C. Shape and Texture: Provide units of basic shape and dimensions indicated with machine-split textured or smooth exposed faces.
- D. Shape and Texture: Provide units matching basic shape, dimensions, and face texture indicated by referencing manufacturer's pattern designation.

- E. Shape and Texture: Provide units of any basic shape and dimensions that will produce segmental retaining walls of dimensions and profiles indicated without interfering with other elements of the Work and with machine-split textured, flat exposed face or shaped exposed face with deeply beveled vertical edges.
- F. Batter: Provide units that offset from course below to provide minimum batter.
- G. Cap Units: Provide cap units of shape indicated with smooth, as-cast top surfaces without holes or lugs.
- H. Special Units: Provide corner units, end units, and other shapes as needed to produce segmental retaining walls of dimensions and profiles indicated and to provide texture on exposed surfaces as indicated.

2.2 INSTALLATION MATERIALS

- A. Pins: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.
- B. Clips: Product supplied by segmental retaining wall unit manufacturer for use with units provided, made from nondegrading polymer reinforced with glass fibers.
- C. Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.
- D. Leveling Base: Comply with requirements in Division 31 Section "Earth Moving" for base material.
 - 1. Leveling Course: Lean concrete with a compressive strength of not more than 500 psi.
- E. Drainage Fill: Comply with requirements in Division 33 Section "Subdrainage."
- F. Reinforced-Soil Fill: Comply with requirements in Division 31 Section "Earth Moving" for satisfactory soils.
- G. Reinforced-Soil Fill: ASTM D 2487; GW, GP, SW, SP, and SM soil classification groups or a combination of these groups; free of debris, waste, frozen materials, vegetation, and other deleterious matter; meeting the following gradation according to ASTM C 136: 20 to 100 percent passing No. 4 sieve, 0 to 60 percent passing No. 40 sieve, 0 to 35 percent passing No. 200 sieve, and with fine fraction having a plasticity index of less than 20.
- H. Nonreinforced-Soil Fill: Comply with requirements in Division 31 Section "Earth Moving" for satisfactory soils.

- I. Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent.
 - 1. Apparent Opening Size: No. 70 to 100 sieve, maximum; ASTM D 4751.
 - 2. Minimum Grab Tensile Strength: 110 lb; ASTM D 4632.
 - 3. Minimum Weight: 4 oz./sq. yd..
- J. Subdrainage Pipe and Filter Fabric: Comply with requirements in Division 33 Section "Subdrainage."
- K. Soil Reinforcement: Product specifically manufactured for use as soil reinforcement and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Colbond Inc.
 - b. Huesker, Inc.
 - c. Luckenhaus Technical Textiles, Inc.
 - d. Mirafi Construction Products; Ten Cate Nicolon.
 - e. Propex Fabrics Inc.; Civil Engineering Fabrics.
 - f. Strata Systems, Inc.
 - g. Synteen Technical Fabrics, Inc.
 - h. Tenax Corporation; Subsidiary of Tenax Group.
 - i. Tensar Earth Technologies, Inc.
 - j. Versa-Lok Retaining Wall Systems; a division of Kiltie Corporation.
 - k. Webtec, Inc.
 - 2. Product Type: Woven geotextile made from polyamides, polyesters, or polyolefins.

2.3 SOURCE QUALITY CONTROL

- A. Direct manufacturer to test and inspect each roll of soil reinforcement at the factory for minimum average roll values for geosynthetic index property tests, including the following:
 - 1. Weight.
 - 2. Roll size.
 - 3. Grab or single-rib strength.
 - 4. Aperture opening.
 - 5. Rib or yarn size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of segmental retaining walls.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 RETAINING WALL INSTALLATION

- A. General: Place units according to NCMA's "Segmental Retaining Wall Installation Guide" and segmental retaining wall unit manufacturer's written instructions.
 - 1. Lay units in bond pattern indicated.
 - 2. Form corners and ends by cutting units with motor-driven saw or splitting units with mason's hammer and chisel.
- B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent maximum dry unit weight according to ASTM D 698.
 - 1. Leveling Course: Place unreinforced lean concrete over leveling base 1 to 2 inches thick. Compact and screed concrete to a smooth, level surface.
- C. First Course: Place first course of segmental retaining wall units for full length of wall. Place units in firm contact with each other, properly aligned and level.
 - 1. Tamp units into leveling base as necessary to bring tops of units into a level plane.
- D. Subsequent Courses: Remove excess fill and debris from tops of units in course below. Place units in firm contact, properly aligned, and directly on course below.
 - 1. For units with lugs designed to fit into holes in adjacent units, lay units so lugs are accurately aligned with holes, and bedding surfaces are firmly seated on beds of units below.
 - 2. For units with lips at front of units, slide units as far forward as possible for firm contact with lips of units below.
 - 3. For units with lips at bottom rear of units, slide units as far forward as possible for firm contact of lips with units below.
 - 4. For units with pins, install pins and align units.
 - 5. For units with clips, install clips and align units.
- E. Cap Units: Place cap units and secure with cap adhesive.

3.3 FILL PLACEMENT

- A. General: Comply with requirements in Division 31 Section "Earth Moving," NCMA's "Segmental Retaining Wall Installation Guide," and segmental retaining wall unit manufacturer's written instructions.
- B. Fill voids between and within units with drainage fill. Place fill as each course of units is laid.
- C. Place, spread, and compact drainage fill and soil fill in uniform lifts for full width and length of embankment as wall is laid. Place and compact fills without disturbing alignment of units. Where both sides of wall are indicated to be filled, place fills on both sides at same time. Begin at wall and place and spread fills toward embankment.
 - 1. Use only hand-operated compaction equipment within 48 inches of wall, or one-half of height above bottom of wall, whichever is greater.
 - 2. Compact reinforced-soil fill to not less than 95 percent maximum dry unit weight according to ASTM D 698.
 - a. In areas where only hand-operated compaction equipment is allowed, compact fills to not less than 90 percent maximum dry unit weight according to ASTM D 698.
 - b. In areas where fill height exceeds 15 feet, compact reinforced-soil fill that will be more than 15 feet below finished grade to not less than 98 percent maximum dry unit weight according to ASTM D 698.
 - c. In areas where fill height exceeds 30 feet, compact reinforced-soil fill that will be more than 30 feet below finished grade to not less than 100 percent maximum dry unit weight according to ASTM D 698.
 - 3. Compact nonreinforced-soil fill to comply with Division 31 Section "Earth Moving."
- D. Place drainage geotextile against back of wall and place layer of drainage fill at least 12 inches wide behind drainage geotextile to within 12 inches of finished grade. Place another layer of drainage geotextile between drainage fill and soil fill.
- E. Place a layer of drainage fill at least 12 inches wide behind wall to within 12 inches of finished grade. Place a layer of drainage geotextile between drainage fill and soil fill.
- F. Wrap subdrainage pipe with filter fabric and place in drainage fill as indicated, sloped not less than 0.5 percent to drain.
- G. Place impervious fill over top edge of drainage fill layer.
- H. Slope grade at top of wall away from wall unless otherwise indicated. Slope grade at base of wall away from wall. Provide uniform slopes that will prevent ponding.

- I. Place soil reinforcement in horizontal joints of retaining wall where indicated and according to soil-reinforcement manufacturer's written instructions. Embed reinforcement a minimum of 8 inches into retaining wall and stretch tight over compacted backfill. Anchor soil reinforcement before placing fill.
 1. Place additional soil reinforcement at corners and curved walls to provide continuous reinforcement.
 2. Place geosynthetics with seams, if any, oriented perpendicular to segmental retaining walls.
 3. Do not dump fill material directly from trucks onto geosynthetics.
 4. Place at least 6 inches of fill over reinforcement before compacting with tracked vehicles or 4 inches before compacting with rubber-tired vehicles.
 5. Do not turn vehicles on fill until first layer of fill is compacted and second layer is placed over each soil-reinforcement layer.

3.4 CONSTRUCTION TOLERANCES

- A. Variation from Level: For bed-joint lines along walls, do not exceed 1-1/4 inches in 10 feet, 3 inches maximum.
- B. Variation from Indicated Batter: For slope of wall face, do not vary from indicated slope by more than 1-1/4 inches in 10 feet.
- C. Variation from Indicated Wall Line: For walls indicated as straight, do not vary from straight line by more than 1-1/4 inches in 10 feet.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Comply with requirements in Division 31 Section "Earth Moving" for field quality control.
 1. In each compacted backfill layer, perform at least 1 field in-place compaction test for each 150 feet or less of segmental retaining wall length.
 2. In each compacted backfill layer, perform at least 1 field in-place compaction test for each 24 inches of fill depth and each 50 feet or less of segmental retaining wall length.

3.6 ADJUSTING

- A. Remove and replace segmental retaining wall construction of the following descriptions:

1. Broken, chipped, stained, or otherwise damaged units. Units may be repaired if Architect approves methods and results.
 2. Segmental retaining walls that do not match approved Samples.
 3. Segmental retaining walls that do not comply with other requirements indicated.
- B. Replace units so segmental retaining wall matches approved Samples and mockups, complies with other requirements, and shows no evidence of replacement.

3.7 Quantity Measurement

- A. The square foot quantity of the modular block concrete wall will only be measured by the exposed wall face space. All other costs are to be build the modular concrete block retaining wall will be incorporated within that unit price per square foot of exposed wall face area.

END OF SECTION 32 32 23

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Hydroseeding.
 - 3. Sodding.
 - 4. Meadow grasses and wildflowers.
 - 5. Turf renovation.
 - 6. Erosion-control material(s).
 - 7. Grass paving.
- B. Related Sections:
 - 1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
 - 3. Division 32 Section "Planting Irrigation " for turf irrigation.
 - 4. Division 32 Section "Plants" for border edgings.

1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass. Include identification of source and name and telephone number of supplier.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material Test Reports: For standardized ASTM D 5268 topsoil existing native surface topsoil existing in-place surface soil and imported or manufactured topsoil.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and meadows during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf and meadow establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.
 - c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
 5. Maintenance Proximity: Not more than three hours' normal travel time from Installer's place of business to Project site.
 6. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: The contractor is responsible for an independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

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

1.8 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:
 - 1. Seeded Turf: 120 days from date of planting completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
 - 2. Sodded Turf: 60 days from date of planting completion.
- B. Initial Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 90 days from date of planting completion.

