PROJECT MANUAL FOR

OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION

PROJECT NUMBER: H27-6096-MJ

PREPARED FOR

THE UNIVERSITY OF SOUTH CAROLINA

Campus Planning and Construction
743 Greene Street
Columbia, South Carolina 29208

January 13, 2014

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2011 Edition
Rev. 7/20/2011

SE-310
REQUEST FOR ADVERTISEMENT

PROJECT NAME: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION

PROJECT NUMBER: H27-6096-MJ

PROJECT LOCATION: UNIVERSITY OF SOUTH CAROLINA COLUMBIA, SC

Contractor may be subject to performance appraisal at close of project

BID SECURITY REQUIRED? Yes ☒ No ☐

PERFORMANCE & PAYMENT BONDS REQUIRED? Yes ☒ No ☐

CONSTRUCTION COST RANGE: $2,200,000.00 - $2,700,000.00

DESCRIPTION OF PROJECT: Demolish utilities, drainage and irrigation systems. Grade field area. Construct new sand based outdoor football practice fields. Construct new filming towers and other practice field appurtenances. Construct field irrigation system. Construct Vapor Management System. Install field drainage and natural turf system. Bidders are responsible for obtaining all documents and updates from www.purchasing.sc.edu. See "Facilities/Construction Solicitations and Awards." Small and minority business participation is encouraged.

A/E NAME: COX and DINKINS, INC.

A/E CONTACT: Darren Holcombe

A/E ADDRESS: Street/PO Box: 724 BELTLINE BOULEVARD
City: COLUMBIA
State: SC ZIP: 29205-

EMAIL: DHOLCOMBE@COXANDDINKINS.COM

TELEPHONE: 803-254-0518 **FAX:** 803-765-0993

All questions & correspondence concerning this Invitation shall be addressed to the A/E.

BIDDING DOCUMENTS/PLANS MAY BE OBTAINED FROM: www.purchasing.sc.edu; See "Facilities/Construction solicitations and Awards"

PLAN DEPOSIT AMOUNT: $0.00 **IS DEPOSIT REFUNDABLE:** Yes ☐ No ☐

Only those Bidding Documents/Plans obtained from the above listed source(s) are official. Bidders rely on copies of Bidding Documents/Plans obtained from any other source at their own risk.

BIDDING DOCUMENTS/PLANS ARE ALSO ON FILE FOR VIEWING PURPOSES ONLY AT *(list name and location for each plan room or other entity)*:

PRE-BID CONFERENCE? Yes ☒ No ☐ **MANDATORY ATTENDANCE?** Yes ☒ No ☐

DATE: 1/30/2014 **TIME:** 10:00 **PLACE:** Facilities Management, 743 Greene Street, Columbia, SC

AGENCY: UNIVERSITY OF SOUTH CAROLINA

NAME OF AGENCY PROCUREMENT OFFICER: JUAQUANA BROOKINS

ADDRESS: Street/PO Box: 743 GREENE STREET
City: Columbia
State: SC ZIP: 29208-

EMAIL: JBROOKIN@FMC.SC.EDU

TELEPHONE: 803-777-3596 **FAX:** 803-777-7334

BID CLOSING DATE: 2/13/2014 **TIME:** 2:00 **LOCATION:** Facilities Management,743 Greene Street, Columbia, SC

BID DELIVERY ADDRESSES:

HAND-DELIVERY:
Attn: JUAQUANA BROOKINS
FACILITIES MANAGEMENT CENTER
UNIV of SOUTH CAROLIN
743 GREENE STREET
COLUMBIA, SC 29208

MAIL SERVICE:
Attn: JUAQUANA BROOKINS
FACILITIES MANAGEMENT CENTER
UNIV of SOUTH CAROLIN
743 GREENE STREET
COLUMBIA, SC 29208

IS PROJECT WITHIN AGENCY CONSTRUCTION CERTIFICATION? *(Agency MUST check one)* Yes ☐ No ☒

APPROVED BY *(Office of State Engineer)*: [signature] **DATE:** 1/14/14

NOTE: AIA DOCUMENT A701

"INSTRUCTIONS TO BIDDERS"

1997 EDITION

may be viewed at

Cox and Dinkins, Inc
724 Beltline Blvd.
Columbia, SC 29205

American Institute of Architects
1735 New York Ave.
N.W. Washington, D.C. 20006
or
The local office of the AIA

OSE FORM 00201
STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

OWNER: UNIVERSITY OF SOUTH CAROLINA
PROJECT NUMBER: H27-6096-MJ
PROJECT NAME: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION
PROJECT LOCATION: UNIVERSITY OF SOUTH CAROLINA, COLUMBIA, SOUTH CAROLINA

PROCUREMENT OFFICER: JUAQUANA BROOKINS

1. STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

1.1. These Standard Supplemental Instructions To Bidders amend or supplement Instructions To Bidders (AIA Document A701-1997) and other provisions of Bidding and Contract Documents as indicated below.

1.2. Compliance with these Standard Supplemental Instructions is required by the Office of State Engineer (OSE) for all State projects when competitive sealed bidding is used as the method of procurement.

1.3. All provisions of A701-1997, which are not so amended or supplemented, remain in full force and effect.

1.4. Bidders are cautioned to carefully examine the Bidding and Contract Documents for additional instructions or requirements.

2. MODIFICATIONS TO A701-1997

2.1. *Delete Section 1.1 and insert the following:*

> **1.1** Bidding Documents, collectively referred to as the **Invitation for Bids**, include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement, Instructions to Bidders (A-701), Supplementary Instructions to Bidders, the bid form (SE-330), the Intent to Award Notice (SE-370), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda issued prior to execution of the Contract, and other documents set forth in the Bidding Documents. Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

2.2. *In Section 1.8, delete the words "and who meets the requirements set forth in the Bidding Documents".*

2.3. *In Section 2.1, delete the word "making" and substitute the word "submitting."*

2.4. *In Section 2.1.1:*

After the words "Bidding Documents," delete the word "or" and substitute the word "and."

Insert the following at the end of this section:
Bidders are expected to examine the Bidding Documents and Contract Documents thoroughly and should request an explanation of any ambiguities, discrepancies, errors, omissions, or conflicting statements. Failure to do so will be at the Bidder's risk. Bidder assumes responsibility for any patent ambiguity that Bidder does not bring to the Owner's attention prior to bid opening.

2.5. *In Section 2.1.3, insert the following after the term "Contract Documents" and before the period:*
and accepts full responsibility for any pre-bid existing conditions that would affect the Bid that could have been ascertained by a site visit. As provided in Regulation 19-445.2042(B), A bidder's failure to attend an advertised pre-bid conference will not excuse its responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the State.

2.6. *Insert the following Sections 2.2 through 2.6:*

2.2 CERTIFICATION OF INDEPENDENT PRICE DETERMINATION

GIVING FALSE, MISLEADING, OR INCOMPLETE INFORMATION ON THIS CERTIFICATION MAY RENDER YOU SUBJECT TO PROSECUTION UNDER SECTION 16-9-10 OF THE SOUTH CAROLINA CODE OF LAWS AND OTHER APPLICABLE LAWS.

(a) By submitting an bid, the bidder certifies that—

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to—

(i) Those prices;
(ii) The intention to submit an bid; or
(iii) The methods or factors used to calculate the prices offered.

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit an bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory—

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid, and that the signatory has not participated and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; or

(2)(i) Has been authorized, in writing, to act as agent for the bidder's principals in certifying that those principals have not participated, and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this certification [As used in this subdivision (b)(2)(i), the term "principals" means the person(s) in the bidder's organization responsible for determining the prices offered in this bid];

(ii) As an authorized agent, does certify that the principals referenced in subdivision (b)(2)(i) of this certification have not participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this certification.

(c) If the bidder deletes or modifies paragraph (a)(2) of this certification, the bidder must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

2.3 DRUG FREE WORKPLACE

By submitting a bid, the Bidder certifies that Bidder will maintain a drug free workplace in accordance with the requirements of Title 44, Chapter 107 of South Carolina Code of Laws, as amended.

2.4 CERTIFICATION REGARDING DEBARMENT AND OTHER RESPONSIBILITY MATTERS

(a) (1) By submitting an Bid, Bidder certifies, to the best of its knowledge and belief, that-

(i) Bidder and/or any of its Principals-

(A) Are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any state or federal agency;

(B) Have not, within a three-year period preceding this bid, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in

connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of bids; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(C) Are not presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

(ii) Bidder has not, within a three-year period preceding this bid, had one or more contracts terminated for default by any public (Federal, state, or local) entity.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

(b) Bidder shall provide immediate written notice to the Procurement Officer if, at any time prior to contract award, Bidder learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) If Bidder is unable to certify the representations stated in paragraphs (a)(1), Bid must submit a written explanation regarding its inability to make the certification. The certification will be considered in connection with a review of the Bidder's responsibility. Failure of the Bidder to furnish additional information as requested by the Procurement Officer may render the Bidder nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Bidder is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Bidder knowingly or in bad faith rendered an erroneous certification, in addition to other remedies available to the State, the Procurement Officer may terminate the contract resulting from this solicitation for default.

2.5 ETHICS CERTIFICATE

By submitting a bid, the bidder certifies that the bidder has and will comply with, and has not, and will not, induce a person to violate Title 8, Chapter 13 of the South Carolina Code of Laws, as amended (ethics act). The following statutes require special attention: Section 8-13-700, regarding use of official position for financial gain; Section 8-13-705, regarding gifts to influence action of public official; Section 8-13-720, regarding offering money for advice or assistance of public official; Sections 8-13-755 and 8-13-760, regarding restrictions on employment by former public official; Section 8-13-775, prohibiting public official with economic interests from acting on contracts; Section 8-13-790, regarding recovery of kickbacks; Section 8-13-1150, regarding statements to be filed by consultants; and Section 8-13-1342, regarding restrictions on contributions by contractor to candidate who participated in awarding of contract. The state may rescind any contract and recover all amounts expended as a result of any action taken in violation of this provision. If contractor participates, directly or indirectly, in the evaluation or award of public contracts, including without limitation, change orders or task orders regarding a public contract, contractor shall, if required by law to file such a statement, provide the statement required by Section 8-13-1150 to the procurement officer at the same time the law requires the statement to be filed.

2.6 RESTRICTIONS APPLICABLE TO BIDDERS & GIFTS

Violation of these restrictions may result in disqualification of your bid, suspension or debarment, and may constitute a violation of the state Ethics Act. (a) After issuance of the solicitation, ***bidder agrees not to discuss this procurement activity in any way with the Owner or its employees, agents or officials.*** All communications must be solely with the Procurement Officer. This restriction may be lifted by express written permission from the Procurement Officer. This restriction expires once a contract has been formed. (b) Unless otherwise approved in writing by the Procurement

Officer, ***bidder agrees not to give anything to the Owner, any affiliated organizations, or the employees, agents or officials of either, prior to award.*** (c) Bidder acknowledges that the policy of the State is that a governmental body should not accept or solicit a gift, directly or indirectly, from a donor if the governmental body has reason to believe the donor has or is seeking to obtain contractual or other business or financial relationships with the governmental body. Regulation 19-445.2165(C) broadly defines the term donor.

2.7. *Delete Section 3.1.1 and substitute the following:*

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement in the number and for the deposit sum, if any, stated therein. If so provided in the Advertisement, the deposit will be refunded to all plan holders who return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

2.8. *Delete the language of Section 3.1.2 and insert the word "Reserved."*

2.9. *In Section 3.1.4, delete the words "and Architect may make" and substitute the words "has made."*

2.10. *Insert the following Section 3.1.5*

3.1.5 All persons obtaining Bidding Documents from the issuing office designated in the Advertisement shall provide that office with Bidder's contact information to include the Bidder's name, telephone number, mailing address, and email address.

2.11. *In Section 3.2.2:*

Delete the words "and Sub-bidders"

Delete the word "seven" and substitute the word "ten"

2.12. *In Section 3.2.3:*

In the first Sentence, insert the word "written" before the word "Addendum."

Insert the following at the end of the section:

As provided in Regulation 19-445.2042(B), nothing stated at the pre-bid conference shall change the Bidding Documents unless a change is made by written Addendum.

2.13. *Insert the following at the end of Section 3.3.1:*

Reference in the Bidding Documents to a designated material, product, thing, or service by specific brand or trade name followed by the words "or equal" and "or approved equal" shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.

2.14. *Delete Section 3.3.2 and substitute the following:*

3.3.2 No request to substitute materials, products, or equipment for materials, products, or equipment described in the Bidding Documents and no request for addition of a manufacturer or supplier to a list of approved manufacturers or suppliers in the Bidding Documents will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids established in the Invitation for Bids. Any subsequent extension of the date for receipt of Bids by addendum shall not extend the date for receipt of such requests unless the addendum so specifies. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

2.15. *Delete Section 3.4.3 and substitute the following:*

3.4.3 Addenda will be issued no later than 120 hours prior to the time for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

2.16. *Insert the following Sections 3.4.5 and 3.4.6:*

3.4.5 When the date for receipt of Bids is to be postponed and there is insufficient time to issue a written Addendum prior to the original Bid Date, Owner will notify prospective Bidders by telephone or other appropriate means with immediate follow up with a written Addendum. This Addendum will verify the postponement of the original Bid Date and establish a new Bid Date. The new Bid Date will be no earlier than the fifth (5th) calendar day after the date of issuance of the Addendum postponing the original Bid Date.

3.4.6. If an emergency or unanticipated event interrupts normal government processes so that bids cannot be received at the government office designated for receipt of bids by the exact time specified in the solicitation, the time specified for receipt of bids will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal government processes resume. In lieu of an automatic extension, an Addendum may be issued to reschedule bid opening. If state offices are closed at the time a pre-bid or pre-proposal conference is scheduled, an Addendum will be issued to reschedule the conference. Useful information may be available at: http://www.scemd.org/scgovweb/weather_alert.html

2.17. *In Section 4.1.1, delete the word "forms" and substitute the words "SE-330 Bid Form."*

2.18. *Delete Section 4.1.2 and substitute the following:*

4.1.2 Any blanks on the bid form to be filled in by the Bidder shall be legibly executed in a non-erasable medium. Bids shall be signed in ink or other indelible media.

2.19. *Delete Section 4.1.3 and substitute the following:*

4.1.3 Sums shall be expressed in figures.

2.20. *Insert the following at the end of Section 4.1.4:*

Bidder shall not make stipulations or qualify his bid in any manner not permitted on the bid form. An incomplete Bid or information not requested that is written on or attached to the Bid Form that could be considered a qualification of the Bid, may be cause for rejection of the Bid.

2.21. *Delete Section 4.1.5 and substitute the following:*

4.1.5 All requested Alternates shall be bid. The failure of the bidder to indicate a price for an Alternate shall render the Bid non-responsive. Indicate the change to the Base Bid by entering the dollar amount and marking, as appropriate, the box for "ADD TO" or "DEDUCT FROM". If no change in the Base Bid is required, enter "ZERO" or "No Change." For add alternates to the base bid, Subcontractor(s) listed on page BF-2 of the Bid Form to perform Alternate Work shall be used for both Alternates and Base Bid Work if Alternates are accepted.

2.22. *Delete Section 4.1.6 and substitute the following:*

4.1.6 Pursuant to Title 11, Chapter 35, Section 3020(b)(i) of the South Carolina Code of Laws, as amended, Section 7 of the Bid Form sets forth a list of subcontractor specialties for which Bidder is required to list only the subcontractors Bidder will use to perform the work of each listed specialty. Bidder must follow the Instructions in the Bid Form for filling out this section of the Bid Form. Failure to properly fill out Section 7 may result in rejection of Bidder's bid as non-responsive.

2.23. *Delete Section 4.1.7 and substitute the following:*

4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

2.24. *Delete Section 4.2.1 and substitute the following:*

4.2.1 If required by the Invitation for Bids, each Bid shall be accompanied by a bid security in an amount of not less than five percent of the Base Bid. The bid security shall be a bid bond or a certified cashier's check. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

2.25. *Delete Section 4.2.2 and substitute the following:*

4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney. The bid bond shall:

.1 Be issued by a surety company licensed to do business in South Carolina;

.2 Be issued by a surety company having, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty", which company shows a financial strength rating of at least five (5) times the contract price.

.3 Be enclosed in the bid envelope at the time of Bid Opening, either in paper copy or as an electronic bid bond authorization number provided on the Bid Form and issued by a firm or organization authorized by the surety to receive, authenticate and issue binding electronic bid bonds on behalf the surety.

2.26. *Delete Section 4.2.3 and substitute the following:*

4.2.3 By submitting a bid bond via an electronic bid bond authorization number on the Bid Form and signing the Bid Form, the Bidder certifies that an electronic bid bond has been executed by a Surety meeting the standards required by the Bidding Documents and the Bidder and Surety are firmly bound unto the State of South Carolina under the conditions provided in this Section 4.2.

2.27. *Insert the following Section 4.2.4:*

4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and performance and payment bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

2.28. *Delete Section 4.3.1 and substitute the following:*

4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall, unless hand delivered by the Bidder, be addressed to the Owner's designated purchasing office as shown in the Invitation for Bids. The envelope shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail or special delivery service (UPS, Federal Express, etc.), the envelope should be labeled "BID ENCLOSED" on the face thereof. Bidders hand delivering their Bids shall deliver Bids to the place of the Bid Opening as shown in the Invitation for Bids. Whether or not Bidders attend the Bid Opening, they shall give their Bids to the Owner's procurement officer or his/her designee as shown in the Invitation for Bids prior to the time of the Bid Opening.

2.29. *Insert the following Section 4.3.6 and substitute the following:*

4.3.5 The official time for receipt of Bids will be determined by reference to the clock designated by the Owner's procurement officer or his/her designee. The procurement officer conducting the Bid Opening will determine and announce that the deadline has arrived and no further Bids or bid modifications will be accepted. All Bids and bid modifications in the possession of the procurement officer at the time the announcement is completed will be timely, whether or not the bid envelope has been date/time stamped or otherwise marked by the procurement officer.

2.30. *Delete Section 4.4.2 and substitute the following:*

4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be withdrawn in person or by written notice to the party receiving Bids at the place designated for receipt of Bids. Withdrawal by written notice shall be in writing over the signature of the Bidder.

2.31. *In Section 5.1, delete everything following the caption "OPENING OF BIDS" and substitute the following:*

5.1.1 Bids received on time will be publicly opened and will be read aloud. Owner will not read aloud Bids that Owner determines, at the time of opening, to be non-responsive. .

5.1.2 At bid opening, Owner will announce the date and location of the posting of the Notice of Intended Award.

5.1.3 Owner will send a copy of the final Bid Tabulation to all Bidders within ten (10) working days of the Bid Opening.

5.1.4 If Owner determines to award the Project, Owner will, after posting a Notice of Intended Award, send a copy of the Notice to all Bidders.

5.1.5 If only one Bid is received, Owner will open and consider the Bid.

2.32. *In Section 5.2, insert the section number "5.2.1" before the words of the "The Owner" at the beginning of the sentence.*

2.33. *Insert the following Sections 5.2.2 and 5.2.3:*

5.2.2 The reasons for which the Owner will reject Bids include, but are not limited to:

- **.1** Failure by a Bidder to be represented at a Mandatory Pre-Bid Conference or site visit;
- **.2** Failure to deliver the Bid on time;
- **.3** Failure to comply with Bid Security requirements, except as expressly allowed by law;
- **.4** Listing an invalid electronic Bid Bond authorization number on the bid form;
- **.5** Failure to Bid an Alternate, except as expressly allowed by law;
- **.6** Failure to list qualified Subcontractors as required by law;
- **.7** Showing any material modification(s) or exception(s) qualifying the Bid;
- **.8** Faxing a Bid directly to the Owner or their representative; or
- **.9** Failure to include a properly executed Power-of-Attorney with the bid bond.

5.2.3 The Owner may reject a Bid as nonresponsive if the prices bid are materially unbalanced between line items or sub-line items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated in relation to cost for other work, and if there is a reasonable doubt that the bid will result in the lowest overall cost to the Owner even though it may be the low evaluated bid, or if it is so unbalanced as to be tantamount to allowing an advance payment.

2.34. *Delete Section 6.1 and substitute the following:*

6.1 CONTRACTOR'S RESPONSIBILITY

Owner will make a determination of Bidder's responsibility before awarding a contract. Bidder shall provide all information and documentation requested by the Owner to support the Owner's evaluation of responsibility. Failure of Bidder to provide requested information is cause for the Owner, at its option, to determine the Bidder to be non-responsible

2.35. *Delete the language of Section 6.2 and insert the word "Reserved."*

2.36. *Delete the language of Sections 6.3.2, 6.3.3, and 6.3.4 and insert the word "Reserved" after each Section Number.*

2.37. *Insert the following Section 6.4*

6.4 CLARIFICATION

Pursuant to Section 11-35-1520(8), the Procurement Officer may elect to communicate with a Bidder after opening for the purpose of clarifying either the Bid or the requirements of the Invitation for Bids. Such communications may be conducted only with Bidders who have submitted a Bid which obviously conforms in all material aspects to the Invitation for Bids and only in accordance with Appendix D (Paragraph A(6)) to the Manual for Planning and Execution of State Permanent Improvement, Part II. Clarification of a Bid must be documented in writing and included with the Bid. Clarifications may not be used to revise a Bid or the Invitation for Bids. [Section 11-35-1520(8); R.19-445.2080]

2.38. *Delete Section 7.1.2 and substitute the following:*

7.1.2 The performance and payment bonds shall conform to the requirements of Section 11.4 of the General Conditions of the Contract. If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid.

2.39. *Delete the language of Section 7.1.3 and insert the word "Reserved."*

2.40. *In Section 7.2, insert the words "CONTRACT, CERTIFICATES OF INSURANCE" into the caption after the word "Delivery."*

2.41. *Delete Section 7.2.1 and substitute the following:*

7.2.1 After expiration of the protest period, the Owner will tender a signed Contract for Construction to the Bidder and the Bidder shall return the fully executed Contract for Construction to the Owner within seven days thereafter. The Bidder shall deliver the required bonds and certificate of insurance to the Owner not later than three days following the date of execution of the Contract. Failure to deliver these documents as required shall entitle the Owner to consider the Bidder's failure as a refusal to enter into a contract in accordance with the terms and conditions of the Bidder's Bid and to make claim on the Bid Security for re-procurement cost.

2.42. *Delete the language of Section 7.2.2 and insert the word "Reserved."*

2.43. *Delete the language of Article 8 and insert the following:*

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on South Carolina Modified AIA Document A101, 2007, Standard Form of Agreement Between Owner and Contractor as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor.

2.44. *Insert the following Article 9:*

ARTICLE 9 MISCELLANEOUS

9.1 NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING

IMPORTANT TAX NOTICE - NONRESIDENTS ONLY

Withholding Requirements for Payments to Nonresidents: Section 12-8-550 of the South Carolina Code of Laws requires persons hiring or contracting with a nonresident conducting a business or performing personal services of a temporary nature within South Carolina to withhold 2% of each payment made to the nonresident. The withholding requirement does not apply to (1) payments on purchase orders for tangible personal property when the payments are not accompanied by services to be performed in South Carolina, (2) nonresidents who are not conducting business in South Carolina, (3) nonresidents for contracts that do not exceed $10,000 in a calendar year, or (4) payments to a nonresident who (a) registers with either the S.C. Department of Revenue or the S.C. Secretary of State and (b) submits a Nonresident Taxpayer Registration Affidavit - Income Tax Withholding, Form I-312 to the person letting the contract.

For information about other withholding requirements (e.g., employee withholding), contact the Withholding Section at the South Carolina Department of Revenue at 803-898-5383 or visit the Department's website at: www.sctax.org

This notice is for informational purposes only. This Owner does not administer and has no authority over tax issues. All registration questions should be directed to the License and Registration Section at 803-898-5872 or to the South Carolina Department of Revenue, Registration Unit, Columbia, S.C. 29214-0140. All withholding questions should be directed to the Withholding Section at 803-898- 5383.

PLEASE SEE THE "NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT INCOME TAX WITHHOLDING" FORM (FORM NUMBER I-312) LOCATED AT: **http://www.sctax.org/Forms+and+Instructions/withholding/default.htm .**

9.2 CONTRACTOR LICENSING

Contractors and Subcontractors listed in Section 7 of the Bid Form who are required by the South Carolina Code of Laws to be licensed, must be licensed at the time of bidding.

9.3 SUBMITTING CONFIDENTIAL INFORMATION

For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the word "CONFIDENTIAL" every page, or portion thereof, that Bidder contends contains information that is exempt from public disclosure because it is either (a) a trade secret as defined in Section 30-4-40(a)(1), or (b) privileged & confidential, as that phrase is used in Section 11-35-410. For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the words "TRADE SECRET" every page, or portion thereof, that Bidder contends contains a trade secret as that term is defined by Section 39-8-20 of the Trade Secrets Act. For every document Bidder submits in response to or with regard to this solicitation or request, Bidder must separately mark with the word "PROTECTED" every page, or portion thereof, that Bidder contends is protected by Section 11-35-1810. All markings must be conspicuous; use color, bold, underlining, or some other method in order to conspicuously distinguish the mark from the other text. Do not mark your entire bid as confidential, trade secret, or protected! If your bid, or any part thereof, is improperly marked as confidential or trade

secret or protected, the State may, in its sole discretion, determine it nonresponsive. If only portions of a page are subject to some protection, do not mark the entire page. By submitting a response to this solicitation, Bidder (1) agrees to the public disclosure of every page of every document regarding this solicitation or request that was submitted at any time prior to entering into a contract (including, but not limited to, documents contained in a response, documents submitted to clarify a response, & documents submitted during negotiations), unless the page is conspicuously marked "TRADE SECRET" or "CONFIDENTIAL" or "PROTECTED", (2) agrees that any information not marked, as required by these bidding instructions, as a "Trade Secret" is not a trade secret as defined by the Trade Secrets Act, & (3) agrees that, notwithstanding any claims or markings otherwise, any prices, commissions, discounts, or other financial figures used to determine the award, as well as the final contract amount, are subject to public disclosure. In determining whether to release documents, the State will detrimentally rely on Bidders's marking of documents, as required by these bidding instructions, as being either "Confidential" or "Trade Secret" or "PROTECTED". By submitting a response, Bidder agrees to defend, indemnify & hold harmless the State of South Carolina, its officers & employees, from every claim, demand, loss, expense, cost, damage or injury, including attorney's fees, arising out of or resulting from the State withholding information that Bidder marked as "confidential" or "trade secret" or "PROTECTED".

9.4 POSTING OF INTENT TO AWARD

Notice of Intent to Award, SE-370, will be posted at the following location:
Room or Area of Posting: LOBBY
Building Where Posted: FACILITIES MANAGEMENT CENTER
Address of Building: 743 GREENE STREET, COLUMBIA, SOUTH CAROLINA 29208
WEB site address (if applicable): WWW.PURCHASING.SC.EDU; SEE "FACILITIES/CONSTRUCTION SOLICITATIONS AND AWARDS."
Posting date will be announced at bid opening. In addition to posting the notice, the Owner will promptly send all responsive bidders a copy of the notice of intent to award and the final bid tabulation

9.5 PROTEST OF SOLICITATION OR AWARD

Any prospective bidder, offeror, contractor, or subcontractor who is aggrieved in connection with the solicitation of a contract shall protest within fifteen days of the date of issuance of the applicable solicitation document at issue. Any actual bidder, offeror, contractor, or subcontractor who is aggrieved in connection with the intended award or award of a contract shall protest within ten days of the date notification of intent to award is posted in accordance with Title 11, Chapter 35, Section 4210 of the South Carolina Code of Laws, as amended. A protest shall be in writing, shall set forth the grounds of the protest and the relief requested with enough particularity to give notice of the issues to be decided, and must be received by the State Engineer within the time provided.
Any protest must be addressed to the CPO, Office of State Engineer, and submitted in writing:

(a) by email to protest-ose@mmo.sc.gov,
(b) by facsimile at 803-737-0639, or
(c) by post or delivery to 1201 Main Street, Suite 600, Columbia, SC 29201.

By submitting a protest to the foregoing email address, you (and any person acting on your behalf) consent to receive communications regarding your protest (and any related protests) at the e-mail address from which you sent your protest.

9.6 SOLICITATION INFORMATION FROM SOURCES OTHER THAN OFFICIAL SOURCE

South Carolina Business Opportunities (SCBO) is the official state government publication for State of South Carolina solicitations. Any information on State agency solicitations obtained from any other source is unofficial and any reliance placed on such information is at the bidder's sole risk and is without recourse under the South Carolina Consolidated Procurement Code.

9.7 BUILDER'S RISK INSURANCE

Bidder's are directed to Article 11.3 of the South Carolina Modified AIA Document A201, 2007 Edition, which, unless provided otherwise in the bid documents, requires the contractor to provide builder's risk insurance on the project.

9.8 TAX CREDIT FOR SUBCONTRACTING WITH MINORITY FIRMS

Pursuant to Section 12-6-3350, taxpayers, who utilize certified minority subcontractors, may take a tax credit equal to 4% of the payments they make to said subcontractors. The payments claimed must be based on work performed directly for a South Carolina state contract. The credit is limited to a maximum of fifty thousand dollars annually. The taxpayer is eligible to claim the credit for 10 consecutive taxable years beginning with the taxable year in which the first payment is made to the subcontractor that qualifies for the credit. After the above ten consecutive taxable years, the taxpayer is no longer eligible for the credit. The credit may be claimed on Form TC-2, "Minority Business Credit." A copy of the subcontractor's certificate from the Governor's Office of Small and Minority Business (OSMBA) is to be attached to the contractor's income tax return. Taxpayers must maintain evidence of work performed for a State contract by the minority subcontractor. Questions regarding the tax credit and how to file are to be referred to: SC Department of Revenue, Research and Review, Phone: (803) 898-5786, Fax: (803) 898-5888. The subcontractor must be certified as to the criteria of a "Minority Firm" by the Governor's Office of Small and Minority Business Assistance (OSMBA). Certificates are issued to subcontractors upon successful completion of the certification process. Questions regarding subcontractor certification are to be referred to: Governor's Office of Small and Minority Business Assistance, Phone: (803) 734-0657, Fax: (803) 734-2498. Reference: SC §11-35-5010 – Definition for Minority Subcontractor & SC §11-35-5230 (B) – Regulations for Negotiating with State Minority Firms.

§ 9.9 OTHER SPECIAL CONDITIONS OF THE WORK

NONE

_____

_____

_____

_____

END OF DOCUMENT

NOTE: AIA DOCUMENT A310

"BID BOND"

2010 EDITION

may be viewed at

Cox and Dinkins, Inc
724 Beltline Blvd.
Columbia, SC 29205

American Institute of Architects
1735 New York Ave.
N.W. Washington, D.C. 20006
or
The local office of the AIA

SE-330 – LUMP SUM BID
BID FORM

Bidders shall submit bids on only Bid Form SE-330.

BID SUBMITTED BY:_____
(Bidder's Name)

BID SUBMITTED TO: UNIVERSITY OF SOUTH CAROLINA
(Owner's Name)

FOR PROJECT: **PROJECT NAME:** OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION

PROJECT NUMBER: H27-6096-MJ

OFFER

§ 1. In response to the Invitation for Construction Bids and in compliance with the Instructions to Bidders for the above-named Project, the undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with the Owner on the terms included in the Bidding Documents, and to perform all Work as specified or indicated in the Bidding Documents, for the prices and within the time frames indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

§ 2. Pursuant to Section 11-32-3030(1) of the SC Code of Laws, as amended, Bidder has submitted Bid Security as follows in the amount and form required by the Bidding Documents:

☐ Bid Bond with Power of Attorney ☐ Electronic Bid Bond ☐ Cashier's Check
(Bidder check one)

§ 3. Bidder acknowledges the receipt of the following Addenda to the Bidding Documents and has incorporated the effects of said Addenda into this Bid:

ADDENDUM No:_____

§ 4. Bidder accepts all terms and conditions of the Invitation for Bids, including, without limitation, those dealing with the disposition of Bid Security. Bidder agrees that this Bid, including all Bid Alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of 60 Days following the Bid Date, or for such longer period of time that Bidder may agree to in writing upon request of the Owner.

§ 5. Bidder herewith offers to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fees, permits, licenses and applicable taxes necessary to complete the following items of construction work:

§ 6.1 BASE BID WORK ***(as indicated in the Bidding Documents and generally described as follows):*** Demolish utilities, drainage and irrigation systems. Grade field area. Construct new sand based outdoor football practice fields. Construct new filming towers and other practice field appurtenances. Construct field irrigation system. Construct Vapor Management System. Install field drainage and natural turf system.

_____, which sum is hereafter called the Base Bid.
(Bidder - insert Base Bid Amount on line above)

SE-330 – LUMP SUM BID
BID FORM

§ 6.2 **BID ALTERNATES** - as indicated in the Bidding Documents and generally described as follows:

ALTERNATE # 1 *(Brief Description)*:Furnish and install perimeter fence and gates around field. Furnish and install ball net system.

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID:**_____

(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)

ALTERNATE # 2 *(Brief Description)*:_____

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID:**_____

(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)

ALTERNATE # 3 *(Brief Description)*: _____

☐ **ADD TO** or ☐ **DEDUCT FROM BASE BID:**_____

(Bidder to Mark appropriate box to clearly indicate the price adjustment offered for each alternate)

§ 6.3 **UNIT PRICE WORK**

Bidder offers for the Agency's consideration and use the following **UNIT PRICES.** The **UNIT PRICES** offered by Bidder indicate the amount to be added to or deducted from the Contract Sum for each item-unit combination. **UNIT PRICES** include all costs to the Agency, including those for materials, labor, equipment, tools of trades and labor, fees, taxes, insurance, bonding, overhead, profit, etc. The Agency reserves the right to include or not to include any of the following **UNIT PRICES** in the Contract and to negotiate the **UNIT PRICES** with Bidder.

NO.	ITEM	UNIT OF MEASURE	ADD	DEDUCT
1.	500 psi Flowable Fill	Cubic Yard		
2.	Engineered Fill	Cubic Yard		
3.				
4.				
5.				
6.				

SE-330 – LUMP SUM BID
BID FORM

§ 7. LISTING OF PROPOSED SUBCONTRACTORS PURSUANT TO SECTION 3020(b)(i), CHAPTER 35, TITLE 11 OF THE SOUTH CAROLINA CODE OF LAWS, AS AMENDED – ***(See Instructions on the following page BF-2A)***

Bidder shall use the below-listed Subcontractors in the performance of the Subcontractor Specialty work listed:

SUBCONTRACTOR SPECIALTY **By License Classification and/or Subclassification** (Completed by Owner)	**SUBCONTRACTOR'S PRIME CONTRACTOR'S NAME** (Must be completed by Bidder) **BASE BID**	**SUBCONTRACTOR'S PRIME CONTRACTOR'S SC LICENSE NUMBER**
Electrical (EL)		
ALTERNATE 1		
ALTERNATE 2		
ALTERNATE 3		

If a Bid Alternate is accepted, Subcontractors listed for the Bid Alternate shall be used for the work of both the Alternate and the Base Bid work.

SE-330 – LUMP SUM BID
BID FORM

INSTRUCTIONS FOR SUBCONTRACTOR LISTING

1. Section 7 of the Bid Form sets forth a list of subcontractor specialties for which bidder is required to identify by name the subcontractor(s)Bidder will use to perform the work of each listed specialty. Bidder must identify only the subcontractor(s) who will perform the work and no others.

2. For purposes of subcontractor listing, a Subcontractor is an entity who will perform work or render service to the prime contractor to or about the construction site. Material suppliers, manufacturers, and fabricators that will not perform physical work at the site of the project but will only supply materials or equipment to the bidder or proposed subcontractor(s) are not subcontractors and Bidder should not insert their names in the spaces provided on the bid form. Likewise, Bidder should not insert the names of sub-subcontractors in the spaces provided on the bid form but only the names of those entities with which bidder will contract directly.

3. Bidder must only insert the names of subcontractors who are qualified to perform the work of the listed specialties as specified in the Bidding Documents and South Carolina Licensing Laws.

4. If under the terms of the Bidding Documents, Bidder is qualified to perform the work of a specialty listed and Bidder does not intend to subcontract such work but to use Bidder's own employees to perform such work, the Bidder must insert its own name in the space provided for that specialty.

5. If Bidder intends to use multiple subcontractors to perform the work of a single specialty listing, Bidder must insert the name of each subcontractor Bidder will use, preferably separating the name of each by the word **"and"**. If Bidder intends to use both his own employees to perform a part of the work of a single specialty listing and to use one or more subcontractors to perform the remaining work for that specialty listing, bidder must insert his own name and the name of each subcontractor, preferably separating the name of each with the word **"and"**.