- C. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: State-certified seed of grass species as follows:
- C. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full Sun: Bermudagrass (*Cynodon dactylon*).
 - 2. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
 - 3. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 10 percent perennial ryegrass (*Lolium perenne*).
 - d. 10 percent redtop (*Agrostis alba*).
 - 4. Shade: Proportioned by weight as follows:
 - a. 50 percent chewings red fescue (*Festuca rubra* variety).
 - b. 35 percent rough bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).
- D. Grass Seed Mix: Proprietary seed mix as follows:

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Certified Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
2. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 10 percent perennial ryegrass (*Lolium perenne*).
 - d. 10 percent redtop (*Agrostis alba*).
3. Shade: Proportioned by weight as follows:
 - a. 50 percent chewings red fescue (*Festuca rubra* variety).
 - b. 35 percent rough bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).

2.3 MEADOW GRASSES AND WILDFLOWERS

- A. Wildflower Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 1. See Landscape Plan.
- B. Native Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 1. See Landscape Plan.
- C. Wildflower and Native Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 1. See Landscape Plan.
- D. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

2.4 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
 2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
 3. Provide lime in form of ground calcitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.5 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
 - 1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.6 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.

- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.7 PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - 1. Ratio of Loose Compost to Topsoil by Volume: 1:4.
 - 2. Ratio of Loose Sphagnum Peat to Topsoil by Volume:
 - 3. Weight of Lime per 1000 Sq. Ft.:
 - 4. Weight of Aluminum Sulfate per 1000 Sq. Ft.:
 - 5. Weight of Agricultural Gypsum per 1000 Sq. Ft.:
 - 6. Volume of Sand Plus 10 Percent Diatomaceous Earth per 1000 Sq. Ft.:
 - 7. Weight of Bonemeal per 1000 Sq. Ft.:
 - 8. Weight of Superphosphate per 1000 Sq. Ft.:
 - 9. Weight of Commercial Fertilizer per 1000 Sq. Ft.:
 - 10. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.: Unamended or raw topsoil and surface soil, including agricultural topsoil, in first three paragraphs below seldom contain more than 1 or 2 percent organic matter.
- B. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 1. Mix existing, native surface topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: 1:4.
 - b. Ratio of Loose Sphagnum Peat to Topsoil by Volume:

- c. Weight of Lime per 1000 Sq. Ft.:
 - d. Weight of Aluminum Sulfate per 1000 Sq. Ft.:
 - e. Weight of Agricultural Gypsum per 1000 Sq. Ft.:
 - f. Volume of Sand Plus 10 Percent Diatomaceous Earth per 1000 Sq. Ft.:
 - g. Weight of Bonemeal per 1000 Sq. Ft.:
 - h. Weight of Superphosphate per 1000 Sq. Ft.:
 - i. Weight of Commercial Fertilizer per 1000 Sq. Ft.:
 - j. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.:
- C. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
- 1. Ratio of Loose Compost to Surface Soil by Volume: 1:4.
 - 2. Ratio of Loose Sphagnum Peat to Surface Soil by Volume:
 - 3. Ratio of Loose Wood Derivatives to Surface Soil by Volume:
 - 4. Weight of Lime per 1000 Sq. Ft.:
 - 5. Weight of Aluminum Sulfate per 1000 Sq. Ft.:
 - 6. Weight of Agricultural Gypsum per 1000 Sq. Ft.:
 - 7. Volume of Sand Plus 10 Percent Diatomaceous Earth per 1000 Sq. Ft.:
 - 8. Weight of Bonemeal per 1000 Sq. Ft.:
 - 9. Weight of Superphosphate per 1000 Sq. Ft.:
 - 10. Weight of Commercial Fertilizer per 1000 Sq. Ft.:
 - 11. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.:
- D. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
- 1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
 - 2. Mix imported topsoil or manufactured topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: 1:4.
 - b. Ratio of Loose Sphagnum Peat to Topsoil by Volume:
 - c. Ratio of Loose Wood Derivatives to Topsoil by Volume:

- d. Weight of Lime per 1000 Sq. Ft.:
 - e. Weight of Aluminum Sulfate per 1000 Sq. Ft.: Weight of Agricultural Gypsum per 1000 Sq. Ft.:
 - f. Volume of Sand Plus 10 Percent Diatomaceous Earth per 1000 Sq. Ft.:
 - g. Weight of Bonemeal per 1000 Sq. Ft.: Weight of Superphosphate per 1000 Sq. Ft.:
 - h. Weight of Commercial Fertilizer per 1000 Sq. Ft.:
 - i. Weight of Slow-Release Fertilizer per 1000 Sq. Ft.:
- E. Lightweight On-Structure Planting Soil: Mix produced by modifying planting soil as follows:
- 1. Planting Soil: One part(s), except replace all of sand content with perlite.
 - 2. Additional Perlite: One part.
 - 3. Additional SphagnumPeat: One part.
 - 4. Additional Lime: Ground calcitic limestone applied at the rate of 3 lb per cu. yd.

2.8 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.9 PESTICIDES

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

2.10 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 4-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
 - a. Invisible Structures, Inc.; Slopetame 2.
 - b. Presto Products Company, a business of Alcoa; Geoweb.
 - c. Tenax Corporation - USA; Tenweb.
 - d. <Insert manufacturer's name; product name or designation>.

2.11 GRASS-PAVING MATERIALS

- A. Grass Paving: Cellular, non-biodegradable plastic mats, designed to contain small areas of soil and enhance the ability of turf to support vehicular and pedestrian traffic, of 1-3/4-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Grid Technologies, Inc.; Netlon 50.
 - b. Invisible Structures, Inc.; Grasspave2.
 - c. NDS, Inc.; Tufftrack Grassroad Paver8 Plus.
 - d. Presto Products Company, a business of Alcoa; Geoblock Porous Pavement System.
 - e. RK Manufacturing, Inc.; Grassy Pavers.
- B. Base Course: Sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.

- C. Sand: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.
- D. Proprietary Growing Mix: As submitted and acceptable to Architect.
- E. Sandy Loam Soil Mix: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate blended with planting soil as specified. Use blend consisting of 1/2 sand and 1/2 planting soil.
- F. Soil for Paving Fill: Planting soil as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.

- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 8 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 8 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least 8 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 6 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
 - 3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.
 - 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.

- B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- C. Fill cells of erosion-control mat with planting soil and compact before planting.
- D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 PREPARATION FOR GRASS-PAVING MATERIALS

- A. Reduce subgrade elevation soil to allow for thickness of grass-paving system. Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade so that installed paving is within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions.
- B. Install base course and sand course and sandy loam soil mix proprietary growing mix soil for paving fill as recommended by paving-material manufacturer for site conditions; comply with details shown on Drawings. Compact according to paving-material manufacturer's written instructions.
- C. Install paving mat and fasten according to paving-material manufacturer's written instructions.
- D. Before planting, fill cells of paving mat with sandy loam soil mix and compact according to manufacturer's written instructions.
- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.6 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 - 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.

3.7 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
 - 3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre

3.8 SODDING

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

- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.9 TURF RENOVATION

- A. Renovate existing turf.
- B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

3.10 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow Kentucky bluegrass buffalograss annual ryegrass chewings red fescue to a height of 1-1/2 to 2 inches.
 2. Mow bahiagrass turf-type tall fescue St. Augustinegrass to a height of 2 to 3 inches.
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.11 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
 3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
 4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.12 MEADOW

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at a total rate: See Landscape Plan.
- C. Brush seed into top 1/16 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas from hot, dry weather or drying winds by applying peat or compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.
- E. Water newly planted areas and keep moist until meadow is established.

3.13 MEADOW MAINTENANCE

- A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
 - 3. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and meadow-watering equipment to convey water from sources and to keep meadow uniformly moist.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water meadow with fine spray at a minimum rate of 1/2 inch per week for eight weeks after planting unless rainfall precipitation is adequate.

3.14 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.15 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
 - 5. Lawns.
 - 6. Topsoil and soil amendments.
 - 7. Fertilizers and mulches.
 - 8. Stakes and guys.
 - 9. Landscape edgings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
 - 2. Division 31 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.
- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 1. Manufacturer's certified analysis for standard products.
 - 2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 - 3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing surface soil.
 - 2. Analysis of imported topsoil.
- F. Planting schedule indicating anticipated dates and locations for each type of planting.
- G. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Testing Agency Qualifications: The contractor is responsible for engaging a qualified independent testing agency to perform tests and inspections. To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
- D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.
- E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper

measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of the Contract for "Project Meetings."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- C. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Engineer. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.
 - 1. Immediately after digging bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- D. Handle balled and burlapped stock by the root ball.
- E. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
- F. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.7 COORDINATION AND SCHEDULING

- A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
- C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.
- D. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
- E. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.9 TREE AND SHRUB MAINTENANCE

- A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings. Maintain trees and shrubs for the following period:
 - 1. Maintenance Period: 3 months following Substantial Completion.

1.10 GROUND COVER AND PLANT MAINTENANCE

- A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:

1. Maintenance Period: 3 months following Substantial Completion.

1.11 LAWN MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 1. Seeded Lawns: 60 days after date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
 2. Sodded Lawns: 30 days after date of Substantial Completion.
 3. Plug-Sodded Lawns: 30 days after date of Substantial Completion.
 4. Sprigged Lawns: 30 days after date of Substantial Completion.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and mulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).
 1. Water lawn at the minimum rate of 1 inch (25 mm) per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.
 - 1. Branching Height: 1/3 to 1/2 of tree height.
 - 2. Branching Height: 1/2 of tree height.
- B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as follows:
 - 1. Form: Single stem.
 - 2. Form: Multistem, clump, with 2 or more main stems.
 - 3. Form: Multistem, shrub, with multiple stems.
- C. Provide balled and burlapped trees except where bare-root trees are indicated.
 - 1. Container-grown trees will be acceptable in lieu of balled and burlapped trees subject to meeting ANSI Z60.1 limitations for container stock.

2.3 DECIDUOUS SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
- B. Provide balled and burlapped deciduous shrubs except where bare-root deciduous shrubs are indicated.
 - 1. Container-grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to meeting ANSI Z60.1 limitations for container stock.

2.4 CONIFEROUS EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens.

- C. Provide balled and burlapped coniferous evergreens.
- D. Container-grown coniferous evergreens will be acceptable in lieu of balled and burlapped coniferous evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.5 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide balled and burlapped broadleaf evergreens.
 - 1. Container-grown broadleaf evergreens will be acceptable in lieu of balled and burlapped broadleaf evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.6 GROUND COVERS AND PLANTS

- A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.
- B. All plants must have tags clearly visible and must remain on plants after installation until project Landscape Architect has reviewed and approved all plantings.