6. Bidder may not list subcontractors in the alternative nor in a form that may be reasonably construed at the time of bid opening as a listing in the alternative. A listing that requires subsequent explanation to determine whether or not it is a listing in the alternative is non-responsive. If bidder intends to use multiple entities to perform the work for a single specialty listing, bidder must clearly set forth on the bid form such intent. Bidder may accomplish this by simply inserting the word **"and"** between the name of each entity listed for that specialty. Owner will reject as non-responsive a listing that contains the names of multiple subcontractors separated by a blank space, the word "or", a virgule (that is a /), or any separator that the Owner may reasonably interpret as a listing in the alternative.

7. If Bidder is awarded the contract, bidder must, except with the approval of the owner for good cause shown, use the listed entities to perform the work for which they are listed.

8. If bidder is awarded the contract, bidder will not be allowed to substitute another entity as subcontractor in place of a subcontractor listed in Section 7 of the Bid except for one or more of the reasons allowed by the SC Code of Laws.

9. Bidder's failure to insert a name for each listed specialty subcontractor will render the Bid non-responsive.

SE-330 – LUMP SUM BID
BID FORM

§ 8. LIST OF MANUFACTURERS, MATERIAL SUPPLIERS, AND SUBCONTRACTORS OTHER THAN SUBCONTRACTORS LISTED IN SECTION 7 ABOVE ***(FOR INFORMATION ONLY):*** Pursuant to instructions in the Invitation for Bids, if any, Bidder will provide to Owner upon the Owner's request and within 24 hours of such request, a listing of manufacturers, material suppliers, and subcontractors, other than those listed in Section 7 above, that Bidder intends to use on the project. Bidder acknowledges and agrees that this list is provided for purposes of determining responsibility and not pursuant to the subcontractor listing requirements of SC Code Ann § 11-35-3020(b)(i).

§ 9. TIME OF CONTRACT PERFORMANCE AND LIQUIDATED DAMAGES

a. CONTRACT TIME: Bidder agrees that the Date of Commencement of the Work shall be established in a Notice to Proceed to be issued by the Owner. Bidder agrees to substantially complete the Work within **180*** calendar days from the Date of Commencement, subject to adjustments as provided in the Contract Documents.

b. LIQUIDATED DAMAGES: Bidder further agrees that from the compensation to be paid, the Owner shall retain as Liquidated Damages the sum of **$250.00**for each calendar day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted time for Substantial Completion as provided in the Contract Documents. This sum is intended by the parties as the predetermined measure of compensation for actual damages, not as a penalty for nonperformance.

§ 10. AGREEMENTS

a. Bidder agrees that this bid is subject to the requirements of the law of the State of South Carolina.

b. Bidder agrees that at any time prior to the issuance of the Notice to Proceed for this Project, this Project may be canceled for the convenience of, and without cost to, the State.

c. Bidder agrees that neither the State of South Carolina nor any of its agencies, employees or agents shall be responsible for any bid preparation costs, or any costs or charges of any type, should all bids be rejected or the Project canceled for any reason prior to the issuance of the Notice to Proceed.

§ 11. ELECTRONIC BID BOND

By signing below, the Principal is affirming that the identified electronic bid bond has been executed and that the Principal and Surety are firmly bound unto the State of South Carolina under the terms and conditions of the AIA Document A310, Bid Bond, included in the Bidding Documents.

Electronic Bid Bond Number: _____

Signature and Title: _____

*** Standard liquidated damages are as defined in section 9 of this bid form. However, there is an additional liquidated damages clause due to the sensitive nature of installing the sod on the playing fields with enough grow-in time to meet the requirements of the owner. Owner anticipates installing sod no later than Tuesday July 1, 2014. Liquidated damages in the amount of $500.00 per calendar day will be assessed for any delay to Owner's ability to install sod on July 1, 2014.**

SE-330 – LUMP SUM BID
BID FORM

BIDDER'S TAXPAYER IDENTIFICATION

FEDERAL EMPLOYER'S IDENTIFICATION NUMBER:_____

OR

SOCIAL SECURITY NUMBER:_____

CONTRACTOR'S CLASSIFICATIONS AND SUBCLASSIFICATIONS WITH LIMITATIONS

Classification(s)& Limits: _____

Subclassification(s) & Limits:_____

SC Contractor's License Number(s):_____

BY SIGNING THIS BID, THE PERSON SIGNING REAFFIRMS ALL REPRESENTATIONS AND CERTIFICATIONS MADE BY BOTH THE PERSON SIGNING AND THE BIDDER, INCLUDING WITHOUT LIMITATION, THOSE APPEARING IN ARTICLE 2 OF THE INSTRUCTIONS TO BIDDER. THE INVITATION FOR BIDS, AS DEFINED IN THE INSTRUCTIONS TO BIDDERS, IS EXPRESSLY INCORPORATE BY REFERENCE.

SIGNATURE

BIDDER'S LEGAL NAME: _____

ADRESS:_____

_____

BY:_____ **DATE:**_____
(Signature)

TITLE:_____

TELEPHONE:_____

EMAIL: _____

NOTE: AIA DOCUMENT A101

"STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR"

2007 EDITION

may be viewed at

Cox and Dinkins, Inc
724 Beltline Blvd.
Columbia, SC 29205

American Institute of Architects
1735 New York Ave.
N.W. Washington, D.C. 20006
or
The local office of the AIA

2011 Edition

Rev. 7/11/2011

OSE FORM 00501
STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

OWNER: UNIVERSITY OF SOUTH CAROLINA
PROJECT NUMBER: H27-6096-MJ
PROJECT NAME: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION

1. STANDARD MODIFICATIONS TO AIA A101-2007

1.1. These Standard Modifications amend or supplement the *Standard Form of Agreement Between Owner and Contractor* (AIA Document A101-2007) and other provisions of Bidding and Contract Documents as indicated below.

1.2. All provisions of A101-2007, which are not so amended or supplemented, remain in full force and effect.

2. MODIFICATIONS TO A101

2.1. *Insert the following at the end of Article 1:*

Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

2.2. *Delete Section 3.1 and substitute the following:*

3.1 The Date of Commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner. The Owner shall issue the Notice to Proceed to the Contractor in writing, no less than seven days prior to the Date of Commencement. Unless otherwise provided elsewhere in the contract documents, and provided the contractor has secured all required insurance and surety bonds, the contractor may commence work immediately after receipt of the Notice to Proceed.

2.3. *Delete Section 3.2 and substitute the following:*
3.2 The Contract Time shall be measured from the Date of Commencement as provided in Section 9(a) of the Bid Form (SE-330) for this Project. Contractor agrees that if the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Owner shall be entitled to withhold or recover from the Contractor liquidated damages in the amounts set forth in Section 9(b) of the Bid Form (SE-330, subject to adjustments of this Contract Time as provided in the Contract Documents.

2.4. *In Section 5.1.1, insert the words "and Owner" after the phrase "Payment submitted to the Architect."*

2.5. *Delete Section 5.1.3 and substitute the following:*

5.1.3 The Owner shall make payment of the certified amount to the Contractor not later than 21 days after receipt of the Application for Payment.

2.6. *In Section 5.1.6, Insert the following after the phrase "Subject to other provisions of the Contract Documents":*

and subject to Title 12, Chapter 8, Section 550 of the South Carolina Code of Laws, as amended (Withholding Requirements for Payments to Non-Residents)

In the spaces provided in Sub-Sections 1 and 2 for inserting the retainage amount, insert "three and one-half percent (3.5%)."

OSE FORM 00501
STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

2.7. *In Section 5.1.8, delete the word "follows" and the colon and substitute the following:*

set forth in S.C. Code Ann. § 11-35-3030(4).

2.8. *In Section 5.1.9, delete the words "Except with the Owner's prior approval, the" before the word " Contractor."*

2.9. *In Section 5.2.2, delete the number 30 and substitute the number 21, delete everything following the words "Certificate for Payment" and place a period at the end of the resulting sentence.*

2.10. *Delete the language of Sections 6.1 and 6.2 and substitute the word "Reserved" for the deleted language of each Section .*

2.11. *Delete the language of Section 8.2 and substitute the word "Reserved."*

2.12. *In Section 8.3, make the word "Representative" in the title plural, delete everything following the title, and substitute the following:*

8.3.1 Owner designates the individual listed below as its Senior Representative ("Owner's Senior Representative"), which individual has the responsibility for and, subject to Section 7.2.1 of the General Conditions, the authority to resolve disputes under Section 15.6 of the General Conditions:

Name: Tom N. Opal
Title: Senior Project Manager
Address: University of South Carolina, Campus Planning and Construction, 743 Greene St, Columbia, SC 29208
Telephone: (803) 777-7076 **FAX:** (803) 777-8739
Email: tnopal@fmc.sc.edu

8.3.2 Owner designates the individual listed below as its Owner's Representative, which individual has the authority and responsibility set forth in Section 2.1.1 of the General Conditions:

Name: Ann G. Derrick
Title: Project Manager
Address: University of South Carolina, Campus Planning and Construction, 743 Greene St, Columbia, SC 29208
Telephone: (803) 777-5811 **FAX:** (803) 777-8739
Email: aderrick@fmc.sc.edu

2.13. *In Section 8.4, make the word "Representative" in the title plural, delete everything following the title, and substitute the following:*

8.4.1 Contractor designates the individual listed below as its Senior Representative ("Contractor's Senior Representative"), which individual has the responsibility for and authority to resolve disputes under Section 15.6 of the General Conditions:

Name:
Title:
Address:
Telephone: _____ **FAX:**
Email:

8.4.2 Contractor designates the individual listed below as its Contractor's Representative, which individual has the authority and responsibility set forth in Section 3.1.1 of the General Conditions:

Name:

OSE FORM 00501
STANDARD MODIFICATIONS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR

Title:
Address:
Telephone: _____ **FAX:**
Email:

2.14. *Add the following Section 8.6.1:*

8.6.1 The Architect's representative:

Name: Darren Holcombe
Title: Design Engineer, Cox and Dinkins, Inc.
Address: 724 Beltline Blvd., Columbia, SC 29205
Telephone: (803) 254-0518 **FAX:** (803) 765-0993
Email: dholcombe@coxanddinkins.com

2.15. *In Section 9.1.7, Sub-Section 2, list the following documents in the space provided for listing documents:*

Invitation for Construction Bids (SE-310)
Instructions to Bidders (AIA Document A701-1997)
Standard Supplemental Instructions to Bidders (OSE Form 00201)
Contractor's Bid (Completed SE-330)
Notice of Intent to Award (Completed SE-370)
Certificate of procurement authority issued by the SC Budget & Control Board

2.16. *In Article 10, delete everything after the first sentence.*

END OF DOCUMENT

NOTE: AIA DOCUMENT A201

"GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION"

2007 EDITION

may be viewed at

Cox and Dinkins, Inc
724 Beltline Blvd.
Columbia, SC 29205

American Institute of Architects
1735 New York Ave.
N.W. Washington, D.C. 20006
or
The local office of the AIA

OSE FORM 00811
STANDARD SUPPLEMENTARY CONDITIONS

OWNER: University of South Carolina
PROJECT NUMBER: H27-6096-MJ
PROJECT NAME: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION

1 GENERAL CONDITIONS

The *General Conditions of the Contract for Construction,* AIA Document A201, 2007 Edition, Articles 1 through 15 inclusive, is a part of this Contract and is incorporated as fully as if herein set forth. For brevity, AIA Document A201 is also referred to in the Contract Documents collectively as the "General Conditions."

2 STANDARD SUPPLEMENTARY CONDITIONS

2.1 The following supplements modify, delete and/or add to the General Conditions. Where any portion of the General Conditions is modified or any paragraph, Section or clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of the General Conditions shall remain in effect.

2.2 Unless otherwise stated, the terms used in these Standard Supplementary Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

3 MODIFICATIONS TO A201-2007

3.1 *Insert the following at the end of Section 1.1.1:*

Any reference in this document to the Agreement between the Owner and Contractor, AIA Document A101, or some abbreviated reference thereof, shall mean the AIA A101, 2007 Edition as modified by OSE Form 00501 – Standard Modification to Agreement Between Owner and Contractor. Any reference in this document to the General Conditions of the Contract for Construction, AIA Document A201, or some abbreviated reference thereof, shall mean the AIA A201, 2007 Edition as modified by OSE Form 00811 – Standard Supplementary Conditions.

3.2 *Delete the language of Section 1.1.8 and substitute the word "Reserved."*

3.3 *Add the following Section 1.1.9:*

1.1.9 NOTICE TO PROCEED
Notice to Proceed is a document issued by the Owner to the Contractor, with a copy to the Architect, directing the Contractor to begin prosecution of the Work in accordance with the requirements of the Contract Documents. The Notice to Proceed shall fix the date on which the Contract Time will commence.

3.4 *Insert the following at the end of Section 1.2.1:*

In the event of patent ambiguities within or between parts of the Contract Documents, the contractor shall 1) provide the better quality or greater quantity of Work, or 2) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation.

3.5 *Delete Section 1.5.1 and substitute the following:*

1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as a violation of the Architect's or Architect's consultants' reserved rights.

3.6 *Delete Section 2.1.1 and substitute the following:*

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization, except as provided in Section 7.1.2. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's Representative. [Reference § 8.2 of the Agreement.]

3.7 *Delete Section 2.1.2 and substitute the following:*

2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to post Notice of Project Commencement pursuant to Title 29, Chapter 5, Section 23 of the South Carolina Code of Laws, as amended..

3.8 *Delete Section 2.2.3 and substitute the following:*

2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. Subject to the Contractor's obligations, including those in Section 3.2, the Contractor shall be entitled to rely on the accuracy of information furnished by the Owner pursuant to this Section but shall exercise proper precautions relating to the safe performance of the Work.

3.9 *Replace the period at the end of the last sentence of Section 2.2.4 with a semicolon and insert the following after the inserted semicolon:*

"however, the Owner does not warrant the accuracy of any such information requested by the Contractor that is not otherwise required of the Owner by the Contract Documents. Neither the Owner nor the Architect shall be required to conduct investigations or to furnish the Contractor with any information concerning subsurface characteristics or other conditions of the area where the Work is to be performed beyond that which is provide in the Contract Documents."

3.10 *Delete Section 2.2.5 and substitute the following:*

2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor with ten copies of the Contract Documents. The Contractor may make reproductions of the Contract Documents pursuant to Section 1.5.2. All copies of the drawings and specifications, except the Contractor's record set, shall be returned or suitably accounted for to the Owner, on request, upon completion of the Work.

3.11 *Add the following Sections 2.2.6 and 2.2.7:*

2.2.6 The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor based on information made available by the Owner.

2.2.7 The Owner shall obtain, at its own cost, general building and specialty inspection services as required by the Contract Documents. The Contractor shall be responsible for payment of any charges imposed for reinspections.

3.12 *Delete Section 2.4 and substitute the following:*

2.4 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect, including but not limited to providing necessary resources, with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Directive shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

3.13 *Insert the following at the end of Section 3.2.1:*

The Contractor acknowledges that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Owner, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Owner.

3.14 *In the third sentence of Section 3.2.4, insert the word "latent" before the word "errors."*

3.15 *In the last sentence of Section 3.3.1, insert the words "by the Owner in writing" after the word "instructed."*

3.16 *Delete the third sentence of Section 3.5 and substitute the following sentences:*

Work, materials, or equipment not conforming to these requirements shall be considered defective. Unless caused by the Contractor or a subcontractor at any tier, the Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage.

3.17 *Insert the following at the end of Section 3.6:*

The Contractor shall comply with the requirements of Title 12, Chapter 9 of the South Carolina Code of Laws, as amended, regarding withholding tax for nonresidents, employees, contractors and subcontractors.

3.18 *In Section 3.7.1, delete the words "the building permit as well as for other" and insert the following sentence at the end of this section:*

Pursuant to Title 10, Chapter 1, Section 180 of the South Carolina Code of Laws, as amended, no local general or specialty building permits are required for state buildings.

3.19 *Delete the last sentence of Section 3.7.5 and substitute the following:*

Adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 7.3.3.

3.20 *Delete the last sentence of Section 3.8.2.3 and substitute the following:*

The amount of the Change Order shall reflect the difference between actual costs, as documented by invoices, and the allowances under Section 3.8.2.1.

3.21 *In Section 3.9.1, insert a comma after the word "superintendent" in the first sentence and insert the following after the inserted comma:*

acceptable to the Owner,

3.22 *Delete Section 3.9.2 and substitute the following:*

3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner the name and qualifications of a proposed superintendent. The Owner may reply within 14 days to the Contractor in writing stating (1) whether the Owner has reasonable objection to the proposed superintendent or (2) that the

Owner requires additional time to review. Failure of the Owner to reply within the 14-day period shall constitute notice of no reasonable objection.

3.23 *After the first sentence in Section 3.9.3, insert the following sentence:*

The Contractor shall notify the Owner, in writing, of any proposed change in the superintendent, including the reason therefore, prior to making such change.

3.24 *Delete Section 3.10.3 and substitute the following:*

3.10.3 Additional requirements, if any, for the constructions schedule are as follows:
(Check box if applicable to this Contract))

☐ The construction schedule shall be in a detailed precedence-style critical path management (CPM) or primavera-type format satisfactory to the Owner and the Architect that shall also (1) provide a graphic representation of all activities and events that will occur during performance of the work; (2) identify each phase of construction and occupancy; and (3) set forth dates that are critical in ensuring the timely and orderly completion of the Work in accordance with the requirements of the Contract Documents (hereinafter referred to as "Milestone Dates"). Upon review and acceptance by the Owner and the Architect of the Milestone Dates, the construction schedule shall be deemed part of the Contract Documents and attached to the Agreement as Exhibit "A." If not accepted, the construction schedule shall be promptly revised by the Contractor in accordance with the recommendations of the Owner and the Architect and resubmitted for acceptance. The Contactor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. Whenever the approved construction schedule no longer reflects actual conditions and progress of the work or the Contract Time is modified in accordance with the terms of the Contract Documents, the Contractor shall update the accepted construction schedule to reflect such conditions. In the event any progress report indicates any delays, the Contractor shall propose an affirmative plan to correct the delay, including overtime and/or additional labor, if necessary. In no event shall any progress report constitute an adjustment in the Contract Time, any Milestone Date, or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to Change Order.

3.25 *Add the following Section 3.10.4:*

3.10.4 Owner's review and acceptance of Contractor's schedule is not conducted for the purpose of either determining its accuracy and completeness or approving the construction means, methods, techniques, sequences or procedures. The Owner's approval shall not relieve the Contractor of any obligations. Unless expressly addressed in a Modification, the Owner's approval of a schedule shall not change the Contract Time.

3.26 *Add the following Section 3.12.5.1:*

3.12.5.1 The fire sprinkler shop drawings shall be prepared by a licensed fire sprinkler contractor and shall accurately reflect actual conditions affecting the required layout of the fire sprinkler system. The fire sprinkler contractor shall certify the accuracy of his shop drawings prior to submitting them for review and approval. The fire sprinkler shop drawings shall be reviewed and approved by the Architect's engineer of record who, upon approving the sprinkler shop drawings will submit them to the State Fire Marshal or other authorities having jurisdiction for review and approval. The Architect's engineer of record will submit a copy of the State Fire Marshal's approval letter to the Contractor, Architect, and OSE. Unless authorized in writing by OSE, neither the Contractor nor subcontractor at any tier shall submit the fire sprinkler shop drawings directly to the State Fire Marshal or other authorities having jurisdiction for approval.

3.27 *In the fourth sentence of Section 3.12.10, after the comma following the words "licensed design professional," insert the following:*

who shall comply with reasonable requirements of the Owner regarding qualifications and insurance and

3.28 *In Section 3.13, insert the section number "3.13.1" before the before the opening words "The Contractors shall."*

3.29 Add the following Sections 3.13.2 and 3.13.3:

3.13.2 Protection of construction materials and equipment stored at the Project site from weather, theft, vandalism, damage, and all other adversity is solely the responsibility of the Contractor. The Contractor shall perform the work in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

3.13.3 The Contractor and any entity for whom the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

3.30 *In the first sentence of Section 3.18.1, after the parenthetical "...(other than the Work itself),..." and before the word "...but...", insert the following:*

including loss of use resulting therefrom,

3.31 *Delete Section 4.1.1 and substitute the following:*

4.1.1 The Architect is that person or entity identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

3.32 *Insert the following at the end of Section 4.2.1:*

Any reference in the Contract Documents to the Architect taking action or rendering a decision with a "reasonable time" is understood to mean no more than fourteen days, unless otherwise specified in the Contract Documents or otherwise agreed to by the parties.

3.33 *Delete the first sentence of Section 4.2.2 and substitute the following:*

The Architect will visit the site as necessary to fulfill its obligation to the Owner for inspection services, if any, and, at a minimum, to assure conformance with the Architect's design as shown in the Contract Documents and to observe the progress and quality of the various components of the Contractor's Work, and to determine if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents.

3.34 *Delete the first sentence of Section 4.2.3 and substitute the following*:

On the basis of the site visits, the Architect will keep the Owner informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work.

3.35 *In Section 4.2.5, after the words "evaluations of the" and before the word "Contractor's," insert the following:*

Work completed and correlated with the

3.36 *Delete the first sentence of Section 4.2.11 and substitute the following:*

4.2.11 The Architect will, in the first instance, interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. Upon receipt of such request, the Architect will promptly provide the non-requesting party with a copy of the request.

3.37 *Insert the following at the end of Section 4.2.12:*

If either party disputes the Architects interpretation or decision, that party may proceed as provided in Article 15. The Architect's interpretations and decisions may be, but need not be, accorded any deference in any review conducted pursuant to law or the Contract Documents.

3.38 *Delete Section 4.2.14 and substitute the following:*

The Architect will review and respond to requests for information about the Contract Documents so as to avoid delay to the construction of the Project. The Architect's response to such requests will be made in writing with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information. Any response to a request for information must be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. Unless issued pursuant to a Modification, supplemental Drawings or Specifications will not involve an adjustment to the Contract Sum or Contract Time.

3.39 *Delete Section 5.2.1 and substitute the following:*

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, within fourteen days after posting of the Notice of Intent to Award the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (excluding Listed Subcontractors but including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Owner may reply within 14 days to the Contractor in writing stating (1) whether the Owner has reasonable objection to any such proposed person or entity. Failure of the Owner to reply within the 14 day period shall constitute notice of no reasonable objection.

3.40 *Delete Section 5.2.2 and substitute the following:*

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner has made reasonable and timely objection. The Owner shall not direct the Contractor to contract with any specific individual or entity for supplies or services unless such supplies and services are necessary for completion of the Work and the specified individual or entity is the only source of such supply or services.

3.41 *In the first sentence of Section 5.2.3, delete the words "...or Architect..." in the two places they appear.*

3.42 *Delete the words "...or Architect..." in the in the first sentence of Section 5.2.4 and insert the following sentence at the end of Section 5.2.4:*

The Contractor's request for substitution must be made to the Owner in writing accompanied by supporting information.

3.43 *Add the following Section 5.2.5:*

5.2.5 A Subcontractor identified in the Contractor's Bid in response the specialty subcontractor listing requirements of Section 7 of the Bid Form (SE-330) may only be substituted in accordance with and as permitted by the provisions of Title 11, Chapter 35, Section 3021 of the South Carolina Code of Laws, as amended. A proposed substitute for a Listed Subcontractor shall be subject to the Owner's approval as set forth is Section 5.2.3.

3.44 *In Section 5.3, delete everything following the heading "SUBCONTRACTUAL RELATIONS" and insert the following Sections 5.3.1, 5.3.2, 5.3.3, and 5.3.4:*

5.3.1 By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not

prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise herein or in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.2 Without limitation on the generality of Section 5.3.1, each Subcontract agreement and each Sub-subcontract agreement shall include, and shall be deemed to include, the following Sections of these General Conditions: 3.2, 3.5, 3.18, 5.3, 5.4, 6.2.2, 7.3.3, 7.5, 7.6, 13.1, 13.12, 14.3, 14.4, and 15.1.6.

§ 5.3.3 Each Subcontract Agreement and each Sub-subcontract agreement shall exclude, and shall be deemed to exclude, Sections 13.2.1 and 13.6 and all of Article 15, except Section 15.1.6, of these General Conditions. In the place of these excluded sections of the General Conditions, each Subcontract Agreement and each Sub-subcontract may include Sections 13.2.1 and 13.6 and all of Article 15, except Section 15.1.6, of AIA Document A201-2007, Conditions of the Contract, as originally issued by the American Institute of Architects.

§ 5.3.4 The Contractor shall assure the Owner that all agreements between the Contractor and its Subcontractor incorporate the provisions of Subparagraph 5.3.1 as necessary to preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights. The Contractor's assurance shall be in the form of an affidavit or in such other form as the Owner may approve. Upon request, the Contractor shall provide the Owner or Architect with copies of any or all subcontracts or purchase orders.

3.45 *Delete the last sentence of Section 5.4.1.*

3.46 *Add the following Sections 5.4.4, 5.4.5 and 5.4.6:*

§ 5.4.4 Each subcontract shall specifically provide that the Owner shall only be responsible to the subcontractor for those obligations of the Contractor that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

§ 5.4.5 Each subcontract shall specifically provide that the Subcontractor agrees to perform portions of the Work assigned to the Owner in accordance with the Contract Documents.

§ 5.4.6 Nothing in this Section 5.4 shall act to reduce or discharge the Contractor's payment bond surety's obligations to claimants for claims arising prior to the Owner's exercise of any rights under this conditional assignment.

3.47 *Delete the language of Section 6.1.4 and substitute the word "Reserved."*

3.48 *Insert the following at the end of Section 7.1.2:*

If the amount of a Modification exceeds the limits of the Owner's Construction Change Order Certification (reference Section 9.1.7.2 of the Agreement), then the Owner's agreement is not effective, and Work may not proceed, until approved in writing by the Office of State Engineer.

3.49 *Delete Section 7.2.1 and substitute the following:*

7.2.1 A Change Order is a written instrument prepared by the Architect (using State Form SE-480 "Construction Change Order") and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;

.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

3.50 *Add the following Sections 7.2.2, 7.2.3, 7.2.4, and 7.2.5:*

7.2.2 If a Change Order provides for an adjustment to the Contract Sum, the adjustment must be calculated in accordance with Section 7.3.3.

7.2.3 At the Owner's request, the Contractor shall prepare a proposal to perform the work of a proposed Change Order setting forth the amount of the proposed adjustment, if any, in the Contract Sum; and the extent of the proposed adjustment, if any, in the Contract Time. Any proposed adjustment in the Contract sum shall be prepared in accordance with Section 7.2.2. The Owner's request shall include any revisions to the Drawings or Specifications necessary to define any changes in the Work. Within fifteen days of receiving the request, the Contractor shall submit the proposal to the Owner and Architect along with all documentation required by Section 7.6.

7.2.4 If the Contractor requests a Change Order, the request shall set forth the proposed change in the Work and shall be prepared in accordance with Section 7.2.3. If the Contractor requests a change to the Work that involves a revision to either the Drawings or Specifications, the Contractor shall reimburse the Owner for any expenditures associated with the Architects' review of the proposed revisions, except to the extent the revisions are accepted by execution of a Change Order.

7.2.5 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, any adjustments to the Contract Sum or the Contract Time.

3.51 *Delete 7.3.3 and substitute the following:*

7.3.3 PRICE ADJUSTMENTS
§ 7.3.3.1 If any Modification, including a Construction Change Directive, provides for an adjustment to the Contract Sum, the adjustment shall be based on whichever of the following methods is the most valid approximation of the actual cost to the contractor, with overhead and profit as allowed by Section 7.5:

.1 Mutual acceptance of a lump sum;
.2 Unit prices stated in the Contract Documents, except as provided in Section 7.3.4, or subsequently agreed upon;
.3 Cost attributable to the events or situations under applicable clauses with adjustment of profits or fee, all as specified in the contract, or subsequently agreed upon by the parties, or by some other method as the parties may agree; or
.4 As provided in Section 7.3.7.

§ 7.3.3.2 Consistent with Section 7.6, costs must be properly itemized and supported by substantiating data sufficient to permit evaluation before commencement of the pertinent performance or as soon after that as practicable. All costs incurred by the Contractor must be justifiably compared with prevailing industry standards. Except as provided in Section 7.5, all adjustments to the Contract Price shall be limited to job specific costs and shall not include indirect costs, overhead, home office overhead, or profit.

3.52 *Delete Section 7.3.7 and substitute the following:*

7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall make an initial determination, consistent with Section 7.3.3, of the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.5. In such case, and also under Section 7.3.3.1.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; and

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work.

3.53 *Delete Section 7.3.8 and substitute the following:*

7.3.8 Using the percentages stated in Section 7.5, any adjustment to the Contract Sum for deleted work shall include any overhead and profit attributable to the cost for the deleted Work.

3.54 *Add the following Sections 7.5 and 7.6:*

7.5 AGREED OVERHEAD AND PROFIT RATES

7.5.1 For any adjustment to the Contract Sum for which overhead and profit may be recovered, other than those made pursuant to Unit Prices stated in the Contract Documents, the Contractor agrees to charge and accept, as full payment for overhead and profit, the following percentages of costs attributable to the change in the Work. The percentages cited below shall be considered to include all indirect costs including, but not limited to: field and office managers, supervisors and assistants, incidental job burdens, small tools, and general overhead allocations. The allowable percentages for overhead and profit are as follows:

.1 To the Contractor for work performed by the Contractor's own forces, 17% of the Contractor's actual costs.

.2 To each Subcontractor for work performed by the Subcontractor's own forces, 17% of the subcontractor's actual costs.

.3 To the Contractor for work performed by a subcontractor, 10% of the subcontractor's actual costs (not including the subcontractor's overhead and profit).

7.6 PRICING DATA AND AUDIT

§ 7.6.1 Cost or Pricing Data.

Upon request of the Owner or Architect, Contractor shall submit cost or pricing data prior to execution of a Modification which exceeds $500,000. Contractor shall certify that, to the best of its knowledge and belief, the cost or pricing data submitted is accurate, complete, and current as of a mutually determined specified date prior to the date of pricing the Modification. Contractor's price, including profit, shall be adjusted to exclude any significant sums by which such price was increased because Contractor furnished cost or pricing data that was inaccurate, incomplete, or not current as of the date specified by the parties. Notwithstanding Subparagraph 9.10.4, such adjustments may be made after final payment to the Contractor.

§ 7.6.2 Cost or pricing data means all facts that, as of the date specified by the parties, prudent buyers and sellers would reasonably expect to affect price negotiations significantly. Cost or pricing data are factual, not judgmental; and are verifiable. While they do not indicate the accuracy of the prospective contractor's judgment about estimated future costs or projections, they do include the data forming the basis for that judgment. Cost or pricing data are more than historical accounting data; they are all the facts that can be reasonably expected to contribute to the soundness of estimates of future costs and to the validity of determinations of costs already incurred.

§ 7.6.3 Records Retention.

As used in Section 7.6, the term "records" means any books or records that relate to cost or pricing data that Contractor is required to submit pursuant to Section 7.6.1. Contractor shall maintain records for three years from the date of final payment, or longer if requested by the chief procurement officer. The Owner may audit Contractor's records at reasonable times and places.

3.55 Delete Section 8.2.2 and substitute the following:

8.2.2 The Contractor shall not knowingly commence operations on the site or elsewhere prior to the effective date of surety bonds and insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such surety bonds or insurance.

3.56 *Delete Section 8.3.1 and substitute the following:*

8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the control of the Contractor and any subcontractor at any tier; or by delay authorized by the Owner pending dispute resolution; or by other causes that the Architect determines may justify delay, then to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time and provided the delay (1) is not caused by the fault or negligence of the Contractor or a subcontractor at any tier and (2) is not due to unusual delay in the delivery of supplies, machinery, equipment, or services when such supplies, machinery, equipment, or services were obtainable from other sources in sufficient time for the Contractor to meet the required delivery, the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

3.57 *Insert the following at the end of Section 9.1:*

All changes to the Contract Sum shall be adjusted in accordance with Section 7.3.3.

3.58 *Delete Section 9.2 and substitute the following:*

9.2 SCHEDULE OF VALUES

9.2.1 The Contractor shall submit to the Architect, within ten days of full execution of the Agreement, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. As requested by the Architect, the Contractor and each Subcontractor shall prepare a trade payment breakdown for the Work for which each is responsible, such breakdown being submitted on a uniform standardized format approved by the Architect and Owner. The breakdown shall be divided in detail, using convenient units, sufficient to accurately determine the value of completed Work during the course of the Project. The Contractor shall update the schedule of values as required by either the Architect or Owner as necessary to reflect:

- **.1** the description of Work (listing labor and material separately);
- **.2** the total value;
- **.3** the percent and value of the Work completed to date;
- **.4** the percent and value of previous amounts billed; and
- **.5** the current percent completed and amount billed.

9.2.2 Any schedule of values or trade breakdown that fails to include sufficient detail, is unbalanced, or exhibits "front-loading" of the value of the Work shall be rejected. If a schedule of values or trade breakdown is used as the basis for payment and later determined to be inaccurate, sufficient funds shall be withheld from future Applications for Payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Work.

3.59 *Delete Section 9.3.1 and substitute the following:*

Monthly, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2., for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require (such as copies of requisitions from Subcontractors and material suppliers) and shall reflect retainage and any other adjustments provided in Section 5 of the Agreement. If required by the Owner or Architect, the Application for Payment shall be accompanied by a current construction schedule.

3.60 In Section 9.3.2, add the following words to the end of the second sentence:

provided such materials or equipment will be subsequently incorporated in the Work

Insert the following at the end of Section 9.3.2:

The Contractor shall 1) protect such materials from diversion, vandalism, theft, destruction, and damage, 2) mark such materials specifically for use on the Project, and 3) segregate such materials from other materials at the storage facility. The Architect and the Owner shall have the right to make inspections of the storage areas at any time.

3.61 *In Section 9.4.2, in the first sentence, after the words "Work has progressed to the point indicated," insert the following:*

in both the Application for Payment and, if required to be submitted by the Contractor, the accompanying current construction schedule

In the last sentence, delete the third item starting with "(3) reviewed copies" and ending with "Contractor's right to payment,"

3.62 *In Section 9.5.1, in the first sentence, delete the word "may" after the opening words "The Architect" and substitute the word "shall."*

In Section 9.5.1, insert the following sentence after the first sentence:

The Architect shall withhold a Certificate of Payment if the Application for Payment is not accompanied by the current construction schedule required by Section 3.10.1.

3.63 *In Section 9.6.2, delete the word "The..." at the beginning of the first sentence and substitute the following:*

Pursuant to Chapter 6 of Title 29 of the South Carolina Code of Laws, as amended, the

3.64 *Delete Section 9.7 and substitute following:*

9.7 FAILURE OF PAYMENT
If the Architect does not issue a Certificate for Payment to the Owner, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the time established in the Contract Documents the amount certified by the Architect or awarded by a final dispute resolution order, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased, in accordance with the provisions of Section 7.3.3, by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

3.65 *Insert the following words at the end of the sentence in Section 9.8.1:*

and when all required occupancy permits, if any, have been issued and copies of same have been delivered to the Owner.

3.66 *In Section 9.8.2, insert the word "written" after the word "comprehensive" and before the word "list."*

3.67 *Delete Section 9.8.3 and substitute the following:*

9.8.3.1 Upon receipt of the Contractor's list, the Architect, with the Owner and any other person the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to the Architect, Owner, and Contractor, to determine whether the Work or designated portion thereof is substantially complete. The Contractor shall furnish access for the inspection and testing as provided in this Contract. The inspection shall include a

demonstration by the Contractor that all equipment, systems and operable components of the Work function properly and in accordance with the Contract Documents. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion. If more than one Substantial Completion inspection is required, the Contractor shall reimburse the Owner for all costs of reinspections or, at the Owner's option, the costs may be deducted from payments due to the Contractor.

9.8.3.2 If the Architect and Owner concur in the Contractor's assessment that the Work or a portion of the Work is safe to occupy, the Owner and Contractor may arrange for a Certificate of Occupancy Inspection by OSE. The Owner, Architect, and Contractor shall be present at OSE's inspection. Upon verifying that the Work or a portion of the Work is substantially complete and safe to occupy, OSE will issue, as appropriate, a Full or Partial Certificate of Occupancy.