2.7 GRASS MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on the Contract Documents.

2.8 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 2. Topsoil Source: Import topsoil from off-site sources. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes.

2.9 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 (2.36 mm) sieve and a minimum 75 percent passing a No. 60 (250 micrometer) sieve.
 - 1. Provide lime in the form of dolomitic limestone.
- B. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- F. Peat Humus: For acid-tolerant trees and shrubs, provide moss peat, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum moss peat or reed-sedge peat.
- G. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. ft. (cu. m) of loose sawdust or ground bark.
- H. Manure: Well-rotted, unbleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- I. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- J. Water: Potable.

2.10 FERTILIZER

- A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

- D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: 5 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight.
 2. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 3. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.11 MULCHES

- A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
1. Type: Shredded hardwood.
- B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
1. Type: Rounded riverbed gravel or smooth-faced stone.
 2. Type: Crushed stone or gravel.
 3. Size Range: 2 inches maximum, 3/4 inch (19 mm) minimum.
 4. Color: Uniform tan-beige color range, acceptable to Architect.

2.12 WEED-CONTROL BARRIERS

- A. Sheet Polyethylene: Black, 0.006-inch (0.15-mm) minimum thickness.
- B. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz. per sq. yd. (100 g per sq. m) minimum.
- C. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz. per sq. yd. (160 g per sq. m).

2.13 EROSION-CONTROL MATERIALS

- A. Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.
- B. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb per sq. yd. (0.5 kg per sq. m) minimum, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

2.14 STAKES AND GUYS

- A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.
- B. Guy and Tie Wire: ASTM A 641 (ASTM A 641M), Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.
- C. Guy Cable: 5-strand, 3/16-inch (4.8-mm) diameter, galvanized-steel cable, with zinc-coated turn buckles, 3-inch- (75-mm-) long minimum, with two 3/8-inch- (10-mm-) galvanized eyebolts.
- D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.
- E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.15 LANDSCAPE EDGINGS

- A. Steel Edging: ASTM A 569 (ASTM A 569M), rolled edge, standard steel edging, fabricated in sections with loops stamped from or welded to face of sections approximately 30 inches (760 mm) apart to receive stakes.
 - 1. Edging Size: 3/16 inch (4.8 mm) wide by 4 inches (102 mm) deep.
 - 2. Edging Size: As indicated.
 - 3. Stakes: Tapered steel, 15 inches (381 mm) long.
 - 4. Accessories: Standard tapered ends, corners, and splicers as required.
 - 5. Finish: Standard paint finish; color selected by Architect.
 - 6. Finish: ASTM A 525, G 90 (ASTM A 525M, Z 275) zinc coated.
 - 7. Finish: ASTM A 525, G 90 (ASTM A 525M, Z 275) zinc coated with standard paint finish; color selected by Architect.
- B. Aluminum Edging: Standard profile extruded-aluminum edging, ASTM B 221 (ASTM B 221M), alloy 6061-T6, fabricated in interlocking sections with loops stamped from face of sections approximately 24 inches (600 mm) apart to receive stakes.
 - 1. Edging Size: 3/16 inch (4.8 mm) wide by 4 inches (102 mm) deep.
 - 2. Edging Size: 3/16 inch (4.8 mm) wide by 5-1/2 inches (140 mm) deep.
 - 3. Edging Size: As indicated.
 - 4. Stakes: Aluminum, ASTM B 221 (ASTM B 221M), alloy 6061-T6, approximately 1-1/2 inches (38 mm) wide by 12 inches (300 mm) long.
 - 5. Finish: Standard black-paint finish.
 - 6. Finish: Mill finish.
 - 7. Finish: Standard black-anodized finish.

2.16 MISCELLANEOUS MATERIALS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.
- B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4 inches (102 mm) wide minimum, with stretch factor of 33 percent.
- C. Tree Grates and Frames: ASTM A 48, Class 35 or better, gray iron castings of shape, pattern, and size indicated.
- D. Tree Grates and Frames: ASTM A 48, Class 35 or better, gray iron castings and ASTM A 36 (ASTM A 36M) steel angle frames of shape, pattern, and size indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

3.3 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
 - 1. A "Planting Soil Amendments Schedule" is included at the end of this Section.
- C. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.
- D. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
 - 1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.

2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.4 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.
 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
 2. Allow for sod thickness in areas to be sodded.
- D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
 1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 2. Till surface soil to a depth of at least 6 inches (150 mm). Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.
- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 GROUND COVER AND PLANT BED PREPARATION

- A. Loosen subgrade of planting bed areas to a minimum depth of 6 inches (150 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.

- B. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
- C. Till soil in beds to a minimum depth of 8 inches (200 mm) and mix with specified soil amendments and fertilizers.
- D. Remove soil to a minimum depth of 8 inches (200 mm) and replace with prepared planting soil mixture.

3.6 PLANTERS

- A. Planters: Place at least a 4-inch (100-mm) layer of gravel in bottom of planters, cover with nonwoven fabric, and fill with planter soil mixture. Place soil in lightly compacted layers to an elevation of 1-1/2 inches (38 mm) below top of planter, allowing natural settlement.
 - 1. Planter Soil Mixture: 1 part topsoil, 1 part coarse sand, 1 part peat humus, and 3 lb (1.4 kg) dolomitic limestone per cu. yd. (cu. m) of mix.

3.7 EXCAVATION FOR TREES AND SHRUBS

- A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.
 - 1. Balled and Burlapped Trees and Shrubs: Excavate approximately 2 1/3 times as wide as ball diameter and equal to ball depth.
 - 2. Where drain tile is shown or required under planted areas, excavate to top of porous backfill over tile.
- B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - 1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- E. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.8 PLANTING TREES AND SHRUBS

- A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Place stock on setting layer of compacted planting soil.
 - 2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
 - 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- B. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Carefully remove containers so as not to damage root balls.
 - 2. Place stock on setting layer of compacted planting soil.
 - 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- C. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.
- D. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.

3.9 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs according to standard horticultural practice and/or as directed by the Architect. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.10 TREE AND SHRUB GUYING AND STAKING

- A. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1800 mm) above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie

wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

- B. Guying and Staking: Guy and stake trees exceeding 14 feet (4.2 m) and more than 3-inch (75-mm) caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches (760 mm) long, driven to grade. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.

3.11 PLANTING GROUND COVER AND PLANTS

- A. Space ground cover and plants as indicated.
- B. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.12 MULCHING

- A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.
- B. Weed-Control Barriers: Install the following weed-control barriers according to manufacturer's recommendations, before mulching. Completely cover area to be mulched, lapping edges a minimum of 6 inches (150 mm).
 - 1. Material and Seam Treatment: Composite fabric with seams pinned.
- C. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.
 - 1. Thickness: 4 inches (100 mm).

3.13 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
 - 1. Recondition other existing lawn areas.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Where substantial lawn remains, mow, dethatch, core aerate, and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

- D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches (150 mm).
- F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches (100 mm) of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- G. Apply seed and protect with straw mulch as required for new lawns.
- H. Apply sod as required for new lawns.
- I. Water newly planted areas and keep moist until new grass is established.

3.14 INSTALLATION OF EDGINGS

- A. Steel Edging: Install steel edging where indicated according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.
- B. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's recommendations. Anchor with aluminum stakes spaced approximately 24 inches (600 mm) apart, driven below top elevation of edging.

3.15 INSTALLATION OF MISCELLANEOUS MATERIALS

- A. Apply antidesiccant 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 antidesiccant at nursery before moving and again 2 weeks after planting.
- B. Tree Grates: Set grate segments flush with adjoining surfaces as shown on Drawings. Shim up from supporting substrate with soil-resistant plastic. Maintain a 3-inch- (75-mm-) minimum growth radius around base of tree; break away units of casting, if necessary, according to manufacturer's instructions.

3.16 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 32 93 00

SECTION 32 96 00 - SOIL EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. Soil Erosion and Sediment Control shall include implementation and maintenance of soil erosion and sediment control devices and construction procedures, as shown on the plans or as directed by the Engineer, which will reduce and prevent soil losses and associated damages from sedimentation during construction of this project.
- B. All work will be in conformance with the contract documents and Standards for Soil Erosion and Sediment Control in New Jersey revised and adopted April, 1987, and the latest revisions thereof.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hay bales shall consist of timothy, redtop or native grasses bound together with nylon or wire.
- B. Stabilize hay bales with two rebar, steel pickets or two 2"x2" wood stake anchors (length = 1.5' to 2.0') as may be required or as directed by the Owner. Contractor shall embed anchors a depth of 4" or as applicable with site conditions to stabilize hay bales. Stone aggregate shall be 1½ - 2" in diameter.
- C. All other materials shall be as shown and called for on the plans as "Soil Erosion and Sediment Control Notes & Details".

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. The work of soil erosion and sediment controls shall include, but not be limited to the following:
- B. All soil erosion and sediment control practices on this project shall be constructed in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey" or as approved for this project.
 - 1. The smallest practicable area of land shall be exposed at any one time during the project and, whenever feasible, natural vegetation shall be retained and protected. Stripping of vegetation, grading or other soil disturbance shall be completed in a manner which will minimize soil erosion.

2. A schedule of construction operations shall be submitted to the Engineer for his approval including staging areas, stockpile areas and disturbance outside the limits of work. All erosion control devices shall be inspected and maintained periodically.
3. Written notification must be provided to the Engineer and the Soil Conservation District or municipal agency having jurisdiction 72 hours prior to the start of any land disturbing activity.
4. The Applicant must obtain a district issued report of compliance prior to applying for the municipal certificate of occupancy. Please give the district one-week notice to schedule this inspection.
5. All soil erosion and sediment control devices shall be in place prior to any major soil disturbances or installed and removed in their proper sequence to allow for further operations on the site.
6. All sediment control structures shall be checked and maintained on a regular basis and basins shall be cleaned periodically when storage capacity is affected by siltation.
7. During construction, any additional control measures as deemed necessary to prevent erosion or control sediment beyond those measures shown on the approved plans shall be installed or employed at the direction of the Engineer.
8. After completion of construction, soil and sediment controls shall be left in place until all disturbed areas are stabilized.
9. Disturbed areas shall be maintained in a rough graded condition and temporarily seeded and/or mulched until proper weather conditions exist for the establishment or permanent vegetative cover.
10. All areas disturbed by grading on which permanent or semi-permanent seeding or temporary seeding have not been made and all slopes with a grade steeper than 2:1 shall be treated by mulching. The mulch shall be applied at a rate of 2 TO 2 1/2 tons per acre of equivalent measure, according to State standards.
11. All areas disturbed by grading including soil stockpiles which will not be used or constructed upon for a period greater than 30 days shall be temporarily seeded and protected as required.
12. All areas disturbed by grading which will not be constructed upon within six months are to be stabilized with a permanent type seeding and fertilizing.
13. All disturbed areas shall be treated with 6" of topsoiled, limed and fertilized prior to both temporary and permanent seeding as indicated on plans and in conformance with charts and tables as set forth in the "Standards for Soil Erosion and Sediment Control in New Jersey".
14. A crushed stone wheel cleaning "Tracking Pad" is to be installed at all site exits using 2-1/2 inch stone to a length of at least 50 feet. All driveways must exhibit this item in the drive during construction.
15. All paved roadways must be kept clean at all times. Do not use a fire or garden hose to clean roads unless runoff is directed to a proper sediment basin.
16. All Storm drainage inlets are to be protected by temporary filter devices, as indicated on the plans, to prevent the entry of sediment carried by run-off water until vegetation and/or paving is established as planned.
17. Whenever well points, pumps or other dewatering methods are used, care shall be taken to provide for the elimination of erosion and entrapment of sediment at the outfall of said dewatering.
18. All drainage swales shall be parabolic in shape unless otherwise noted and shall conform to SCS design standards.
19. Drainage swales and other structures shall be located in the field so as to retain as much of the original vegetation as possible, especially large trees.

20. The Contractor shall be responsible to contact and obtain approval from the Soil Conservation District for staging/stockpiling areas over 5,000 square feet.
 21. The Contractor must confine all phases of construction work within the permanent and temporary construction easements.
 22. The Contractor shall be responsible to secure his own ingress and egress to the construction site. If construction driveways are required, they shall be provided in accordance with the detail. They shall be the width of opening shown on the plans or as required by the Soil Conservation District, a minimum of 50 feet in length and a minimum of one foot deep.
 23. The Contractor will strictly adhere to all plans, specifications and details approved by the Soil Conservation District.
 24. All erosion and sediment control practices shall be in place prior to any grading operations and installation of proposed structure or utilities.
 25. To provide suitable conditions for growth and vegetation and to prevent the acidifying of drainage water in those areas underlain with acid formation having a pH below 4.0 the following requirements shall be met:
 - a. Grading shall be such that a minimum of acid formation shall be exposed.
 - b. All exposed material shall be covered with a minimum of one foot on non-acid (pH minimum 5.0) soil suitable for plant growth plus 6" of topsoil.
 26. Seeded Dates: The following seeding dates are recommended to establish permanent vegetative cover:
 27. Spring: March 15-May 30
 28. Fall: August 15-October 15
 29. Mulch material shall be unrotted salt hay or small grain straw applied at a rate of at least 2.0 Tons per acre, 90 pounds per 1000 square feet. In no case shall more than five days elapse between seeding and mulching, or by hydroseeding as per the manufacturers specifications.
 30. All damage incurred by erosion shall be rectified immediately by the contractor.
 31. All plan revisions must be submitted to the district for proper review.
 32. Maximum side slopes shall not exceed 2:1 unless approved by the district.
 33. All dewatering operations shall discharge into an approved sediment basin.
 34. The district must be notified, in writing, for the sale of any portion of the project or for the sale of any building lots. New Owner's name(s), addresses, and phone numbers shall be provided to the district.
- C. All soil erosion and sediment control devices shall be installed prior to any major soil disturbance, or in their proper sequence, and maintained until permanent protection is established. During the length of the entire project, the Contractor shall be responsible for maintaining all soil erosion and sediment control devices in an efficient workable condition.
- D. Hay bales shall be replaced as they become filled with silt. Stone at the construction entrances shall be respread as existing stone becomes dirty and covered with silt.

END OF SECTION 32 96 00

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

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 storm drainage outside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.4 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes and other structures, including frames, covers, and grates.
 - 2. Cast-in-place concrete manholes and other structures, including frames, covers, and grates.
 - 3. Storm drainage piping materials, cleanouts and bedding.
 - 4. Connections to existing structures.
 - 5. Bolted frames, covers and grates.
- B. Coordination Drawings: Show manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system piping. Indicate interface and spatial relationship between piping and proximate structures.
- C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

- C. Do not store plastic structures, pipe and fittings in direct sunlight.

1.6 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. 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 Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.2 PIPES AND FITTINGS

- A. A.PVC Sewer Pipe and Fittings, NPS 15 and smaller ASTM D3034, SDR 35 for solvent cemented or gasketed joints.
- B. B.High Density Polyethylene Pipe- smooth interior, AASHTO M 294-94, Type S, O-Ring rubber gasket joints meeting ASTM F477 as specified on the plans or approved equal.
- C. C.Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M), Class III or V, Wall B, for gasketed joints.
 - 1. Gaskets: ASTM C 443 (ASTM C 443m), rubber.

2.3 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
 - 1. Diameter: 48 inches minimum, unless otherwise indicated.
 - 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 - 3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.

4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
 5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
 6. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 9. Steps: ASTM C 478 (ASTM C 478M), individual steps or ladder. Omit steps for manholes less than 60 inches deep.
 10. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
- B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
1. Ballast: Increase thickness of concrete, as required to prevent flotation.
 2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
 3. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
 4. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod or as indicated on the plans and details complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
- C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 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 "STORM SEWER" cast into cover.

2.4 CATCH BASINS

- A. Normal-Traffic, Precast Concrete Catch Basins: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.
1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
 2. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
 3. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.

4. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
 5. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch diameter frame and grate.
 6. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast steps or anchor ladder into base, riser, and top section sidewalls at 12- to 16-inch intervals. Omit steps for catch basins less than 60 inches deep.
 7. Steps: ASTM C 478 (ASTM C 478M), individual steps or ladder. Omit steps for catch basins less than 60 inches deep.
 8. Pipe Connectors: ASTM C 923 (ASTM C 923M), 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 heavy-duty service. Include bolted frame and grates as indicated on the plans.
1. Size: 24 by 24 inches minimum, unless otherwise indicated.
 2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for heavy-duty service. 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.

2.5 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 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 ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious ratio.
1. Include channels and benches in manholes.
 - a. 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.
 - b. Benches: Concrete, sloped to drain into channel.
 2. Include channels in catch basins.

- a. 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.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious ratio.
 - 1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 - 2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed steel.

2.6 PROTECTIVE COATINGS

- A. Description: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
 - 1. Concrete Manholes: On exterior surface.
 - 2. Manhole Frames and Covers: On entire surfaces.
 - 3. Catch Basins: On exterior surface.
 - 4. Catch Basin Frames and Grates: On entire surfaces.
 - 5. Stormwater Inlets: On exterior surface.
 - 6. Stormwater Inlet Frames and Grates: On entire surfaces.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.2 PIPING INSTALLATION

- A. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

3.3 INSTALLATION, GENERAL

- 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 design considerations into account. Install piping as indicated, to extent practical.
- 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. Maintain swab or drag in line, and pull past each joint as it is completed.

- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use 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. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated and manufacturer's specifications.
- B. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: ASTM C 443 (ASTM C 443M), rubber gaskets.
- C. High density Polyethylene pipe and fittings as follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Install in accordance with ASTM D 2321 and the manufacturers specifications. .
- D. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.5 CATCH-BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.6 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.7 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and when work stops.

3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. 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. 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.

END OF SECTION 33 41 00

SECTION 34 00 00 – SPLASH PAD AQUATIC PLAYGROUND

PART 1– GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. General: The below specification describes the equipment to be supplied only and does not include construction or installation. The equipment being supplied is for a complete Splash Pad equipment system. The system includes but is not limited to those components necessary to make up a completely operational system. The Splash Pad system is designed to operate as a recirculated system.
 - 1. The equipment will be delivered to the project site as indicated in the contract documents.
 - 2. All embedded spray features and above grade spray features must be interchangeable to allow reconfiguration of the Splash Pad.
 - 3. The control system will allow the operation of different groups of features and/or individual features, in varying configurations, sequencing, activating individual features, and provide time of schedule. The controller must control the operational variation pattern to be determined by Owner. The controller must operate the solenoid valves to change spray values of individual interactive spray features and have on site accessible control.
 - 4. The Splash Pad equipment (Above Grade Spray Features, Embedded Surface Sprays, Play Barrier Wall, Interactive Sensory Package, Drains, Bollard Activators, Step Activators, Manifold Flow Control System, Solenoid Valve Assemblies, Rain Maker Splash Pad Controller, Feature Pumps, Recirculation Pump, Filter, Chemical Controller, Chemical Feed Pumps & VFD's) will be furnished under this contract. The Splash Pad equipment manufacturer will coordinate the delivery of the equipment to accommodate the Owner's installation schedule. Should the Splash Pad equipment be ready prior to the Owner's required delivery, the Splash Pad equipment manufactured shall store the equipment out of the weather at no additional charge to the Owner.
 - 5. The perimeter of the Splash Pad will have a five-foot buffer beyond the feature area of influence.

1.03 SUBMITTALS

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

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

1.04 QUALITY ASSURANCE

- A. All materials shall be new and shall conform to applicable standards as specified herein.
- B. All Splash Pad equipment required by the specifications and/or the drawings shall be supplied by a single Aquatic Playground Manufacturer unless otherwise specified herein.
- C. The Manufacturer must currently be in the business of supplying Aquatic Playground equipment, similar in size and complexity. The Manufacturer shall provide written documentation of supplying Aquatic Playground equipment, for a minimum ten (10) years of experience and shall have previously supplied Aquatic Playground system design, drawing and equipment, similar in size and complexity to this project.

1.05 DELIVERY, STORAGE & HANDLING

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

1.06 WARRANTY

- A. Splash Pad Equipment Warranty: manufacturer's standard form in which manufacturer agrees to repair or replace components or equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 25 years from date of substantial completion against corrosion, material and workmanship will be warranted for not less than 5 years, and electrical components will be warranted for not less than 1 year.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. This section covers Splash Pad equipment, devices, controls, piping, and other components of the complete system. All components described below are to be supplied by a single manufacturer. All

Splash Pad and Other Improvements

plastic spray nozzles, fiberglass water features, and complete system will be designed and manufactured by an approved manufacturer.