3.68 *In the second sentence of Section 9.8.5, delete the words "and consent of surety, if any."*

3.69 *In the first sentence of Section 9.9.1, delete the words "Section 11.3.1.5" and substitute the words "Section 11.3.1.3."*

3.70 *Delete Section 9.10.1 and substitute the following:*

9.10.1 Unless the parties agree otherwise in the Certificate of Substantial Completion, the Contractor shall achieve Final Completion no later than thirty days after Substantial Completion. Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect, with the Owner and any other person the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to the Architect, Owner, and Contractor, and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. If more than one Final Completion inspection is required, the Contractor shall reimburse the Owner for all costs of reinspections or, at the Owner's option, the costs may be deducted from payments due to the Contractor. If the Contractor does not achieve final completion within thirty days after Substantial Completion or the timeframe agreed to by the parties in the Certificate of Substantial Completion, whichever is greater, the Contractor shall be responsible for any additional Architectural fees resulting from the delay.

3.71 *Delete the first sentence of Section 9.10.2 and substitute the following:*

Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, (6) required Training Manuals, (7) equipment Operations and Maintenance Manuals, (8) any certificates of testing, inspection or approval required by the Contract Documents and not previously provided (9) all warranties and guarantees required under or pursuant to the Contract Documents, and (10) one copy of the Documents required by Section 3.11.

3.72 Delete the first sentence of Section 9.10.3 and substitute the following:

If, after Substantial Completion of the Work, final completion thereof is delayed 60 days through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted.

3.73 *Delete Section 9.10.5 and substitute the following:*

§9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those specific claims in stated amounts that have been previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

3.74 Add the following Section 9.10.6:

9.10.6 If OSE has not previously issued a Certificate of Occupancy for the entire Project, the Parties shall arrange for a representative of OSE to participate in the Final Completion Inspection. Representatives of the State Fire Marshal's Office and other authorities having jurisdiction may be present at the Final Completion Inspection or otherwise inspect the completed Work and advise the Owner whether the Work meets their respective requirements for the Project.

3.75 *Delete Section 10.3.1 and substitute the following:*

10.3.1 If the Contractor encounters a hazardous material or substance which was not discoverable as provided in Section 3.2.1 and not required by the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons or serious loss to real or personal property resulting from such material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. Hazardous materials or substances are those hazardous, toxic, or radioactive materials or substances subject to regulations by applicable governmental authorities having jurisdiction, such as, but not limited to, the S.C. Department of Health and Environmental Control, the U.S. Environmental Protection Agency, and the U.S. Nuclear Regulatory Commission.

3.76 *Insert the following at the end of Section 10.3.2:*

In the absence of agreement, the Architect will make an interim determination regarding any delay or impact on the Contractor's additional costs. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15. Any adjustment in the Contract Sum shall be determined in accordance with Section 7.3.3.

3.77 *Delete Section 10.3.3 and substitute the following:*

10.3.3 The Work in the affected area shall be resumed immediately following the occurrence of any one of the following events: (a) the Owner causes remedial work to be performed that results in the absence of hazardous materials or substances; (b) the Owner and the Contractor, by written agreement, decide to resume performance of the Work; or (c) the Work may safely and lawfully proceed, as determined by an appropriate governmental authority or as evidenced by a written report to both the Owner and the Contractor, which is prepared by an environmental engineer reasonably satisfactory to both the Owner and the Contractor.

3.78 *In Section 10.3.5, delete the word "The" at the beginning of the sentence and substitute the following:*

In addition to its obligations under Section 3.18, the

3.79 *Delete the language of Section 10.3.6 and substitute the word "Reserved."*

3.80 *Insert the following at the end of Section 10.4:*

The Contractor shall immediately give the Architect notice of the emergency. This initial notice may be oral followed within five days by a written notice setting forth the nature and scope of the emergency. Within fourteen days of the start of the emergency, the Contractor shall give the Architect a written estimate of the cost and probable effect of delay on the progress of the Work.

3.81 *Delete 11.1.2 and substitute the following:*

11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified below or required by law, whichever coverage is greater. Coverages shall be written on an occurrence basis and shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

(1) COMMERCIAL GENERAL LIABILITY:
- (a) General Aggregate (per project) $1,000,000
- (b) Products/Completed Operations $1,000,000
- (c) Personal and Advertising Injury $1,000,000
- (d) Each Occurrence $1,000,000
- (e) Fire Damage (Any one fire) $50,000
- (f) Medical Expense (Any one person) $5,000

(2) BUSINESS AUTO LIABILITY (including All Owned, Non-owned, and Hired Vehicles):
- (a) Combined Single Limit $1,000,000

(3) WORKER'S COMPENSATION:
- (a) State Statutory
- (b) Employers Liability ..... $100,000 Per Acc.
  ..... $500,000 Disease, Policy Limit
  ..... $100,000 Disease, Each Employee

In lieu of separate insurance policies for Commercial General Liability, Business Auto Liability, and Employers Liability, the Contractor may provide an umbrella policy meeting or exceeding all coverage requirements set forth in this Section 11.1.2. The umbrella policy limits shall not be less than $3,000,000.

3.82 *Delete Section 11.1.3 and substitute the following:*

11.1.3 Prior to commencement of the Work, and thereafter upon replacement of each required policy of insurance, Contractor shall provide to the Owner a written endorsement to the Contractor's general liability insurance policy that:

(i) names the Owner as an additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations;
(ii) provides that no material alteration, cancellation, non-renewal, or expiration of the coverage contained in such policy shall have effect unless all additional insureds have been given at least ten (10) days prior written notice of cancellation for non-payment of premiums and thirty (30) days prior written notice of cancellation for any other reason; and
(iii) provides that the Contractor's liability insurance policy shall be primary, with any liability insurance of the Owner as secondary and noncontributory.

Prior to commencement of the Work, and thereafter upon renewal or replacement of each required policy of insurance, Contractor shall provide to the Owner a signed, original certificate of liability insurance (ACORD 25). Consistent with this Section 11.1, the certificate shall identify the types of insurance, state the limits of liability for each type of coverage, name the Owner a Consultants as Certificate Holder, provide that the general aggregate limit applies per project, and provide that coverage is written on an occurrence basis. Both the certificates and the

endorsements must be received directly from either the Contractor's insurance agent or the insurance company. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, naming the Owner as an additional insured for claims made under the Contractor's completed operations, and otherwise meeting the above requirements, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

3.83 *Delete Section 11.1.4 and substitute the following:*

11.1.4 A failure by the Owner either (i) to demand a certificate of insurance or written endorsement required by Section 11.1, or (ii) to reject a certificate or endorsement on the grounds that it fails to comply with Section 11.1 shall not be considered a waiver of Contractor's obligations to obtain the required insurance.

3.84 *In Section 11.3.1, delete the first sentence and substitute the following:*

Unless otherwise provided in the Contract Documents, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis.

3.85 *Delete the language of Section 11.3.1.2 and substitute the word "Reserved."*

3.86 *Delete the language of Section 11.3.1.3 and substitute the word "Reserved."*

3.87 *Delete Section 11.3.2 and substitute the following:*

11.3.2 BOILER AND MACHINERY INSURANCE

The Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall both be named insureds.

3.88 *Delete Section 11.3.3 and substitute the following:*

11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. To the extent any losses are covered and paid for by such insurance, the Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

3.89 *Delete Section 11.3.4 and substitute the following:*

11.3.4 If the Owner requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.

3.90 *Delete the language of Section 11.3.5 and substitute the word "Reserved."*

3.91 *Delete Section 11.3.6 and substitute the following:*

11.3.6 Before an exposure to loss may occur, the Contractor shall file with the Owner a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Owner.

3.92 Delete the first sentence of Section 11.3.7 and substitute the following:

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent the property insurance provided by the Contractor pursuant to this Section 11.3 covers and pays for the damage, except such rights as they have to proceeds of such insurance held by the Contractor as fiduciary.

3.93 *Delete the first sentence of Section 11.3.8 and substitute the following:*

A loss insured under the Contractor's property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10.

3.94 *Delete Section 11.3.9 and substitute the following:*

11.3.9 If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor.

3.95 *Delete Section 11.3.10 and substitute the following:*

11.3.10 The Contractor as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Contractor's exercise of this power; if such objection is made, the dispute shall be resolved in the manner provided in the contract between the parties in dispute as the method of binding dispute resolution. The Contractor as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with a final order or determination issued by the appropriate authority having jurisdiction over the dispute..

3.96 *Delete Section 11.4.1 and substitute the following:*

11.4.1 Before commencing any services hereunder, the Contractor shall provide the Owner with Performance and Payment Bonds, each in an amount not less than the Contract Price set forth in Article 4 of the Agreement. The Surety shall have, at a minimum, a "Best Rating" of "A" as stated in the most current publication of "Best's Key Rating Guide, Property-Casualty". In addition, the Surety shall have a minimum "Best Financial Strength Category" of "Class V", and in no case less than five (5) times the contract amount. The Performance Bond shall be written on Form SE-355, "Performance Bond" and the Payment Bond shall written on Form SE-357, "Labor and Material Payment Bond", and both shall be made payable to the Owner.

3.97 *Delete Section 11.4.2 and substitute the following:*

11.4.2 The Performance and Labor and Material Payment Bonds shall:

- **.1** be issued by a surety company licensed to do business in South Carolina;
- **.2** be accompanied by a current power of attorney and certified by the attorney-in-fact who executes the bond on the behalf of the surety company; and
- **.3** remain in effect for a period not less than one (1) year following the date of Substantial Completion or the time required to resolve any items of incomplete Work and the payment of any disputed amounts, whichever time period is longer.

3.98 *Add the following Sections 11.4.3 and 11.4.4:*

11.4.3 Any bonds required by this Contract shall meet the requirements of the South Carolina Code of Laws and Regulations, as amended.

11.4.4 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

3.99 *Delete Section 12.1.1 and substitute the following:*

12.1.1 If a portion of the Work is covered contrary to the to requirements specifically expressed in the Contract Documents, including inspections of work-in-progress required by all authorities having jurisdiction over the Project, it must, upon demand of the Architect or authority having jurisdiction, be uncovered for observation and be replaced at the Contractor's expense without change in the Contract Time.

3.100 *In Section 12.2.2.1, delete the words "and to make a claim for breach of warranty" at the end of the third sentence.*

3.101 *In Section 12.2.2.3, add the following to the end of the sentence:*

unless otherwise provided in the Contract Documents.

3.102 *Insert the following at the end of Section 12.2.4:*

If, prior to the date of Substantial Completion, the Contractor, a Subcontractor, or anyone for whom either is responsible, uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

3.103 *Delete Section 13.1 and substitute the following:*

13.1 GOVERNING LAW
The Contract, any dispute, claim, or controversy relating to the Contract, and all the rights and obligations of the parties shall, in all respects, be interpreted, construed, enforced and governed by and under the laws of the State of South Carolina, except its choice of law rules.

3.104 *Delete Section 13.2, including its Sub-Sections 13.2.1 and 13.2.2, and substitute the following:*

13.2 SUCCESSORS AND ASSIGNS
The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole, or in part, without written consent of the other and then only in accordance with and as permitted by Regulation 19-445.2180 of the South Carolina Code of Regulations, as amended. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

3.105 *Delete Section 13.3 and substitute the following:*

13.3 WRITTEN NOTICE
Unless otherwise permitted herein, all notices contemplated by the Contract Documents shall be in writing and shall be deemed given:

.1 upon actual delivery, if delivery is by hand;
.2 upon receipt by the transmitting party of confirmation or reply, if delivery is by electronic mail, facsimile, telex or telegram;
.3 upon receipt, if delivery is by the United States mail.

Notice to Contractor shall be to the address provided in Section 8.3.2 of the Agreement. Notice to Owner shall be to the address provided in Section 8.2.2 of the Agreement. Either party may designate a different address for notice by giving notice in accordance with this paragraph.

3.106 *In Section 13.4.1, insert the following at the beginning of the sentence:*

Unless expressly provided otherwise,

3.107 *Add the following Section 13.4.3:*

13.4.3 Notwithstanding Section 9.10.4, the rights and obligations which, by their nature, would continue beyond the termination, cancellation, rejection, or expiration of this contract shall survive such termination, cancellation, rejection, or expiration, including, but not limited to, the rights and obligations created by the following clauses:

1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service;
3.5 Warranty
3.17 Royalties, Patents and Copyrights
3.18 Indemnification
7.6 Cost or Pricing Data
11.1 Contractor's Liability Insurance
11.4 Performance and Payment Bond
15.1.6 Claims for Listed Damages
15.1.7 Waiver of Claims Against the Architect
15.6 Dispute Resolution
15.4 Service of Process

3.108 *Delete Section 13.6 and substitute the following:*

13.6 INTEREST
Payments due to the Contractor and unpaid under the Contract Documents shall bear interest only if and to the extent allowed by Title 29, Chapter 6, Article 1 of the South Carolina Code of Laws. Amounts due to the Owner shall bear interest at the rate of one percent a month or a pro rata fraction thereof on the unpaid balance as may be due.

3.109 *Delete the language of Section 13.7 and substitute the word "Reserved."*

3.110 *Add the following Sections 13.8 through 13.16:*

13.8 PROCUREMENT OF MATERIALS BY OWNER
The Contractor accepts assignment of all purchase orders and other agreements for procurement of materials and equipment by the Owner that are identified as part of the Contract Documents. The Contractor shall, upon delivery, be responsible for the storage, protection, proper installation, and preservation of such Owner purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. Unless the Contract Documents specifically provide otherwise, all Contractor warranty of workmanship and correction of the Work obligations under the Contract Documents shall apply to the Contractor's installation of and modifications to any Owner purchased items,.

13.9 INTERPRETATION OF BUILDING CODES
As required by Title 10, Chapter 1, Section 180 of the South Caroline Code of Laws, as amended, OSE shall determine the enforcement and interpretation of all building codes and referenced standards on state buildings. The Contractor shall refer any questions, comments, or directives from local officials to the Owner and OSE for resolution.

13.10 MINORITY BUSINESS ENTERPRISES
Contractor shall notify Owner of each Minority Business Enterprise (MBE) providing labor, materials, equipment, or supplies to the Project under a contract with the Contractor. Contractor's notification shall be via the first monthly status report submitted to the Owner after execution of the contract with the MBE. For each such MBE, the Contractor shall provide the MBE's name, address, and telephone number, the nature of the work to be performed or materials or equipment to be supplied by the MBE, whether the MBE is certified by the South Carolina Office of Small and Minority Business Assistance, and the value of the contract.

13.11 SEVERABILITY
If any provision or any part of a provision of the Contract Documents shall be finally determined to be superseded, invalid, illegal, or otherwise unenforceable pursuant to any applicable Legal Requirements, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of the Contract Documents, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

13.12 ILLEGAL IMMIGRATION
Contractor certifies and agrees that it will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina Code of Laws and agrees to provide to the State upon request any documentation required to establish either: (a) that Title 8, Chapter 14 is inapplicable both to Contractor and its subcontractors or sub-subcontractors; or (b) that Contractor and its subcontractors or sub-subcontractors are in compliance with Title 8, Chapter 14. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony, and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both." Contractor agrees to include in any contracts with its subcontractors language requiring its subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 8, Chapter 14. (An overview is available at www.procurement.sc.gov)

13.13 SETOFF
The Owner shall have all of its common law, equitable, and statutory rights of set-off.

13.14 DRUG-FREE WORKPLACE
The Contractor certifies to the Owner that Contractor will provide a Drug-Free Workplace, as required by Title 44, Chapter 107 of the South Carolina Code of Laws, as amended.

13.15 FALSE CLAIMS
According to the S.C. Code of Laws § 16-13-240, "a person who by false pretense or representation obtains the signature of a person to a written instrument or obtains from another person any chattel, money, valuable security, or other property, real or personal, with intent to cheat and defraud a person of that property is guilty" of a crime.

13.16 NON-INDEMNIFICATION:
Any term or condition is void to the extent it requires the State to indemnify anyone. It is unlawful for a person charged with disbursements of state funds appropriated by the General Assembly to exceed the amounts and purposes stated in the appropriations. (§ 11-9-20) It is unlawful for an authorized public officer to enter into a contract for a purpose in which the sum is in excess of the amount appropriated for that purpose. It is unlawful for an authorized public officer to divert or appropriate the funds arising from any tax levied and collected for any one fiscal year to the payment of an indebtedness contracted or incurred for a previous year. (§ 11-1-40)

3.111 *Delete Section 14.1.1 and substitute the following:*

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 45 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires substantially all Work to be stopped; or

.2 An act of government, such as a declaration of national emergency that requires substantially all Work to be stopped.

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents and the Contractor has stopped work in accordance with Section 9.7

3.112 *Insert the following at the end of Section 14.1.3:*

Any adjustment to the Contract Sum pursuant to this Section shall be made in accordance with the requirements of Article 7.

3.113 *In Section 14.1.4, replace the word "repeatedly" with the word "persistently."*

3.114 *Delete Section 14.2.1 and substitute the following:*

14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials, or otherwise fails to prosecute the Work, or any separable part of the Work, with the diligence, resources and skill that will ensure its completion within the time specified in the Contract Documents, including any authorized adjustments;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the Contract Documents and the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

3.115 *In Section 14.2.2, delete the parenthetical statement ", upon certification by the Initial Decision Maker that sufficient cause exists to justify such action," immediately following the word "Owner" in the first line.*

3.116 *In Section 14.2.4, replace the words "Initial Decision Maker" with the word "Architect"*

3.117 *Add the following Section 14.2.5:*

14.2.5 If, after termination for cause, it is determined that the Owner lacked justification to terminate under Section 14.2.1, or that the Contractor's default was excusable, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the Owner under Section 14.4.

3.118 *Delete the second sentence of Section 14.3.2 and substitute the following:*

Any adjustment to the Contract Sum made pursuant to this section shall be made in accordance with the requirements of Article 7.3.3.

3.119 *Delete Section 14.4.1 and substitute the following:*

14.4.1 The Owner may, at any time, terminate the Contract, in whole or in part for the Owner's convenience and without cause. The Owner shall give written notice of the termination to the Contractor specifying the part of the Contract terminated and when termination becomes effective.

3.120 *Delete Section 14.4.2 and substitute the following:*

14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders; and

.4 complete the performance of the Work not terminated, if any.

3.121 *Delete Section 14.4.3 and substitute the following:*

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, costs incurred by reason of such termination, and any other adjustments otherwise allowed by the Contract. Any adjustment to the Contract Sum made pursuant to this Section 14.4 shall be made in accordance with the requirements of Article 7.3.3.

3.122 *Add the following Sections 14.4.4, 14.4.5, and 14.5:*

14.4.4 Contractor's failure to include an appropriate termination for convenience clause in any subcontract shall not (i) affect the Owner's right to require the termination of a subcontract, or (ii) increase the obligation of the Owner beyond what it would have been if the subcontract had contained an appropriate clause.