- B. Approved manufacturer to provide all equipment and features equal to basis-of-design product at scheduled on drawings and as specified herein.
- C. All equivalents or equals must be pre-approved, in writing, prior to the submission of the bid.
- D. Basis of Design: Rain Drop Products, 2121 Cottage, Ashland, OH 44805, (800)343-6063.

2.02 GENERAL

- A. Provide all equipment as specified per this document. All substitutions must be submitted by the Contractor for approval by the Contracting Officer or his authorized representative 14 days prior to the bid. No substitutions will be accepted after the project is awarded.
- B. Provide all special tools and winterization plates or inserts for proper operation and maintenance of the equipment provided under this Section.

2.03 SPRAYGROUND FOUNTAIN SUMMARY

- A. Splash Pad Features shall include:
- B. Deck Drains
 - 1. Deck Drains shall be factory assembled
 - 2. Drains shall have non-skid surface with slot openings no wider than 5/16"
 - 3. Each drain shall flow not less than 135 GPM at a velocity of 1.5 ft/sec.
 - 4. Drains shall have not less than a 6" diameter outlet
 - 5. Drains shall be fiberglass composite with smooth interior gelcoat surface, and fiberglass non-skid grate.
- C. Activation Devices
 - 1. Activation Device shall not have any moving parts, and shall operate on low voltage (24 VDC). The Activation Device shall serve as a direct interface between the users and the splash pad features.

2. The Activation Device shall be activated by the touch of a person and send a signal to the controller to activate the systems software program.

D. Universal Mounting Fixture

1. The Omni Pod Universal Mounting Fixture (UMF) for installation of water feature apparatus comprising: a housing designed to be positioned within a water park surface, the housing having a sealing surface, and an inlet adapted to be coupled to a water supply for providing water to a water feature mounted in association with the housing, the sealing surface defining an opening, the opening dimensioned to accept an inlet of a water feature fixture in sealing relationship, such that water supplied to the receptacle housing will flow to the water feature mounted therewith, wherein the housing and mounting surface accommodate both inlets from above ground and below ground water feature fixtures
2. The UMF is to be cast into a concrete surface.
3. The UMF must allow above grade or below grade water features to be installed and interchangeable.
4. The UMF shall be furnished with a cover to be selectively positioned to enclose the interior of the receptacle housing when not in use or for winterization.
5. The UMF is formed to accommodate alternative sized inlets of the water feature fixtures.

E. Below Grade Flush Mounted Components

1. The specified fountain shall be suitable for installation in Splash Pad, Zero Entry Public Swimming Facilities, and perimeter deck of Public Swimming Facilities and shall be manufactured by Rain Drop Products LLC. Installation shall be supplied by others.
2. Construction: The body shall be manufactured from heavy duty, high tensile strength PVC, and shall be impervious to rust and corrosion. The nozzle shall be adjustable high strength, corrosion resistant HDPE.
3. Supply Piping: All piping and connections shall be made from heavy-duty high tensile strength schedule 80PVC.
4. Shall be packaged to protect against damage in transit.
5. Drawings and instructions shall be supplied by the manufacturer for ease of installation.
 - a. An Omni Pod (UMF), for Splash Pad or Pools, is provided for installation ease at a later date, or removal for winterization, or for moving to another location.
 - b. A tamper resistant cover shall be provided to winterize the feature. It shall be made from high strength PVC material. Manufacturer to supply installation instructions.

- c. Shall be furnished by manufacturer providing a guarantee against all defects in workmanship and material for a period of five years from the date of shipment, on all components. Excluding only normal wear and tear and improper operations or installation.

F. Above Grade Features

1. The specified feature shall be suitable for installation in Splash Pad or Zero Entry Public Swimming Facilities and shall be manufactured by Rain Drop Products. Pumps and valves to regulate flow shall be supplied separately. Installation shall be supplied by others.
2. Construction: The body/shell shall be manufactured with nonconductive, MACT compliant, corrosion proof vinyl ester resin and fiberglass strand reinforcement and other materials inert to pool chemicals. Galvanized steel, 304/304L stainless steel, aluminum, centrifugally cast fiberglass-reinforced polymer (FRP) or Polyvinyl Chloride (PVC) shall not be utilized for any above grade play product.
3. Supply Piping: All piping connection shall be made from heavy-duty high tensile strength schedule 80PVC.
4. Colors: Shall be available from manufactures color charts or with special colors upon request. Colors are ultraviolet stabilized to inhibit fading and shall be a high solid urethane.
5. Brushed Stainless steel finish is not acceptable and shall not be used.
6. Gaskets: When applicable, gaskets shall be 1/8-inch-thick minimum neoprene material.
7. Fasteners: Shall be type 304 stainless steel for all anchor bolts.
8. Shall be packaged to protect against damage in transit.
9. Drawings and instructions shall be supplied by manufacturer for ease of installation.
10. Shall be furnished by manufacturer providing a guarantee against all defects in workmanship and material for a period of five years from the date of shipment on all components. Excluding only normal wear and tear and improper operations or installation.

G. Distribution System

1. The Flow Control Manifold System shall be responsible for controlling and distributing the water to the water features on the Splash Pad
2. The Flow Control Manifold System shall be constructed of high strength Schedule 80 PVC and shall be gas welded. No connection tees and no solvent (glue) welding is permissible.
3. Each outlet shall contain a PVC Ball Valve to adjust the flow of water

Splash Pad and Other Improvements

4. Each outlet shall contain an electronically operated Solenoid Valve for controlling the flow of water. The Solenoid Valve will either turn the water flow completely on or off. The Solenoid Valves shall be normally closed and activated by a signal from the controller.
5. The Outlets shall be designed so that the valves can be removed from the main body of the manifold by disconnection a union.
6. The Flow Control Manifold and Solenoid Valves shall be housed in an above ground Stainless Steel Enclosure

2.04 RAIN MAKER SPRAYGROUND CONTROLLER (CONTROL SYSTEM)

- A. The Rain Maker control system shall be responsible for controlling solenoid valves for
- B. sequential, on demand or random distribution of water to the water features while monitoring system water pressure and flow. It shall control and receive signals form photo electric sensors, push button sensors, pressure transducers, proximity sensors and depth sensors.
- C. The control system shall be capable of onsite and remote access programming,
- D. monitoring and actuation from any location with internet access. It shall be capable to data log chemical levels in the system in 15 minute intervals. It shall maintain all operating installation manuals of all water features and equipment provided by manufacturer. The controller shall include all the necessary software to provide a complete Splash Pad operation controlling the timing and frequency of water distribution automatically to the specific water features in the system. It shall be equipped with a 24-hour clocking system for automatic daily activation and shut down of programming. It shall be capable of daily programming for each day of the week.
- E. The control system must shut the system down in the event either or both the feature
- F. pump(s) or filtration pump(s) lose prime, and cannot regain prime within the pump manufacturers suggested time period.
- G. The control system must shut down the system if the water pH or ORP levels exceed or fall below health department water quality standards.
- H. The control system must shut down the system if the reservoir level drops below safe
- I. operating level
- J. The control system must be capable of controlling park lighting or special effect lighting.
- K. The control system shall be capable of sound effects in conjunction with interactivity of the water features.
- L. The control system shall be capable of monitoring and controlling automatic backwash of filtration media and data log backwash frequency.

Splash Pad and Other Improvements

- M. The control system must be capable of controlling makeup water and reservoir tank water level
- N. The control system must be able to respond to RSS feeds and or e-mail alerts from weather monitoring websites to shut down during inclement weather
- O. The control system must be able to ensure health code compliance via cloud based data logging of water usage, water chemistry conditions and activity reports uploaded to the cloud
- P. The control system shall provide multiple available methods of authorized users to interface the control system local to the device and remotely to modify program settings, sequence of operations, times and schedules
- Q. The control system must contain a power supply with an internal surge protection and overload protection with high-quality transient diversion system
- R. The control system electrical components must be certified by CE, TUV, CCS, BSMI & UL
- S. The control system must be 4G data ready
- T. The control system must be available in English and Spanish
- U. The control system shall be capable of future expansion
- V. Automatic Run: The control system shall allow for Automatic Run with an activator for a preset period of time before needing to be reactivated.
- W. Construction: The controller shall be housed in a NEMA 4 enclosure designed for wall mount installation in an indoor application.
- X. Bypass Run: The control system must be able to run continuously bypassing the activator on manual run if so chosen by the owner.
- Y. Controls: The control system shall be equipped with controls which allow each feature grouping to be run individually alone or in conjunction with any combination of water feature groupings as desired by the system operator
- Z. The basis of design is the Rain Maker controller by Rain Drop Products.

END OF SECTION 34 00 00



Corporate Office
1800 Route 34, Suite 101, Wall, New Jersey 07719

Regional Offices
King of Prussia, Pennsylvania
Bethlehem, Pennsylvania
Hackettstown, New Jersey
Camden, New Jersey
Newark, New Jersey
New York, New York
Atlanta, Georgia

June 10, 2022

Mr. Paul Harris
CITY OF TRENTON
319 East State Street
Trenton, NJ 08608

Re: Report of Subsurface Evaluation
& Geotechnical Engineering Assessment
Martin Luther King Jr. Park Improvements
City of Trenton, Mercer County, New Jersey
FPA No. 18015.001R1

Dear Mr. Harris:

INTRODUCTION

This report presents the results of our Subsurface Exploration and Geotechnical Engineering Assessment performed in connection with the proposed improvements at the Martin Luther King Jr. Park in the City of Trenton, Mercer County, New Jersey. The project site is located at 345 Brunswick Avenue and is currently occupied by an existing swimming pool, two 1-story masonry buildings and cleared grass areas. An existing 2-story dwelling located along Bond Street will be demolished to accommodate the proposed site improvements. The existing site grades vary from approximately elevation +88 feet along Brunswick Avenue to +96 feet along Bond Street. The regional location of the project site is presented on Drawing No. 1, "Regional Location Plan."

It is our understanding that the existing swimming pool is to be renovated with a new zero depth spray ground occupying a plan area of approximately 5,000 square feet. Additional improvements include site access and parking, fencing, a pool storage building and a combined pump house and restroom facility occupying a plan area of approximately 1,500 square feet. The proposed site grades were unavailable at the time this report was prepared. However, we anticipate only minor cuts and fills will be required to achieve the proposed site grades.

The purpose of our involvement at this time was to perform a Geotechnical Engineering Assessment to facilitate the planning, design and construction for the support of the proposed storage room, pump room, restroom and parking lot adjacent to the existing MLK pool. Our scope of work



included the technical observation of 7 test pits, in-situ and laboratory permeability testing, engineering evaluation of the acquired data and the preparation of this geotechnical report.