14.4.5 Upon written consent of the Contractor, the Owner may reinstate the terminated portion of this Contract in whole or in part by amending the notice of termination if it has been determined that:

.1 the termination was due to withdrawal of funding by the General Assembly, Governor, or Budget and Control Board or the need to divert project funds to respond to an emergency as defined by Regulation 19-445.2110(B) of the South Carolina Code of Regulations, as amended;

.2 funding for the reinstated portion of the work has been restored;

.3 circumstances clearly indicate a requirement for the terminated work; and

.4 reinstatement of the terminated work is advantageous to the Owner.

14.5 CANCELLATION AFTER AWARD BUT PRIOR TO PERFORMANCE
Pursuant to Title 11, Chapter 35 and Regulation 19-445.2085 of the South Carolina Code of Laws and Regulations, as amended, this contract may be canceled after award but prior to performance.

3.123 *Insert the following sentence after the second sentence of Section 15.1.1:*

A voucher, invoice, payment application or other routine request for payment that is not in dispute when submitted is not a Claim under this definition.

3.124 *Delete Section 15.1.2 and substitute the following:*

15.1.2 NOTICE OF CLAIMS
Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Architect. Such notice shall include sufficient information to advise the Architect and other party of the circumstances giving rise to the claim, the specific contractual adjustment or relief requested and the basis of such request. Claims by either party arising prior to the date final payment is due must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later except as stated for adverse weather days in Section 15.1.5.2. By failing to give written notice of a Claim within the time required by this Section, a party expressly waives its claim.

3.125 *Delete Section 15.1.3 and substitute the following:*

15.1.3 CONTINUING CONTRACT PERFORMANCE
Pending final resolution of a Claim, including any administrative review allowed under Section 15.6, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will issue Certificates for Payment in accordance with the initial decisions and determinations of the Architect.

3.126 *Insert the following at the end of Section 15.1.5.1:*

Claims for an increase in the Contract Time shall be based on one additional calendar day for each full calendar day that the Contractor is prevented from working.

3.127 *Insert the following Sub-Sections at the end of Section 15.1.5.2:*

.1 Claims for adverse weather shall be based on actual weather conditions at the job site or other place of performance of the Work, as documented in the Contractor's job site log.

.2 For the purpose of this Contract, a total of five (5) calendar days per calendar month (non-cumulative) shall be anticipated as "adverse weather" at the job site, and such time will not be considered justification for an extension of time. If, in any month, adverse weather develops beyond the five (5) days, the Contractor shall be allowed to claim additional days to compensate for the excess weather delays only to the extent of the impact on the approved construction schedule. The remedy for this condition is for an extension of time only and is exclusive of all other rights and remedies available under the Contract Documents or imposed or available by law.

.3 The Contractor shall submit monthly with their pay application all claims for adverse weather conditions that occurred during the previous month. The Architect shall review each monthly submittal in accordance with Section 15.5 and inform the Contractor and the Owner promptly of its evaluation. Approved days shall be included in the next Change Order issued by the Architect. Adverse weather conditions not claimed within the time limits of this Subparagraph shall be considered to be waived by the Contractor. Claims will not be allowed for adverse weather days that occur after the scheduled (original or adjusted) date of Substantial Completion.

3.128 *Delete Section 15.1.6 and substitute the following:*

15.1.6 CLAIMS FOR LISTED DAMAGES
Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor and Owner waive Claims against each other for listed damages arising out of or relating to this Contract.

15.1.6.1 For the Owner, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) costs suffered by a third party unable to commence work, (vi) attorney's fees, (vii) any interest, except to the extent allowed by Section 13.6 (Interest), (viii) lost revenue and profit for lost use of the property, (ix) costs resulting from lost productivity or efficiency.

15.1.6.2 For the Contractor, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) attorney's fees, (vi) any interest, except to the extent allowed by Section 13.6 (Interest); (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. Without limitation, this mutual waiver is applicable to all damages due to either party's termination in accordance with Article 14. Nothing contained in this Section shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

3.129 *Add the following Section 15.1.7:*

15.1.7 WAIVER OF CLAIMS AGAINST THE ARCHITECT
Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor waives all claims against the Architect and any other design professionals who provide design and/or project management services to the Owner, either directly or as independent contractors or subcontractors to the Architect, for listed damages arising out of or relating to this Contract. The listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v)

attorney's fees, (vi) any interest; (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

3.130 ***Delete the language of Sections 15.2, 15.3, and 15.4, including all Sub-Sections, and substitute the word "Reserved" for the deleted language of each Section and Sub-Section.***

3.131 *Add the following Sections 15.5 and 15.6 with their sub-sections:*

15.5 CLAIM AND DISPUTES - DUTY OF COOPERATION, NOTICE, AND ARCHITECTS INITIAL DECISION

15.5.1 Contractor and Owner are fully committed to working with each other throughout the Project to avoid or minimize claims. To further this goal, Contractor and Owner agree to communicate regularly with each other and the Architect at all times notifying one another as soon as reasonably possible of any issue that if not addressed may cause loss, delay, and/or disruption of the Work. If claims do arise, Contractor and Owner each commit to resolving such claims in an amicable, professional, and expeditious manner to avoid unnecessary losses, delays, and disruptions to the Work.

15.5.2 Claims shall first be referred to the Architect for initial decision. An initial decision shall be required as a condition precedent to resolution pursuant to Section 15.6 of any Claim arising prior to the date of final payment, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered, or after all the Architect's requests for additional supporting data have been answered, whichever is later. The Architect will not address claims between the Contractor and persons or entities other than the Owner.

15.5.3 The Architect will review Claims and within ten days of the receipt of a Claim (1) request additional supporting data from the claimant or a response with supporting data from the other party or (2) render an initial decision in accordance with Section 15.5.5.

15.5.4 If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Architect when the response or supporting data will be furnished or (3) advise the Architect that all supporting data has already been provided. Upon receipt of the response or supporting data, the Architect will render an initial decision in accordance with Section 15.5.5.

15.5.5 The Architect will render an initial decision in writing; (1) stating the reasons therefor; and (2) notifying the parties of any change in the Contract Sum or Contract Time or both. The Architect will deliver the initial decision to the parties within two weeks of receipt of any response or supporting data requested pursuant to Section 16.4, or within such longer period as may be mutually agreeable to the parties. If the parties accept the initial decision, the Architect shall prepare a Change Order with appropriate supporting documentation for the review and approval of the parties and the Office of State Engineer. If either the Contractor, Owner, or both, disagree with the initial decision, the Contractor and Owner shall proceed with dispute resolution in accordance with the provisions of Section 15.6.

15.5.6 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

15.6 DISPUTE RESOLUTION

15.6.1 If a claim is not resolved pursuant to Section 15.5 to the satisfaction of either party, both parties shall attempt to resolve the dispute at the field level through discussions between Contractor's Representative and Owner's Representative. If a dispute cannot be resolved through Contractor's Representative and Owner's Representative, then the Contractor's Senior Representative and the Owner's Senior Representative, upon the request of either party, shall meet as soon as conveniently possible, but in no case later than twenty-one days after such a request is made, to attempt to resolve such dispute. Prior to any meetings between the Senior Representatives, the parties will exchange relevant information that will assist the parties in resolving their dispute. The meetings required by this Section are a condition precedent to resolution pursuant to Section 15.6.2.

15.6.2 If after meeting in accordance with the provisions of Section 15.6.1, the Senior Representatives determine that the dispute cannot be resolved on terms satisfactory to both the Contractor and the Owner, then either party may submit the dispute by written request to South Carolina's Chief Procurement Officer for Construction (CPOC). Except as otherwise provided in Article 15, all claims, claims, or controversies relating to the Contract shall be resolved exclusively by the appropriate Chief Procurement Officer in accordance with Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws, or in the absence of jurisdiction, only in the Court of Common Pleas for, or in the absence of jurisdiction a federal court located in, Richland County, State of South Carolina. Contractor agrees that any act by the State regarding the Contract is not a waiver of either the State's sovereign immunity or the State's immunity under the Eleventh Amendment of the United State's Constitution.

15.6.3 If any party seeks resolution to a dispute pursuant to Section 15.6.2, the parties shall participate in non-binding mediation to resolve the claim. If the claim is governed by Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws as amended and the amount in controversy is $100,000.00 or less, the CPOC shall appoint a mediator, otherwise, the mediation shall be conducted by an impartial mediator selected by mutual agreement of the parties, or if the parties cannot so agree, a mediator designated by the American Arbitration Association ("AAA") pursuant to its Construction Industry Mediation Rules. The mediation will be governed by and conducted pursuant to a mediation agreement negotiated by the parties or, if the parties cannot so agree, by procedures established by the mediator.

15.6.4 Without relieving any party from the other requirements of Sections 15.5 and 15.6, either party may initiate proceedings in the appropriate forum prior to initiating or completing the procedures required by Sections 15.5 and 15.6 if such action is necessary to preserve a claim by avoiding the application of any applicable statutory period of limitation or repose.

15.6.5 SERVICE OF PROCESS
Contractor consents that any papers, notices, or process necessary or proper for the initiation or continuation of any claims, claims, or controversies relating to the Contract; for any court action in connection therewith; or for the entry of judgment on any award made, may be served on Contractor by certified mail (return receipt requested) addressed to Contractor at the address provided for the Contractor's Senior Representative or by personal service or by any other manner that is permitted by law, in or outside South Carolina. Notice by certified mail is deemed duly given upon deposit in the United States mail.

3.132 *Add the following Article 16:*

ARTICLE 16 PROJECT-SPECIFIC REQUIREMENTS AND INFORMATION
16.1. Inspection Requirements: *(Indicate the inspection services required by the Contract)*

☒ Special Inspections are required and are not part of the Contract Sum. *(see section 01400)*
☒ Building Inspections are required and are not part of the Contract Sum. *(see section 01400)*
☐ Building Inspections are required and are part of the Contract Sum.

The inspections required for this Work are :
(Indicate which services are required and the provider)
☐ Civil: _____
☐ Structural: _____
☐ Mechanical: _____
☐ Plumbing: _____
☐ Electrical: _____
☐ Gas: _____
☐ Other *(list)*: _____
Remarks: All inspections provided by owner

16.1.1 Contractor shall schedule and request inspections in an orderly and efficient manner and shall notify the Owner whenever the Contractor schedules an inspection in accordance with the requirements of Section 16.1. Contractor shall be responsible for the cost of inspections scheduled and conducted without the Owner's knowledge and for any increase in the cost of inspections resulting from the inefficient scheduling of inspections.

16.2 List Cash Allowances, if any. *(Refer to attachments as needed* If *none, enter NONE)*
NONE

16.3. Requirements for Record Drawings, if any. *(Refer to attachments as needed.* If *none, enter NONE)*
SEE SPECIFICATIONS

16.4. Requirements for Shop Drawings and other submittals, if any, including number, procedure for submission, list of materials to be submitted, etc. *(Refer to attachments as needed. If none, enter NONE)*
SEE SPECIFICATIONS

16.5. Requirements for signage, on-site office or trailer, utilities, restrooms, etc., in addition to the Contract, if any. *(Refer to attachments as needed. If none, enter NONE)*
NONE

16.6. Requirements for Project Cleanup in addition to the Contract, if any. *(Refer to attachments as needed. If none, enter NONE)*
NONE

16.7. List all attachments that modify these General Conditions. *(If none, enter NONE)*
NONE

SE-480

2011 Edition

CONSTRUCTION CHANGE ORDER

Change Order No.:

Agency: UNIVERSITY OF SOUTH CAROLINA
Project Number: H27-6096-MJ
Project Name: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION

Contractor:
Contract Dated: **For:**

This Contract is changed as follows: *(Insert description of change in space provided below)*

Adjustments in the Contract Sum:

1. Original Contract Sum: ----------
2. Change in Contract Sum by previously approved Change Orders:
3. Contract Sum prior to this Change Order: ---------- $0.00
4. Amount of this Change Order: ----------
5. New Contract Sum, including this Change Order: ---------- $0.00

Adjustments in Contract Time:

1. Original Substantial Completion Date: ----------
2. Sum of previously approved increases and decreases: ---------- Days
3. Changes in Days for this Change Order: ---------- Days
4. New Substantial Completion Date: ----------

Contractor Acceptance:

BY: _____ **Date:** _____
(Signature of Representative
Print Name: _____

Architect Recommendation for Acceptance:

BY: _____ **Date:** _____
(Signature of Representative
Print Name: _____

Agency Acceptance and Certification

BY: _____ **Date:** _____
(Signature of Representative
Print Name: _____

☐ Change is within Agency Construction Procurement Certification amount of _____

☐ Change is not within Agency Construction Procurement Certification amount

Office of the State Engineer Authorization for change not within Agency Construction Procurement Certification:

Signature of OSE Project Manager: _____
Date: _____

USC SUPPLEMENTAL GENERAL CONDITIONS
FOR CONSTRUCTION PROJECTS

1. Contractor's employees shall take all reasonable means not to interrupt the flow of student traffic in building corridors, lobbies and stairs. All necessary and reasonable safety precautions shall be taken to prevent injury to building occupants while transporting materials and equipment through the building to the work area. Providing safe, accessible, plywood pedestrian ways around construction may be required if a suitable alternative route is not available.

2. Fraternization between Contractor's employees and USC students, faculty or staff is strictly prohibited-zero tolerance!

3. USC will not tolerate rude, abusive or degrading behavior on the job site. Heckling and cat-calling directed toward students, faculty or staff or any other person on USC property is strictly prohibited. Any contractor whose employees violate this requirement will be assessed a fine of up to $500 per violation.

4. Contractor's employees must adhere to the University's policy of maintaining a drug-free and smoke-free/tobacco free workplace.

5. Contractor must sign a Contractor Key Receipt/Return form before any keys are issued. Keys must be returned immediately upon the completion of the work. The Contractor will bear the cost of any re-keying necessary due to the loss of or failure to return keys.

6. A welding permit must be issued by the University Fire Marshall before any welding can begin inside a building. Project Manager will coordinate.

7. Contractor must notify the University immediately upon the discovery of suspect material such as those potentially containing asbestos or other such hazardous materials. These materials **must not** be disturbed until approved by the USC Project Manager.

8. At the beginning of the project, the USC Project Manager will establish the Contractor's lay-down area. This area will also be used for the Contractor's work vehicles. No personal vehicles will be allowed in this area, or in any areas surrounding the construction site that are not regular or authorized parking lots. Personal vehicles must be parked in the perimeter parking lots. Parking permits can be obtained at the USC Parking Office located in the Pendleton Street parking garage. The lay down area will be clearly identified to the contractor by the PM, with a sketch or drawing provided to Parking. In turn, the contractor will mark off this area with a sign containing the project name, PM name, Contractor name and contact number, and end date. Where this area is subject to foot traffic, protective barriers will be provided as specified by the PM. The area will be maintained in a neat and orderly fashion. Vehicles parked in the lay down area (or designated parking areas) will be clearly marked or display a CPC furnished placard for identification.

Updated: July 15, 2011

9. Contractor will be responsible for providing its own temporary toilet facilities, unless prior arrangements are made with the USC Project Manager.

10. Use of USC communications facilities (telephones, computers, etc.) by the Contractor is prohibited, unless prior arrangements are made with the USC Project Manager.

11. For all projects over $100,000, including IDCIs, an SE-395, Contractor Performance Evaluation, will be completed by the USC Project Manager and reviewed with the GC at the beginning of the project and a copy given to the GC. At the end of the project the form will be completed and a Construction Performance rating will be established.

12. Contractor is responsible for removal of all debris from the site, and is required to provide the necessary dumpsters which will be emptied at least ___1___ times per week. Construction waste must not be placed in University dumpsters. THE CONSTRUCTION SITE MUST BE THOROUGHLY CLEANED WITH ALL TRASH PICKED UP AND PROPERLY DISPOSED OF ON A DAILY BASIS AND THE SITE MUST BE LEFT IN A SAFE AND SANITARY CONDITION EACH DAY. THE UNIVERSITY WILL INSPECT JOB SITES REGULARLY AND WILL FINE ANY CONTRACTOR FOUND TO BE IN VIOLATION OF THIS REQUIREMENT AN AMOUNT OF UP TO $1,000 PER VIOLATION.

13. **Contractor must provide all O&M manuals, as-built drawings, and training of USC personnel on new equipment, controls, etc. prior to Substantial Completion. Final payment will not be made until this is completed.**

14. The contractor will comply with all regulations set forth by OSHA and SCDHEC. Contractor must also adhere to USC's internal policies and procedures (available by request). As requested, the contractor will submit all Safety Programs and Certificates of Insurance to the University for review.

15. Tree protection fencing is required to protect existing trees and other landscape features to be preserved within a construction area. The limits of this fence will be evaluated for each situation with the consultant, USC Arborist and USC Project Manager. The tree protection fence shall be 5' high chain link fence unless otherwise approved by USC Project Manager. No entry or materials storage will be allowed inside the tree protection zone. A 4" layer of mulch shall be placed over the tree protection area to maintain moisture in the root zone.

16. Where it is necessary to cross walks, tree root zones (i.e., under canopy) or lawns the following measures shall be taken: For single loads up to 9,000 lbs., a 3/4" minimum plywood base shall be placed over areas impacted. For single loads over 9,000 lbs., two layers of 3/4" plywood is required.

17. For projects requiring heavy loads to cross walks tree root zones or lawns. A construction entry road consisting of 10' X 16' oak logging mates on 12" coarse, chipped, hardwood base. Mulch and logging mats shall be supplemented throughout the project to keep

matting structurally functional.

18. Any damage to existing landscaping (including lawn areas) will be remediated before final payment is made.

19. Orange safety fence to be provided by the contractor. (USC Arborist, Kevin Curtis may be contacted at 777-0033 or 315-0319)

Campus Vehicle Expectations

1. All motorized vehicles on the University campus are expected to travel and park on roadways and/or in parking stalls.

2. All motorized vehicle traffic on USC walkways must first receive the Landscape Manager's authorization. Violators may be subject to fines and penalties.

3. All motorized vehicles that leak or drip liquids are prohibited from traveling or parking on walks or landscaped areas.

4. Contractors, vendors, and delivery personnel are required to obtain prior parking authorization before parking in a designated space. Violators may be subject to fines and/or penalties. See Item 10 below.

5. Drivers of equipment or motor vehicles that damage university hardscape or landscape will be held personally responsible for damages and restoration expense.

6. Vehicle drivers who park on landscape or drives must be able to produce written evidence of need or emergency requiring parking on same.