SUBSURFACE EXPLORATION

FPA provided technical oversight of 7 test pits performed on May 5, 2022 to characterize the subsurface conditions in the vicinity of the proposed improvements. The field work was performed by an excavation subcontractor while under the full-time technical observation by a representative of FPA. The test pit locations were located by a representative of FPA based on correlation with existing site features presented on the site plan. The approximate test pit locations are presented on Drawing No. 2, "Test Pit Location Plan."

The test pits, designated as TP-1 through TP-7, were excavated to characterize the in-situ soil conditions and provide a better view of the near surface soil conditions at the project site. The test pits were advanced to depths ranging from approximately 10 feet to 11.5 feet below the existing ground surface. The exposed soil profile was classified in accordance with the Burmister Soil Classification System. Indications of seasonal high groundwater (e.g., soil mottling) was also monitored within the test pit and noted on the log where observed. The depth to groundwater was measured upon the completion of each test pit. Soil classifications, soil mottling observations and recorded groundwater depths are presented on the test pit logs in Appendix A.

PERMEABILITY TESTING

The permeability of the in-situ soils was assessed by performing in-situ percolation tests adjacent to two of the test pits. The percolation tests were designated as TP-3 and TP-5 corresponding to the adjacent test pit. The testing was conducted at depths ranging from approximately 3 feet to 5 feet below the existing grade and were representative soils encountered across the project site. The percolation tests were performed in accordance with the procedures outlined in Appendix E of the NJDEP Stormwater BMP Manual. The locations of the percolation tests are shown on Drawing No. 2, "Test Pit Location Plan." Additionally, samples collected from the same soil stratum where in-situ testing was performed was subjected to laboratory permeability testing in accordance with ASTM – Test Method 2434, Rigid Wall Permeability Testing. The in-situ percolation test data sheets and laboratory test results are presented in Appendix B.

SITE CONDITIONS

Regional Geology

Based on our review of published geologic literature pertaining to the project region, the native soils at the project site consist of a discontinuous mantle of alluvial material deposited during the Quaternary period. The soils are known as the Pensauken Formation on the Geologic Map of New Jersey. The alluvial material typically consists of sandy silt, silt and clayey silt with some intermixed gravel. The silty soil overlies coarser, stratified material consisting of intermixed sand



and gravel with occasional cobbles and boulders. The alluvial soils are underlain by four crystalline bedrock formations of pre-Cambrian age: Baltimore gneiss, Wissahickon gneiss, Chickies quartzite and an intrusive Gabbro. The depth to bedrock is typically greater than 10 feet in the project vicinity.

Subsurface Conditions

The soils encountered at the project site were consistent with published geologic literature. The test pits encountered surficial fill material underlain by cohesive and granular alluvial deposits and completely weathered Gabbro bedrock. The surficial fills were encountered from the existing grade to depths ranging from approximately 2 feet to 4.5 feet. The fill material typically consisted of coarse to fine sand with significant amounts of silt and clay and minor to moderate amounts of coarse to fine gravel intermixed with brick, concrete, glass, cobbles and tile fragments. The amount of construction debris encountered within the test pits varied from approximately 5 percent to 65 percent by volume.

The underlying native alluvial soils typically consisted of silt and clay intermixed with varying amounts of medium to fine sand as well as minor amounts of fine gravel. The amount of gravel typically decreased with depth within the cohesive deposits. Test pits TP-2, TP-3 and TP-7 encountered stratified granular material below the cohesive deposits at depths ranging from approximately 6.7 feet to 8.3 feet below the existing grade. The granular soils typically consisted of coarse to fine sand intermixed with moderate amounts of coarse to fine gravel, moderate amounts of silt as well as few cobbles. Completely weathered Gabbro bedrock was encountered within test pits TP-5 and TP-6 at depths ranging from approximately 7 feet to 9.5 feet below the existing grade. Based upon observed excavation efforts, the consistency of the cohesive alluvial deposits may be described as firm to stiff. The relative density of the underlying granular soils and completely weathered Gabbro bedrock may be described as medium-dense and dense to very dense, respectively.

The static groundwater level was observed within test pit TP-7 at a depth of approximately 8.7 feet below the existing ground surface corresponding to approximate elevation +83.8 feet. Soil mottling or groundwater seepage, indications of the seasonal high water elevation, were observed within test pits TP-1 through TP-6 at a depths ranging from approximately 4 feet to 11.5 feet below the existing ground surface corresponding to approximate elevations +85 feet to +89.5 feet as indicated on the respective test pit log. Seasonal and storm related fluctuations in the groundwater level, as well as the potential for perched water within the site fills and cohesive alluvial deposits should be anticipated. For more detailed information regarding the subsurface conditions encountered, please refer to the test pit logs in Appendix A.

Seismicity

We have reviewed the guidelines presented in the New Jersey Edition of the 2018 International Building Code (IBC) regarding seismic design. Based upon our review, we offer the following site characterization parameters:



Short Period Spectral Acceleration (Ss).....	0.211g
Spectral Acceleration @ 1 Second (S1)	0.051g
Site Class.....	D

DISCUSSION & RECOMMENDATIONS

General

Based on the results of our subsurface exploration and geotechnical engineering evaluation, it is our opinion that the proposed pool storage building and combined pump house and restroom facility may be founded on conventional shallow foundations, provided that the site preparation recommendations provided herein are implemented. The test pits encountered fill material to depths ranging from approximately 2 feet to 4.5 feet below the existing grade. The fill material typically consisted of coarse to fine sand with significant amounts of silt and clay and minor to moderate amounts of coarse to fine gravel intermixed with brick, concrete, glass, tile fragments and cobbles. We note that the surficial fills were likely placed in an uncontrolled manner and are not adequate to support the foundations of the proposed building. The presence of the very loose to loose surficial fills may be addressed by implementing proof-rolling and isolated removal and re-compaction efforts as described herein.

Groundwater Considerations

The static groundwater level was observed within test pit TP-7 at a depth of approximately 8.7 feet below the existing ground surface corresponding to approximate elevation +83.8 feet. Soil mottling or groundwater seepage, indications of the seasonal high water elevation, were observed within test pits TP-1 through TP-6 at a depths ranging from approximately 4 feet to 11.5 feet below the existing ground surface corresponding to approximate elevations +85 feet to +89.5 feet. We do not anticipate that the static groundwater table will be encountered within foundation excavations. In the event that perched groundwater is encountered in foundation excavations, it is our opinion that the associated dewatering may be accomplished using in-trench sump pumps, placed within crushed stone.

Shallow Foundations

Shallow foundations bearing on compacted fills or native alluvial soils may be designed utilizing an allowable bearing pressure of 3,000 psf, provided the recommended subgrade preparation provided herein is implemented. We recommend that continuous wall footings be a minimum of 24-inches in width and isolated column footings be a minimum of 36-inches square. In accordance with IBC regulations, the bottom of all reinforced concrete foundations exposed to outside ambient temperatures should extend to a minimum depth of 36-inches below the proposed grade for frost protection.

Our analyses indicate that footings loaded to the recommended allowable static bearing pressures will undergo total settlements on the order of 1-inch or less. We estimate that



differential settlements will be approximately 1/2 inch or less over a horizontal distance of 50 feet.

Foundation Excavations & Subgrade Preparation

We anticipate that the Contractor may utilize conventional earth excavating equipment for performing excavations within the native soils. We note that larger excavation equipment may be required to remove buried debris encountered at the site. Subsequent to the advancement of excavations for the foundations, we recommend that all excavations for foundations be hand trimmed, in a workmanlike manner, and that the footing subgrades be compacted using a walk-behind, sheepsfoot, vibratory roller to further densify the subsoils and to delineate soft regions. A vibra-plate compactor may be used in areas where space and access are limited. Any areas exhibiting excessive yielding should be over-excavated and backfilled using imported Type "G" fill. We anticipate isolated areas of the encountered historical fills will need to be removed below the proposed building foundation elevation.

We recommend that fills be excavated under the guidance of a Geotechnical Engineer in order to limit the extent of the excavations. Subgrade soils should then be reviewed and prepared to receive fill. Fills should be placed in maximum 12-inch loose lifts and compacted to a minimum of 95 percent of their maximum dry density as determined by ASTM Test Method D-1557, The Modified Proctor Test.

Due to the significant amount of fine-grained material, i.e. silt and clay, encountered at the proposed footing elevation, we recommend that the foundation subgrades be over-excavated to allow for the placement of at least six inches of NJDOT No. 57 Coarse Graded Aggregate. The gradational requirements for Type "G" and NJDOT No. 57 Coarse Graded Aggregate are presented in Appendix C.

Concrete Floor Slabs

Provided that the required earthwork is accomplished in accordance with the recommendations contained in this report, we recommend that a modulus of subgrade reaction of 150 pci be utilized in the structural design of the concrete slab. We recommend a minimum 4-inch thick layer of NJDOT No. 57 coarse graded aggregate be placed beneath all floor slabs to provide uniform support.

Site Preparation & Earthwork

We recommend that the initial preparation of the property include the removal of all existing pavement, concrete, foundations from demolished dwellings, vegetation, soft cohesive soil and surficial debris. The ground surface should then be leveled, rough graded within the building footprints and in areas where fills are proposed, and proofrolled using a minimum 10-ton, vibratory roller prior to the placing of any permanent fills. We recommend that a minimum of 2 passes be made across the proposed building pads and paved areas to delineate potential soft areas. Additionally, we recommend that the proof-rolling process be monitored by French and



Parrello Associates, such that soft areas may be delineated, their impact on the proposed construction evaluated, and then remediated, if necessary.

Remediation may include the dental excavation of the soft material and backfilling with suitable aggregate or the installation of geotextile fabrics or geogrids to facilitate the bridging of weak areas.

Fills

We recommend that the fills required under or in the vicinity of any proposed structures and paved areas consist of imported Type “G” fill. Each horizontal lift of new fill placed should not exceed a loose lift thickness of 12 inches. Fill placement that will support foundations and slabs on-grade for the proposed building or under proposed paved areas should be compacted to a minimum of 95 percent of their maximum dry density as determined by ASTM Test Method D-1557, The Modified Proctor Test. Fill materials placed in non-structural areas for lawn, landscaping and general grading purposes should be compacted to a minimum of 90 percent of their maximum dry density per ASTM D-1557. Non-structural fills should be compacted to a minimum of 90 percent of the optimum dry density as determined by ASTM Test Method D-698, The Standard Proctor.

We anticipate that the in-situ soils are not suitable for re-use as backfill material in structural areas due to the miscellaneous construction debris including pieces of glass as well as the significant amounts of silt and clay intermixed within the native soils. Imported, well-graded granular fill material (Type “G” Fill) may be used for compacted structural fill and general grading fill placement and earthwork. The surface of all compacted fill subgrades should be graded or sloped to provide drainage of surface run-off. In addition, the surface of all prepared subgrades should be thoroughly compacted at the end of each day to seal the surface and minimize softening that may result from precipitation.

Lateral Earth Pressures

Below-grade walls and retaining walls will need to be designed to resist lateral earth forces, and potential hydrostatic pressures. The lateral earth pressure will be dependent on the type of backfill utilized. To facilitate the design of below-grade walls, we offer the following soil parameters:

On-Site Soils

Total Unit Weight of Soil (γ)	115 pcf
Angle of Soil Internal Friction (ϕ)	28°
Cohesion (c)	0 psf
Active Earth Pressure Coefficient (K_a)	0.36
At-Rest Earth Pressure Coefficient (K_o)	0.53
Passive Earth Pressure Coefficient (K_p)	2.77



Type “G” Fill

Total Unit Weight of Soil (γ)	120 pcf
Angle of Soil Internal Friction (ϕ)	32°
Active Earth Pressure Coefficient (K_a)	0.31
At-Rest Earth Pressure Coefficient (K_o)	0.47
Passive Earth Pressure Coefficient (K_p)	3.25

Coefficient of Base Friction

In-Situ Soils & Type “G” Fill (μ)	0.35
No. 57 Coarse Aggregate (μ)	0.60

In the event that concentrated loads are located in the vicinity of the below-grade walls, we recommend that the potential for additional lateral pressures be evaluated. The magnitude of any lateral stress increases may be calculated using published solutions based on elastic theory. We recommend that any below-grade walls located adjacent to roadways or parking areas be designed for a uniform surcharge of 250 psf at the ground surface. The use of heavy compaction equipment within 5 feet of the below-grade or retaining walls is prohibited.

Stormwater Management

Based on the results of our subsurface exploration, the native soils at the project site consist predominantly of surficial fills underlain by cohesive alluvial deposits and completely weathered Gabbro bedrock. The cohesive alluvial soils were encountered below the historic fills to depths ranging from approximately 6.7 feet to 11 feet and consisted of silt and clay intermixed with varying amounts of medium to fine sand as well as minor amounts of fine gravel. These soils exhibit very low permeability rates and will restrict the vertical percolation of stormwater. They should not be relied upon for stormwater recharge.

The static groundwater level was observed within test pit TP-7 at a depth of approximately 8.7 feet below the existing ground surface corresponding to approximate elevation +83.8 feet. Soil mottling or groundwater seepage, indications of the seasonal high water elevation, were observed within test pits TP-1 through TP-6 at depths ranging from approximately 4 feet to 11.5 feet below the existing ground surface corresponding to approximate elevations +85 feet to +89.5 feet. Seasonal and storm related fluctuations in the groundwater level, as well as the potential presence of perched groundwater on the cohesive marine deposits, should be anticipated.

The permeability of the in-situ soils was assessed by performing in-situ percolation tests adjacent to two of the test pits as well as laboratory permeability testing. The percolation tests were designated as TP-3 and TP-5 corresponding to the adjacent test pit and were typically conducted at depths ranging from approximately 3 feet to 5 feet below the existing grade. The representative soils consisted of silt and clay intermixed with significant amounts of medium to



fine sand and minor amounts of fine gravel. The percolation tests were performed in accordance with the procedures outlined in Appendix E of the NJDEP Stormwater BMP Manual.

The two percolation tests failed the pre-soak portion of the percolation test as after the completion of the pre-soak, the hole did not entirely drain and therefore the reported permeability rate must be less than 1 inches per hour per the stormwater regulations. The permeability rates for the laboratory tested samples were 9.9×10^{-6} inches per hour and 1.0×10^{-5} inches.

The guidelines presented in the New Jersey Stormwater Best Management Practices manual indicate that a minimum design permeability rate of 0.5 inches per hour is required for infiltration basins. Design rates consider a factor of safety of 2 applied to laboratory permeability testing results. Therefore, the in-situ soil is not suitable for stormwater infiltration.

CLOSING & LIMITATIONS

The recommendations contained herein are contingent upon subsurface conditions remaining consistent with those encountered during our subsurface exploration. They are also contingent upon the basis that all foundation related aspects of construction, including stripping, controlled fill operation, foundation excavation and subgrade preparation, be observed by a representative of FPA. This is to observe compliance with the design concepts and specifications and to allow design changes in the event that subsurface conditions differ from those anticipated prior to construction.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, chemically hazardous, or biologically toxic materials in the soil, surface water, groundwater or air, on or below or around the site.

Services performed by FPA during this project have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty, guarantee, or fiduciary responsibility is included or intended in the services provided.



Should you have any questions, please feel free to contact us.

Sincerely,

FRENCH & PARRELLO ASSOCIATES

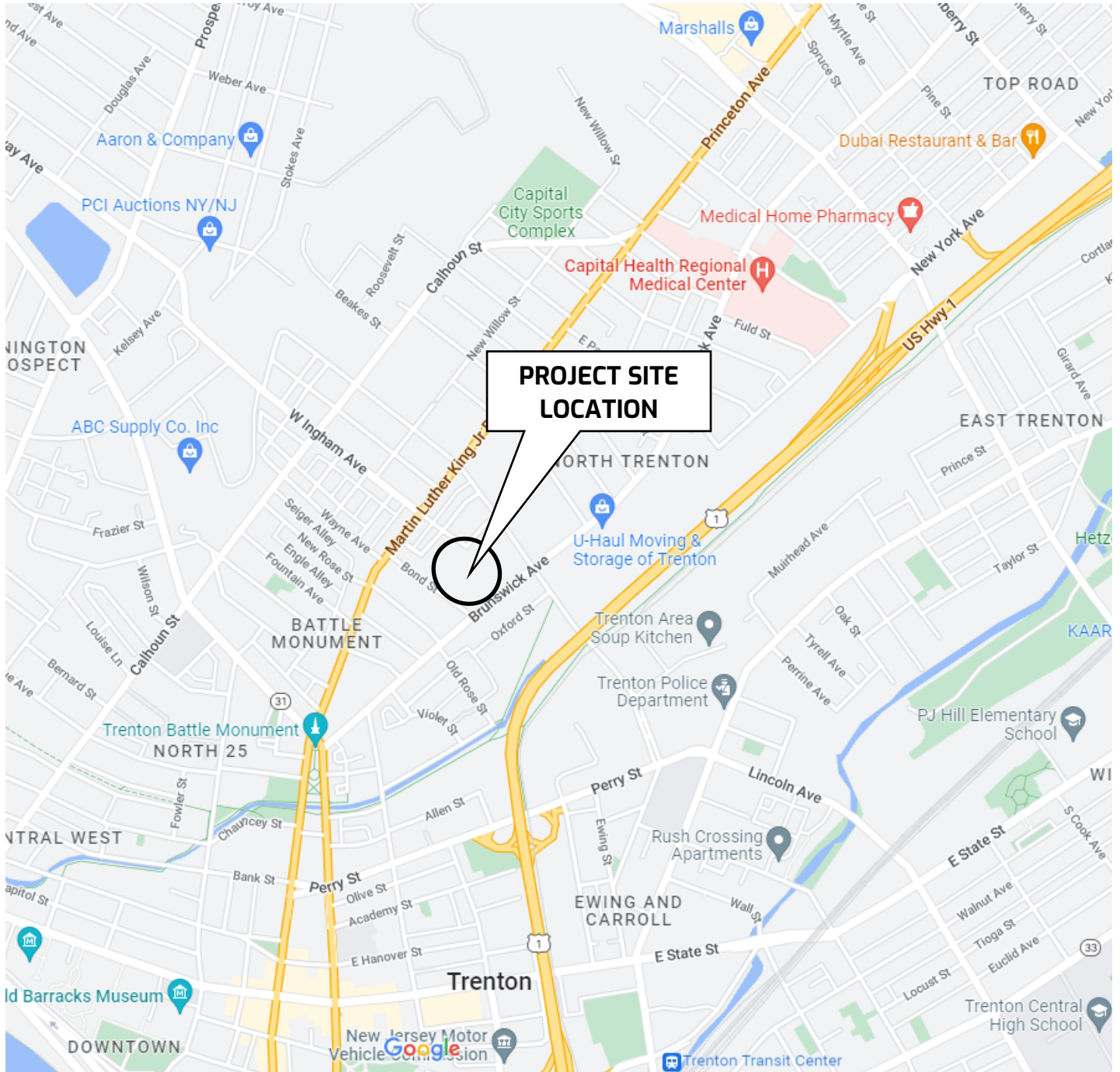
A blue ink signature of David M. Rohmeyer, written in a cursive style, is displayed above a light gray rectangular background.

David M. Rohmeyer, PE
Project Engineer

A blue ink signature of Joseph M. Tierney, written in a cursive style, is displayed above a light gray rectangular background.

Joseph M. Tierney, PE

Project Consultant, Manager of Geotechnical Services
JMT/DMR



REGIONAL LOCATION PLAN

Copyright Google Maps, 2022

MARTIN LUTHER KING JR. PARK IMPROVEMENTS CITY OF TRENTON, MERCER COUNTY, NEW JERSEY

SCALE:	DATE:	JOB NO.:	DRAWING NO.:
NTS	JUNE 2022	18015.001	1



Percolation Test Data

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY
(FPA PROJECT NO. 18015.001)

DATE: 5/5/2022
SHEET 1

1. Test Number: TP-3 Date Tested: 5/5/22
2. Depth/Elevation: 48-60"
3. Soil Conditions at Test Location: Light Brown mf+ **SAND**, and Clayey Silt.