7. All vehicles parked on landscape, hardscape, or in the process of service delivery, must display adequate safety devices, i.e. flashing lights, cones, signage, etc.

8. All drivers of equipment and vehicles will be respectful of University landscape, equipment, structures, fixtures and signage.

9. All incidents of property damage will be reported to Parking Services or the Work Management Center.

10. Parking on campus is restricted to spaces designated by Parking Services at the beginning of the project. Once the project manager and contractor agree on how many spaces are needed, the project manager will obtain a placard for each vehicle. This placard must be hung from the mirror of the vehicle, otherwise a ticket will be issued and these tickets cannot be "fixed". Parking spaces are restricted to work vehicles only; no personal vehicles.

SE-355 2011 Edition

Performance Bond

KNOW ALL MEN BY THESE PRESENTS, that *(Insert full name or legal title and address of Contractor)*

Name: _____
Address: _____
_____

hereinafter referred to as "Contractor", and *(Insert full name and address of principal place of business of Surety)*

Name: _____
Address: _____
_____

hereinafter called the "surety", are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: UNIVERSITY OF SOUTH CAROLINA
Address: 743 GREENE STREET
COLUMBIA, SC 29208

hereinafter referred to as "Agency", or its successors or assigns, the sum of _____ ($_____), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ entered into a contract with Agency to construct

State Project Name: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION
State Project Number: H27-6096-MJ
Brief Description of Awarded Work, as found on the SE-330, Bid Form: Demolish utilities, drainage and irrigation systems, Grade field area. Construct new sand based outdoor football practice fields. Construct new filming towers and other practice field appurtenances. Construct field irrigation system. Construct Vapor Management System. Install field drainage and natural turf system.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: COX and DINKINS, INC.
724 BELTLINE BLVD
COLUMBIA, SC 29205

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

IN WITNESS WHEREOF, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

DATED this _____ day of _____, 2_____ BOND NUMBER _____
(shall be no earlier than Date of Contract)

CONTRACTOR	SURETY
By: _____ (Seal)	By: _____ (Seal)
Print Name: _____	Print Name: _____
Print Title: _____	Print Title: _____ (Attach Power of Attorney)
Witness: _____	Witness: _____

(Additional Signatures, if any, appear on attached page)

Performance Bond

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency for the full and faithful performance of the contract, which is incorporated herein by reference

2. If the Contractor performs the contract, the Surety and the Contractor have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. The Surety's obligation under this Bond shall arise after:

3.1 The Agency has notified the Contractor and the Surety at the address described in paragraph 10 below, that the Agency is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If the Agency, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the Agency's right, if any, subsequently to declare a Contractor Default; or

3.2 The Agency has declared a Contractor Default and formally terminated the Contractor's right to complete the Contract.

4. The Surety shall, within 15 days after receipt of notice of the Agency's declaration of a Contractor Default, and at the Surety's sole expense, take one of the following actions:

4.1 Arrange for the Contractor, with consent of the Agency, to perform and complete the Contract; or

4.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Agency for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Agency and the contractor selected with the Agency's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the Agency the amount of damages as described in paragraph 7 in excess of the Balance of the Contract Sum incurred by the Agency resulting from the Contractor Default; or

4.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and:

4.4.1 After investigation, determine the amount for which it may be liable to the Agency and, within 60 days of waiving its rights under this paragraph, tender payment thereof to the Agency; or

4.4.2 Deny liability in whole or in part and notify the Agency, citing the reasons therefore.

5. Provided Surety has proceeded under paragraphs 4.1, 4.2, or 4.3, the Agency shall pay the Balance of the Contract Sum to either:

5.1 Surety in accordance with the terms of the Contract; or

5.2 Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

5.3 The balance of the Contract Sum due either the Surety or another contractor shall be reduced by the amount of damages as described in paragraph 7.

6. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond 15 days after receipt of written notice from the Agency to the Surety demanding that the Surety perform its obligations under this Bond, and the Agency shall be entitled to enforce any remedy available to the Agency.

6.1 If the Surety proceeds as provided in paragraph 4.4, and the Agency refuses the payment tendered or the Surety has denied liability, in whole or in part, then without further notice the Agency shall be entitled to enforce any remedy available to the Agency.

6.2 Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the Dispute Resolution process defined in the Contract Documents and the laws of the State of South Carolina.

7. After the Agency has terminated the Contractor's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Agency shall be those of the Contractor under the Contract, and the responsibilities of the Agency to the Surety shall those of the Agency under the Contract. To a limit of the amount of this Bond, but subject to commitment by the Agency of the Balance of the Contract Sum to mitigation of costs and damages on the Contract, the Surety is obligated to the Agency without duplication for:

7.1 The responsibilities of the Contractor for correction of defective Work and completion of the Contract; and

7.2 Additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

7.3 Damages awarded pursuant to the Dispute Resolution Provisions of the Contract. Surety may join in any Dispute Resolution proceeding brought under the Contract and shall be bound by the results thereof; and

7.4 Liquidated Damages, or if no Liquidated Damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. The Surety shall not be liable to the Agency or others for obligations of the Contractor that are unrelated to the Contract, and the Balance of the Contract Sum shall not be reduced or set-off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Agency or its heirs, executors, administrators, or successors.

9. The Surety hereby waives notice of any change, including changes of time, to the contract or to related subcontracts, purchase orders and other obligations.

10. Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the address shown on the signature page.

11. Definitions

11.1 Balance of the Contract Sum: The total amount payable by the Agency to the Contractor under the Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts to be received by the Agency in settlement of insurance or other Claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Contract.

11.2 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform the Contract or otherwise to comply with the terms of the Contract.

SE-357
Labor and Material Payment Bond

KNOW ALL MEN BY THESE PRESENTS, that *(Insert full name or legal title and address of Contractor)*

Name: _____
Address: _____
_____

hereinafter referred to as "Contractor", and *(Insert full name and address of principal place of business of Surety)*

Name: _____
Address: _____
_____

hereinafter called the "surety", are jointly and severally held and firmly bound unto *(Insert full name and address of Agency)*

Name: UNIVERSITY OF SOUTH CAROLINA
Address: 743 GREENE STREET
COLUMBIA, SC 29208

hereinafter referred to as "Agency", or its successors or assigns, the sum of _____ ($ _____), being the sum of the Bond to which payment to be well and truly made, the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____ entered into a contract with Agency to construct

Project Name: OUTDOOR FOOTBALL PRACTICE FIELDS CONSTRUCTION
Project Number: H27-6096-MJ
Brief Description of Awarded Work, as found on the SE-330, Bid Form: Demolish utilities, drainage and irrigation systems, Grade field area. Construct new sand based outdoor football practice fields. Construct new filming towers and other practice field appurtenances. Construct field irrigation system. Construct Vapor Management System. Install field drainage and natural turf system.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: COX and DINKINS, INC.
724 BELTLINE BLVD
COLUMBIA, SC 29205

which agreement is by reference made a part hereof, and is hereinafter referred to as the Contract.

IN WITNESS WHEREOF, Surety and Contractor, intending to be legally bound hereby, subject to the terms stated herein, do each cause this Labor and Material Payment Bond to be duly executed on its behalf by its authorized officer, agent or representative.

DATED this _____ day of _____, 2_____ BOND NUMBER _____
(shall be no earlier than Date of Contract)

CONTRACTOR	SURETY
By: _____ (Seal)	By: _____ (Seal)
Print Name: _____	Print Name: _____
Print Title: _____	Print Title: _____ (Attach Power of Attorney)
Witness: _____	Witness: _____

(Additional Signatures, if any, appear on attached page)

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

1. The Contractor and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Agency to pay for all labor, materials and equipment required for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the Agency, this obligation shall be null and void if the Contractor:

2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and

2.2 Defends, indemnifies and holds harmless the Agency from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract.

3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.

4. With respect to Claimants, and subject to the provisions of Title 29, Chapter 5 and the provisions of §11-35-3030(2)(c) of the SC Code of Laws, as amended, the Surety's obligation under this Bond shall arise as follows:

4.1 Every person who has furnished labor, material or rental equipment to the Contractor or its subcontractors for the work specified in the Contract, and who has not been paid in full therefore before the expiration of a period of ninety (90) days after the date on which the last of the labor was done or performed by him or material or rental equipment was furnished or supplied by him for which such claim is made, shall have the right to sue on the payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit and to prosecute such action for the sum or sums justly due him.

4.2 A remote claimant shall have a right of action on the payment bond upon giving written notice by certified or registered mail to the Contractor within ninety (90) days from the date on which such person did or performed the last of the labor or furnished or supplied the last of the material or rental equipment upon which such claim is made.

4.3 Every suit instituted upon a payment bond shall be brought in a court of competent jurisdiction for the county or circuit in which the construction contract was to be performed, but no such suit shall be commenced after the expiration of o ne year after the day on which the last of the labor was performed or material or rental equipment was supplied by the person bringing suit.

5. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

5.1 Send an answer to the Claimant, with a copy to the Agency, within sixty (60) days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

5.2 Pay or arrange for payment of any undisputed amounts.

5.3 The Surety's failure to discharge its obligations under this paragraph 5 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a claim. However, if the Surety fails to discharge its obligations under this paragraph 5, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs to recover any sums found to be due and owing to the Claimant.

6. Amounts owed by the Agency to the Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the Contractor furnishing and the Agency accepting this Bond, they agree that all funds earned by the contractor in the performance of the Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Agency's prior right to use the funds for the completion of the Work.

7. The Surety shall not be liable to the Agency, Claimants or others for obligations of the Contractor that are unrelated to the Contract. The Agency shall not be liable for payment of any costs or expenses of any claimant under this bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

9. Notice to the Surety, the Agency or the Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the Agency or the contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

10. By the Contractor furnishing and the Agency accepting this Bond, they agree that this Bond has been furnished to comply with the statutory requirements of the South Carolina Code of Laws, as amended, and further, that any provision in this Bond conflicting with said statutory requirements shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

11. Upon request of any person or entity appearing to be a potential beneficiary of this bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

12. Any dispute, suit, action or proceeding arising out of or relating to this Bond shall be governed by the laws of the State of South Carolina.

13. DEFINITIONS

13.1 Claimant: An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the Contractor and the Contractor's Subcontractors, and all other items for which a mechanic's lien might otherwise be asserted.

13.2 Remote Claimant: A person having a direct contractual relationship with a subcontractor of the Contractor or subcontractor, but no contractual relationship expressed or implied with the Contractor.

13.3 Contract: The agreement between the Agency and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

SECTION 010000 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DEFINITIONS AND STATUS OF INDIVIDUALS

A. The terms defined in the agreement, general conditions, and general provision for fixed price construction shall apply throughout. Certain additional terms and refinements shall apply as specified below.

B. Contractor: The term "Contractor" shall mean the person or firm responsible for the execution of this Contract, or any portion thereof. This shall include the General or Prime Contractor, all Subcontractors and any suppliers. However, the General Contractor has the sole responsibility for completing the entire work of this Contract.
   1. The Contractor shall complete the work in accordance with the Construction Documents, approved submittals that comply with the Construction Documents, and any clarifications or instructions issued by the Project Manager. The Contractor shall not be relieved of any responsibility to comply with such requirements by the activities of the Engineer or the Project Manager.

C. Engineer: The term "Engineer" is the person or firm designated as the responsible design professional. The Engineer shall interpret and clarify the intent of the Construction Documents, and will participate with the University of South Carolina in determining the acceptability of workmanship, materials and the progress of the work and entitlement to payment. The Engineer will review proposed changes, substitutions, shop drawings and schedules submitted by the Contractor for approval as required by the Construction Documents. The Engineer shall have access to the work at all times and the authority to recommend that University of South Carolina not accept any work or materials deemed not to conform to the requirements of the Contract.
   1. The Engineer for University of South Carolina is:
      a. Company: Cox and Dinkins, Inc.
      b. Address: 724 Beltline Blvd., Columbia, SC 29205

D. Project Manager: During the Construction Phase, all submittals and communications with the Engineer shall be through the University of South Carolina "Project Manager". The Project Manager will administer the technical requirements of the Contract and will coordinate the inspection of the work. All professional design responsibility matters will be determined by the Engineer.
   1. The Project Manager for University of South Carolina is:
      a. Ann G. Derrick, Project Manager
      b. 743 Greene Street
         Columbia, SC 29208

1.2 SCOPE OF WORK

A. Work shall include:
   1. Selective demolition of existing site improvements

2. Earthwork and fill for new practice fields
3. Import of soil for sand based fields and installation of field drainage system
4. Construction of three viewing towers and appurtenances
5. Construction of Vapor Management System
6. Construction of other field-related appurtenances as indicated in the construction documents

B. Alternate is as follows:

Alternate No. 1 – Furnish and install perimeter fence and gates around field. Furnish and install ball net system.

1.3 CONSTRUCTION LIMITS

A. The area to be set aside for the work under this Contract is shown on the drawings, and the Contractor shall confine the construction to the immediate area within the construction limits.

1.4 PARKING - SITE ACCESS

A. PARKING: Parking for private vehicles is limited. Parking for Contractors and their workers will be limited to the construction limits and as agreed with the Project Manager.

END OF SECTION 010000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.3 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

2.2 TEMPORARY FACILITIES

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

2.3 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

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

3.2 TEMPORARY UTILITY INSTALLATION

A. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Coordinate with Owner for use of Owner's existing toilet facilities.

C. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
1. Connect temporary service to Owner's existing power source, as directed by Owner.

D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

D. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to the Site Plan and requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Remove each temporary facility when need for its service has ended or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

END OF SECTION 015000

SECTION 016000 – ELECTRONIC SUBMITTAL PROCEDURES

ELECTRONIC SUBMITTAL PROCEDURES

A. Summary:
   1. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using Submittal Exchange (www.submittalexchange.com) or equal pre-approved website service designed specifically for transmitting submittals between all construction team members.
   2. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
   3. The electronic submittal process is not intended for color samples, color charts, or physical material samples.

B. Procedures:
   1. Create submittal log in Submittal Exchange by inserting required submittals listed in individual specification sections.
   2. Submittal Preparation - Contractor may use any or all of the following options:
      a. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the Submittal Exchange website.
      b. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via email.
      c. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
   3. Printed Submittals: Provide two printed sets of submittals for shop drawings for structural framing in addition to electronic submittals.
   4. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
   5. Contractor shall transmit each submittal to Architect using the Submittal Exchange website, www.submittalexchange.com.
   6. Architect / Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.
   7. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
   8. Submit paper copies of any reviewed submittals not submitted electronically at project closeout for record purposes in accordance with Section 01 77 19 – Contract Closeout.

C. Costs:
   1. General Contractor shall include the full cost of Submittal Exchange project subscription in their proposal. This cost is included in the Contract Amount. Contact Submittal Exchange at 1-800-714-0024 to verify cost prior to bid.
   2. The intent is for Submittal Exchange service cost to be in lieu of postage or shipping costs typically paid for paper submittals. Service cost is a net cost savings to Contractor because submittals sent electronically do not need to be shipped physically.
   3. After award of contract, training will be provided by Submittal Exchange regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024.
   4. Internet Service and Equipment Requirements:
      a. Email address and Internet access at Contractor's main office.
      b. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

D. Products:

5. Basis of specification is Submittal Exchange website system for electronic construction submittals (www.submittalexchange.com) or equal.
6. Substitution may be considered if submitted prior to bid date for pre-approval. Product requirements:

   a. Independently hosted, web-based system for automated tracking, storage, and distribution of contract submittals, Requests For Information, and other contract related documents. FTP sites, e-mail exchanges, and server-based systems hosted from inside a contractor's office will not be considered are not acceptable.
   b. Utilize 256-bit SSL encryption and hosted at SSAE 16 compliant data centers.
   c. Minimum five years documented experience of use on comparable commercial construction projects. "Comparable commercial construction projects" shall be defined as documented use on a minimum of five hundred governmental, public-entity, or private sector projects each of $1 million construction value or greater.
   d. Minimum five years documented 99.5% website uptime.
   e. Unlimited individual user accounts and system access for all project subcontractors, general contractor, owner staff, architect, design consultants, and sub-consultants, with no additional fees for those parties to access the system.
   f. Separate locations for owner, architect, design consultant, and sub-consultant review comments with contractors restricted from viewing comments until final review or release by owner or primary design consultant.
   g. Full version histories and dates of exchanges automatically tracked and available for viewing, searching, and reporting in a linear log format compatible with AIA G712.
   h. Functionality to group submittals as required packages and apply forms and review comments to entire package simultaneously.
   i. Functionality for integrated online PDF viewing and review, including graphical markups and stamps, for owner, architect, design consultants, sub-consultants, and general contractor without need for additional software purchase.
   j. Automatic, configurable email notifications for each project team member for new and reviewed submittals and other items.
   k. Automatic, configurable email reminders of past due items.
   l. Customized, automated PDF form generation for submittals, RFIs, and other documents matching standard templates used by owner, design consultants, sub-consultants, and general contractor. Documentation and demonstration of automatic form generation using each entity's templates must be submitted as part of any substitution request.
   m. Prior to project start, system vendor shall create submittal log with all required items from project manual or submittal register. Owner or primary design consultant shall have full control over required items list and access to edit, add, or remove items during project.
   n. System vendor shall provide minimum one-hour live web meeting training sessions to contractors, design consultants, sub-consultants, and owners staff prior to project start.
   o. System vendor shall make available minimum thirty-minute live web meeting training sessions for subcontractors at least twice weekly for the entire duration of the project.
   p. System vendor shall provide access for owner, design consultants, sub-consultants, general contractor, and subcontractors to live technical support by phone and email minimum of 7 AM to 6 PM CST on standard business days at no additional cost.
   q. Allowance for scanning and printing services provided by local third-party reprographic vendor to assist with obtaining documents electronically and online print ordering.
   r. At completion of project closeout, system vendor shall provide minimum of four archival discs that include all documents and tracking logs, or the ability to download this information from the live website in a single complete archive package.

END

SECTION 024116 - SELECTIVE DEMOLITION

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. Demolition and removal of site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.

B. Related Sections:
1. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements not part of building demolition.
2. Section 312000 "Earth Moving" for filling of all cavities and trenches and general earth moving.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

C. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction.
2. Review and finalize protection requirements.
3. Discuss and review incidental demolition items and issues.
4. Review procedures for noise control and dust control.
5. Review procedures for protection of adjacent buildings.
6. Review discussion of construction laydown areas and access points and procedures.
7. Review and discuss requirements for record drawings.