4. Pre-soak:

- X Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required or 12 in. of Water to Drain after Second Filling, Minutes: Failed – Dropped 1" in 4 hours
- Four Hour Pre-soak completed - Indicate result
- Test Hole Drained within 15 to 24 hours after Pre-soak
- Test Hole did not Drain within 24 hours after Pre-soak

5. Rate of Fall Data:

- a. Time Interval Selected, Minutes N/A
- b. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
<u> </u>	<u> </u>	<u> </u>
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6. Percolation Rate:

- a. Time, minutes, Required for a Six-inch Drop in the Water level: N/A
- b. Percolation Rate = $a/6 = \frac{N/A}{6} = \frac{N/A}{6}$ min/in

$$k = a / \text{Percolation Rate}$$

$$a = 20.5$$

(NJ Stormwater BMP Manual Appendix E, Addendum Section B, Table 2)

$$k = < 1 \text{ in/hr.}$$

SOILS ENGINEER: J. TIERNEY, PE
SOILS EVALUATOR: D. ROHMEYER, PE



Percolation Test Data

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY
(FPA PROJECT NO. 18015.001)

DATE: 5/5/2022
SHEET 1

1. Test Number: TP-5 Date Tested: 5/5/22
2. Depth/Elevation: 36-48"
3. Soil Conditions at Test Location: Brown mf+ **SAND**, and+ Silt, trace+ f Gravel.

4. Pre-soak:

- X Sandy Textured Soil Only, Shortened Pre-soak - Indicate Time Required or 12 in. of Water to Drain after Second Filling, Minutes: Failed – Dropped 1" in 4 hours
- Four Hour Pre-soak completed - Indicate result
- Test Hole Drained within 15 to 24 hours after Pre-soak
- Test Hole did not Drain within 24 hours after Pre-soak

5. Rate of Fall Data:

- c. Time Interval Selected, Minutes N/A
- d. Record the Drop in Water Level during each time Interval to the nearest 1/10th-inch on the line below:

Depth of Water, Start of Interval (inches)	Depth of Water, End of Interval (inches)	Drop in Water Level (inches)
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
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6. Percolation Rate:

- c. Time, minutes, Required for a Six-inch Drop in the Water level: N/A
- d. Percolation Rate = $a/6 = \frac{N/A}{6} = \frac{N/A}{6}$ min/in

$$k = a / \text{Percolation Rate}$$

$$a = 20.5$$

(NJ Stormwater BMP Manual Appendix E, Addendum Section B, Table 2)

$$k = < 1 \text{ in/hr.}$$

SOILS ENGINEER: J. TIERNEY, PE
SOILS EVALUATOR: D. ROHMEYER, PE



TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-1
DATE: 5/5/2022

GROUND ELEV.: +97'±
DEPTH OF WATER: 9'±*
GROUNDWATER ELEV.: N/A
DEPTH TO EST. SEASONAL HIGH WATER: 9'±
EST. SEASONAL HIGH WATER ELEV.: +88'±

DEPTH	DESCRIPTION
0 – 4"	Dark Brown Clayey SILT , some mf+ Sand w/ many roots.
4 – 20"	Grey-Brown mf SAND , and Clayey Silt, little+ mf Gravel w/ brick – approx. 5% by volume. (fill)
20 – 41"	Orange-Brown SILT & CLAY , some mf Sand. (S-1)
41 – 78"	Orange-Brown CLAY & SILT , little+ f Sand. (S-2)
78 – 126"	Dark Orange-Brown SILT & CLAY , and c+mf Sand, some cmf Sand w/ few cobbles. (S-3)

END OF TEST PIT AT 10.5'

NOTES: *Minor seepage at 9'.

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-2
DATE: 5/5/2022

GROUND ELEV.: +96'±
DEPTH OF WATER: 10.5'±*
GROUNDWATER ELEV.: N/A
DEPTH TO EST. SEASONAL HIGH WATER: 10.5'±
EST. SEASONAL HIGH WATER ELEV.: +85.5'±

DEPTH	DESCRIPTION
0 – 38"	Dark Brown cmf+ SAND , and+ Silt, some- cmf+ Gravel w/ pieces of concrete, brick & glass – approx. 40% by volume. (fill)
38 – 71"	Light Brown CLAY & SILT , little+ mf Sand. (S-1)
71 – 99"	Orange-Brown Clayey SILT , and- cmf Sand, some- cmf Gravel w/ some cobbles. (S-2)
99 – 132"	Yellow-Brown m+f SAND , some+ Silt, trace+ f Gravel w/ few clay pods. (S-3)

END OF TEST PIT AT 11'

NOTES: *Minor seepage at 10.5'.

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

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TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-3
DATE: 5/5/2022

GROUND ELEV.: +96.5'±
DEPTH OF WATER: Dry
GROUNDWATER ELEV.: N/A
DEPTH TO EST. SEASONAL HIGH WATER: 11.5'±
EST. SEASONAL HIGH WATER ELEV.: +85'±

DEPTH	DESCRIPTION
0 – 26"	Dark Grey-Brown SILT , and mf Sand, trace+ cmf+ Gravel w/ tile, ceramic & glass – approx. 15% by volume. (fill)
26 – 43"	Brown Clayey SILT , some+ f Sand, little- f Gravel w/ pieces of brick & glass bottles – approx. 10% by volume. (fill)
43 – 84"	Light Brown mf+ SAND , and Clayey Silt. (S-1)
84 – 109"	Light Brown m+f SAND , and Clayey Silt. (S-2)
109 – 138"	Orange-Brown mf SAND , and+ Silt & Clay w/ grey mottling @ 11.5'. (S-3)

END OF TEST PIT AT 11.5'

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-4
DATE: 5/5/2022

GROUND ELEV.: +97'±
DEPTH OF WATER: Dry
GROUNDWATER ELEV.: N/A
DEPTH TO EST. SEASONAL HIGH WATER: Not Observed
EST. SEASONAL HIGH WATER ELEV.: N/A

DEPTH	DESCRIPTION
0 – 40"	Dark Grey-Brown c+mf GRAVEL , and cm+f Sand, some Silt w/ many cobbles & glass – approx. 65% by volume. (fill)
40 – 53"	Grey SILT , and cmf+ Sand, little+ mf Gravel w/ pieces of concrete & glass – approx. 10% by volume. (fill)
53 – 84"	Brown Clayey SILT , some mf+ Sand, trace f Gravel. (S-1)
84 – 102"	Light Brown CLAY & SILT , little+ mf Sand. (S-2)
102 – 132"	Light Grey Clayey SILT , and f Sand. (S-3)

END OF TEST PIT AT 11'

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-5
DATE: 5/5/2022

GROUND ELEV.: +91.5'±
DEPTH OF WATER: 4.2'±*
GROUNDWATER ELEV.: N/A
DEPTH TO EST. SEASONAL HIGH WATER: 4.2'±
EST. SEASONAL HIGH WATER ELEV.: +87.3'±

DEPTH	DESCRIPTION
0 – 6"	Dark Brown Clayey SILT , some mf+ Sand w/ many roots.
6 – 23"	Dark Brown & Red-Brown SILT , and mf+ Sand, little f gravel w/ few pieces of glass. (fill) (S-1)
23 – 36"	Dark Grey Clayey SILT , and cmf+ Sand, some cmf Gravel w/ pieces of plastic ceramic & glass – approx. 10% by volume. (fill)
36 – 50"	Brown mf+ SAND , and+ Silt, trace+ f Gravel. (S-2)
50 – 84"	Light Brown Clayey SILT , and f Sand. (S-3)
84 – 114"	Orange-Brown & Grey CLAY & SILT , some mf+ Sand w/ few cobbles. (S-4)
114 – 132"	Grey SILT & CLAY , some+ c+mf Sand. (micaceous – completely weathered gabbro) (S-5)

END OF TEST PIT AT 11'

NOTES: *Minor seepage at 4.2'.

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.



TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-6
DATE: 5/5/2022

GROUND ELEV.: +93.5'±
DEPTH OF WATER: 4'±*
GROUNDWATER ELEV.: N/A
DEPTH TO EST. SEASONAL HIGH WATER: 4'±
EST. SEASONAL HIGH WATER ELEV.: +89.5'±

DEPTH	DESCRIPTION
0 – 9"	Dark Brown Clayey SILT , some+ cmf+ Sand w/ many roots.
9 – 30"	Dark Grey-Brown Clayey SILT , some- cmf+ Gravel, little+ mf Sand w/ pieces of glass & ceramic – approx. 15% by volume. (fill) (S-1)
30 – 50"	Tan-Brown SILT & CLAY , some+ mf+ Sand, trace f Gravel. (S-2)
50 – 84"	Orange-Brown CLAY & SILT , some- mf Sand, little- mf Gravel. (S-3)
84 – 120"	Grey & Orange-Brown SILT & CLAY , some cmf Sand. (micaceous – completely weathered gabbro) (S-4)

END OF TEST PIT AT 10'

NOTES: *Moderate seepage at 4'.

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

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TEST PIT LOG

MARTIN LUTHER KING JR. PARK IMPROVEMENTS
CITY OF TRENTON, MERCER COUNTY, NEW JERSEY (FPA JOB NO. 18015.001)

TEST PIT NO.: TP-7
DATE: 5/5/2022

GROUND ELEV.: +92.5'±
DEPTH OF WATER: 8.7'±
GROUNDWATER ELEV.: +83.8'±
DEPTH TO EST. SEASONAL HIGH WATER: 8.7'±
EST. SEASONAL HIGH WATER ELEV.: +83.8'±

DEPTH	DESCRIPTION
0 – 5"	Dark Brown Clayey SILT , and cmf+ Sand w/ many roots.
5 – 22"	Red-Brown Clayey SILT , and+ mf+ Sand, little+ c+mf Gravel w/ pieces of shale, glass & brick – approx. 10% by volume. (fill) (S-1)
22 – 36"	Dark Grey Clayey SILT , some+ cm+f Gravel, some cmf+ Sand w/ pieces of ceramic, brick & glass – approx. 25% by volume. (fill) (S-2)
36 – 52"	Light Tan-Brown Clayey SILT , and f Sand. (S-3)
52 – 80"	Light Brown & Grey SILT , some+ f Sand. (S-4)
80 – 104"	Brown cm+f SAND , some+ cmf Gravel, little Silt w/ few cobbles. (S-5)
104 – 120"	Orange-Brown c+mf SAND , some- c+mf Gravel, little Silt.

END OF TEST PIT AT 10'

NOTES:

SOILS ENGINEER: J. Tierney, PE

CONTRACTOR: Renova Environmental Company

TEST PIT OBSERVER: D. Rohmeyer, PE

EXCAVATOR: Case CX37C

The information shown hereon indicates the subsurface conditions encountered at the specified test pit location on the date(s) of excavation. Subsurface conditions are likely to vary across the project site. Interpretation of the subsurface data shall be at the discretion of the user.