1.6 PROJECT CONDITIONS

A. At the time of bidding and construction the area should consist of asphalt pavement, a gravel pad area where the large shed used to stand, storm drainage system with some to remain and some to be removed (see plans) and other utilities.

B. On-site storage or sale of removed items or materials is not permitted except for the sale of reclaimed asphalt if applicable.

1.7 COORDINATION

A. Arrange schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings. Depending on the schedule, it is possible that the owner will be present on the site and making preparations for parking vehicles prior to the 2014 football season. Such preparations may include but are not limited to parking striping, installation of temporary fencing or other barriers, and general site cleanup (not associated with the demolition operation outlined in the contract documents. Coordinate with the owner to reduce conflicts.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected or turned off and capped before starting operations.

B. Review Contract Documents and Drawings of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in the drawings.

3.2 PREPARATION

A. Existing Utilities: Locate, identify, disconnect, and seal or cap off any utilities that were not properly accommodated during the previous building demolition project.

B. Salvaged Items: Comply with the following: It is not expected that there will be any salvage

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 PROTECTION

A. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

   a. Provide at least 72 hours notice to occupants of affected buildings if shutdown of service is required during changeover.

B. Temporary Protection:

1. Protect existing site improvements, appurtenances, and landscaping to remain.

2. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings and roads.

C. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. Insure that all erosion and sediment controls are in place prior to demolition and properly maintained throughout the demolition process and until all areas of the site are properly stabilized.

B. If a well is encountered on the site, stop work in that vicinity and barricade the well. Inform the Owner immediately and await further instructions prior to resuming work within 50' of the well.

C. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage

adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution. Insure that erosion control measures are in place prior to use of water.

D. Explosives: Use of explosives is not permitted.

E. All existing trees on the site shall remain and shall be protected unless otherwise noted on the plans. Contractor shall be responsible for properly stabilizing all areas of the site.

F. General notes:

1. Contractor shall coordinate with City of Columbia and cut off and remove all existing water lines 6" and above as noted on the plans, meters, backflow preventers and associated boxes serving buildings being demolished or otherwise not indicated on the plans to remain. The cut off shall occur at the main by plugging the service according to City of Columbia standards. Mark the location and keep accurate records of all underground cutoff points.

2. All sanitary sewer mains on this site are owned by City of Columbia and are to remain and shall be protected by the contractor. If damage to existing sanitary sewer facilities occurs during demolition, the contractor shall repair and/or replace to the satisfaction of the owner at the contractor's expense.
3. Telecom, gas and cable lines if encountered shall be abandoned in place.
4. Existing storm drainage facilities unless otherwise indicated on the plans shall remain. If drainage lines or structures are damaged during construction, the contractor shall repair and/or replace to the satisfaction of the owner at the contractor's expense.

5. Backfill all cavities and trenches with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

3.5 REPAIRS

A. Promptly repair damage to adjacent buildings and fencing to remain caused by construction operations.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA/SCDHEC-approved landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

C. As shown on the plans the asphalt shall be broken up into particle sizes no larger than 3" and remain in place. Any existing concrete shall be treated the same as asphalt. There is no haul off from this site other than some materials gathered during utility and drainage demolition. The

transformer shall be properly disposed of and any hazardous materials related to the transformer if they exist shall be documented and properly disposed of.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by construction operations.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. 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.

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

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

E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

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

1.4 MATERIAL OWNERSHIP

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

1.5 INFORMATIONAL SUBMITTALS

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

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

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

D. The following practices are prohibited within protection zones:

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

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

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

PART 3 - EXECUTION

3.1 PREPARATION

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

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

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

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

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

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

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

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

3.3 TREE AND PLANT PROTECTION

A. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Contractor will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing.

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

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

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

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

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

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

E. Excavate for and remove underground utilities indicated to be removed. Unless a utility is specifically indicated to be removed on the drawings, contractor can assume that the utility can be abandoned in place. However the contractor shall remove the utility if it interferes with other work or will remain closer than 12" in depth from the finished grade.

3.5 CLEARING AND GRUBBING

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

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 12 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and dispose of off site.

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

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

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil 4 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

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

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

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

B. The asphalt and base materials on this site are to be removed and ground into small particles and intermixed with existing organic soils and topsoil located on the site now. This new material will become the growth medium for all of the grassed parking areas. See other specification sections for more detailed information about this process.

C. Remove slabs, curbs and gutters as indicated.

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

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements and turf and grasses.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:
1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

1. 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 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom; measured according to SAE J-1179.
2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.

I. 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.

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

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

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

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

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

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

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

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

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

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 311000 "Site Clearing," are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

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

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

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

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

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

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

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

H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C 33; fine aggregate.

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

L. Manufactured topsoil: Soil produced by homogeneously blending in-situ soil with crushed asphalt, sand and stabilized organic soil amendments and other onsite organic soils to produce topsoil or planting soil.

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:

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

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

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

PART 3 - EXECUTION

3.1 PREPARATION

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

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

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

3.2 DEWATERING

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

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

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

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

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

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

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

f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

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.

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

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. See Landscape Architects specifications for more details and information.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.7 EXCAVATION FOR UTILITY TRENCHES

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

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

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

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

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

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.

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

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

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. See Landscape Architects specifications for more details and information.

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

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

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

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

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

3.9 UNAUTHORIZED EXCAVATION

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

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

3.10 STORAGE OF SOIL MATERIALS

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

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

3.11 BACKFILL

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

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring 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. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

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

E. Place and compact initial backfill of satisfactory soil, free of particles larger than Insert dimension in any dimension, to a height of 12 inches over the pipe or conduit.

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

F. Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

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

3.13 SOIL FILL

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

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

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

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

3.14 SOIL MOISTURE CONTROL

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

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

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

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

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

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, steps, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

2. Under pavements recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
3. Under playing fields, walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.

4. Under turf or unpaved areas not intended to be driven upon outside of the playing fields, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
5. Under turf or unpaved areas intended to be driven upon, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
6. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.16 GRADING

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

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

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

1. Turf or Unpaved Areas: Plus or minus 1 inch. Or as otherwise defined in the turf and grasses specification. Turf and grasses specification takes precedence.
2. Walks: Plus or minus ½ inch.
3. Pavements: Plus or minus 1/2 inch.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

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

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
1. Place base course material over subbase course under hot-mix asphalt pavement.
2. Shape subbase course and base course to required crown elevations and cross-slope grades.
3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
4. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

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

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course 6 inches or less in compacted thickness in a single layer.
   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.

3.19 FIELD QUALITY CONTROL

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

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

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.

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

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

3.20 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 Architect; reshape and recompact.

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

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

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 312000

SECTION 334100 - 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. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Drains.
4. Manholes.
5. Catch basins.

1.3 DELIVERY, STORAGE, AND HANDLING

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

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

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

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

1.4 PROJECT CONDITIONS

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

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

1. tongue-and-groove ends and gasketed joints with ASTM C 443, rubber gaskets
2. Class V, Wall B.

2.2 DRAINS

A. Cast-Iron Area Drains: See details

2.3 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and

designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.

6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

2.4 CONCRETE

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

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

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

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

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

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

   a. Invert Slope: 2 percent through manhole.

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

   a. Slope: 4 percent.

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

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.5 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
8. Steps: ASTM A 615/A 615M, deformed, 1/2-inch steel reinforcing rods encased in ASTM D 4101, PP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 48 inches.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

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

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

PART 3 - EXECUTION

3.1 EARTHWORK

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

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout

take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

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

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

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

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

F. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 24 inches minimum cover.
4. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
2. Join dissimilar pipe materials with nonpressure-type flexible couplings.

3.4 DRAIN INSTALLATION

A. Install type of drains in locations indicated.

1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
2. Use Heavy-Duty, top-loading classification drains in vehicle-traffic service areas.

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

3.5 MANHOLE INSTALLATION

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

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface CATCH BASIN INSTALLATION

E. Construct catch basins to sizes and shapes indicated.

F. Set frames and grates to elevations indicated.

3.6 CONCRETE PLACEMENT

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

3.7 FIELD QUALITY CONTROL

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

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

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

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

3.8 CLEANING

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

END OF SECTION 334100

SECTION 334700 – HDPE STORM DRAINAGE PIPING

PART 1 — GENERAL

1.1 SUMMARY

This specification applies to corrugated High-Density Polyethylene (HDPE) pipe with full circular cross-section and an integrally formed smooth interior. Nominal sizes are 4" – 60" diameter.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)

a. AASHTO HB -Section 30 – Thermoplastic Pipe

b. AASHTO M252 – Corrugated Polyethylene Drainage Pipe

c. AASHTO M294 – Corrugated Polyethylene Drainage Pipe 300- to 1500-mm Diameter

B. American Society for Testing and Materials (ASTM)

a. ASTM D2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

b. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

c. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe

d. ASTM F2306 – 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

1.3 DEFINITIONS

HDPE - High Density Polyethylene Pipe
NTPEP - National Transportation Product Evaluation Program

1.4 PERFORMANCE STANDARDS

Pipe and fittings shall meet the requirements of AASHTO M252 for diameters 4" through 10" (100 to 250mm), and AASHTO M294 or ASTM F2306 for diameters 12" through 60" (300 to 1500mm). Pipe shall be Type S (Smooth interior) unless otherwise specified. Pipe and resin producers shall be certified according to the NTPEP Third Party Certification Program. All corrugated polyethylene pipe shall contain the appropriate program mark, either an official label or permanent affixation prior to shipment.

1.5 DELIVERY, STORAGE AND HANDLING

All pipe and fittings shall be delivered to the site and unloaded with handling that conforms to the manufacturer's instructions for reasonable care. Pipe shall not be rolled or dragged over gravel or rock during handling. The Contractor shall take necessary precautions to ensure the method used in lifting or placing the pipe does not induce stress fatigue in the pipe.

PART 2 — PRODUCTS

2.1 CORRUGATED HIGH DENSITY POLYETHYLENE PIPE

1. Pipe and fittings shall meet the requirements of AASHTO M252 for diameters 4" through 10" (100 to 250mm), and AASHTO M294 or ASTM F2306 for diameters 12" through 60" (300 to 1500mm). Pipe shall be Type S (Smooth interior) unless otherwise specified. Pipe and resin producers shall be certified according to the NTPEP Third Party Certification Program. All corrugated polyethylene pipe shall contain the appropriate program mark, either an official label or permanent affixation prior to shipment.

2.1.1 Joint Performance

Pipe joints shall be water-tight joints must meet a 10.8 psi (74 kPa) laboratory test per ASTM D3212 and utilize a bell and spigot design with a gasket meeting ASTM F 477. A reinforced bell device shall be used on all water-tight pipe and fittings and this device shall be integrally bonded to the bell.

2.1.2 Fittings

Fittings used with the pipe shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be molded or fabricated and shall be furnished by the pipe manufacturer.

2.1.3 Installation

Pipe installation shall be in accordance with Section 3 of this specification and the product manufacturer's published installation guides.

PART 3 — EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling shall be as specified in this Section and with reference to Section 312000 EARTH MOVING.

3.2 IDENTIFICATION

For all stormwater and subsurface drainage piping, green warning tape should be placed six (6) inches directly over the top of pipe and at outside edges of underground structures.

3.3 PIPING INSPECTION

3.3.1 General

Piping, fittings, and drainage structures shall be inspected prior to installation and any defective or damaged product shall be replaced.

3.3.2 Corrugated HDPE Pipe and Fittings

A. Any pipe, fittings, or drainage structures with cuts, punctures, or other damage on the interior or exterior shall be rejected and replaced.

B. Any pipe, fittings or drainage structures with damaged ends or joints, which would prevent proper sealing of the joints, shall be rejected and replaced.

3.4 PIPING, FITTING, AND DRAINAGE STRUCTURE INSTALLATION

3.4.1 General

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

B. All products shall be inspected for defects and cracks before being lowered into the trench, piece by piece. Any defective, damaged or unsound pipe, fitting or drainage structure or any product that has had its grade disturbed after laying, shall be taken up and replaced. Pipe ends shall be protected to prevent earth or other material from entering the pipe during construction. The interior of the pipe shall be free from dirt, excess water and other foreign materials as the pipe laying progresses and left clean at the completion of the installation.

C. Install piping system 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. Follow product manufacturer's instructions for the use of lubricants, cements, and other special installation requirements.

D. Use Manholes or Catch Basins for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

E. 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.

3.4.2 Trench Excavation

3.4.2.1 Excavation

A. Excavate trenches to ensure that sides will be stable under all working conditions. Slope trench walls or provide supports in conformance with all local and national standards for safety. Open only as much trench as can be safely maintained by available equipment. Backfill all trenches as soon as practicable, but not later than the end of each working day.

B. Where trench walls are stable or supported, provide a width sufficient, but no greater than necessary, to ensure working room too properly and safely place and compact haunching and other embedment materials. The space between the pipe and trench wall must be wider than the compaction equipment used in the pipe zone. Minimum width shall be not less than the greater of either the pipe outside diameter plus 16 in. or the pipe outside diameter times 1.25, plus 12 in. In addition to safety considerations, trench width in unsupported, unstable soils will depend on the size and stiffness of the pipe, stiffness of the embedment and in-situ soil, and depth of cover.

Table 6-1
Minimum Trench Widths

Pipe Diameter, in. (mm)	Minimum Trench in. (m)
4 (100)	21 (0.5)
6 (150)	23 (0.6)
8 (200)	26 (0.7)
10 (250)	28 (0.7)
12 (300)	30 (0.8)
15 (375)	34 (0.9)
18 (450)	39 (1.0)
24 (600)	48 (1.2)
30 (750)	56 (1.4)
36 (900)	64 (1.6)
42 (1050)	72 (1.8)
48 (1200)	80 (2.0)
54 (1350)	88 (2.2)
60 (1500)	96 (2.4)

C. When supports such as trench sheeting, trench jacks, trench shields or boxes are used, ensure that support of the pipe and its embedment is maintained throughout installation. Ensure that sheeting is sufficiently tight to prevent washing out of the trench wall from

behind the sheeting. Provide tight support of trench walls below viaducts, existing utilities, or other obstructions that restrict driving of sheeting.

3.4.2.2 Dewatering

A. Do not lay or embed pipe fittings or drainage structures in standing or running water. At all times prevent runoff and surface water from entering the trench.

B. When water is present in the work area, dewater to maintain stability of in-situ and imported materials. Maintain water level below pipe bedding and foundation to provide a stable trench bottom. Use, as appropriate, sump pumps, well points, deep wells, geofabrics, perforated underdrains, or stone blankets of sufficient thickness to remove and control water in the trench. When excavating while depressing ground water, ensure the ground water is below the bottom of cut at all times to prevent washout from behind sheeting or sloughing of exposed trench walls. Maintain control of water in the trench before, during, and after pipe system installation and until embedment is installed and sufficient backfill has been placed to prevent flotation of the pipe, fitting, or drainage structures. To preclude loss of soil support, employ dewatering methods that minimize removal of fines and the creation of voids in in-situ materials.

3.4.2.3 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between exposed rock and the pipe of at least 12 inches (0.3m). Where Bell-and-Spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined under section 02300 Earthwork.

3.4.2.4 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe system, as determined by the Engineer, is encountered in the bottom of a trench, such material shall be removed to at least 24 inches below bottom of pipe and replaced to the proper grade with select granular material, compacted as directed by the engineer.

3.4.3 Bedding

A stable and uniform bedding shall be provided for the pipe and any protruding features of its joint and/or fittings. The middle of the bedding, equal to one-third of the pipe outside diameter, shall be loosely placed while the remainder shall be compacted to a minimum of 90% of maximum density per AASHTO T99, or as shown in the plans. Pipe bedding shall be a minimum of 4" – 6" in thickness. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.4.4 Placing Pipe

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Pipe shall not be laid in water, and the pipe shall not be laid when trench conditions or weather are unsuit-

able for such work. Diversion of drainage or dewatering of trenches shall be provided as directed by the engineer; see dewatering section.

3.4.5 Jointing

A. Joints shall be constructed as described herein and in accordance with manufacturer's installation instructions.

B. All Bell-and-Spigot pipe joints shall be thoroughly cleaned. Joint lubricant, supplied by the manufacturer, shall be applied evenly to entire interior of bell and gasket on spigot prior to assembly.

3.4.6 Backfilling

3.4.6.1 General

Backfill material, placement, and compaction shall be constructed in accordance with the specifications herein and the product manufacturer's published installation guides.

3.4.6.2 Backfilling Pipe in Trenches

After the pipe and pipe system have been properly bedded, selected material from excavation or borrow and conforming to ASTM D2321 Class I, II, or III material, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layer depths to ensure minimum compaction density is obtained evenly throughout the backfill material. The backfill shall be brought up evenly on both sides of pipe and pipe system for the full length of pipe. Fill shall be thoroughly stepped in place, or knifed in place prior to compaction. The fill shall be compacted under the haunches of the pipe, or . Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 6 inches above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in loose layers not exceeding 8 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below.

3.4.6.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

3.5 TESTING AND INSPECTION

3.5.1.1 General

The Engineer shall inspect the drainage piping and boxes and institute any of the following testing and additional inspection measures as he deems necessary to insure that the systems are installed properly. Following the placement and densification of backfill and prior to the placing of permanent pavement, all pipe shall be cleaned and a CCTV inspection shall be performed, unless otherwise specified by the engineer or in the special provisions. Deflection and leakage tests for storm drain shall be required at the discretion of the Engineer when CCTV inspection indicates that there is a probability for leaks or when there are anomalies in the pipe that would indicate deflection.

3.5.1.2 Television Inspection

A closed circuit television (CCTV) inspection may be conducted prior to new storm drain pipeline acceptance. The CCTV inspection shall document and verify the following:

1. The overall condition of the host pipeline,
2. line and grade,
3. cleanliness, and
4. that post-installation per the Contract has taken place.

The CCTV inspection shall be documented in an electronic report and digital video recording as specified herein. It is the Contractor's responsibility to verify that the indexing, report and video documentation format is in the latest, most up-to-date format required by the Agency. Cleaning of storm drains shall be performed prior to the television inspection in a separate operation. The Contractor shall perform a television inspection on all storm drains between manholes and all storm drain inlet laterals.

3.5.1.3 Tests for Deflection

When visual inspection or inspection by CCTV indicates a potential for excessive deflection, the following test method shall be used:

A deflection test shall be made by the Contractor upon completion and acceptance of all backfill operations and prior to placement of the finished surface, if any. The deflection testing shall be witnessed by the Inspector and shall be conducted by the Contractor at the Contractor's expense. Deflection shall be tested for excessive vertical deflection using a pre-sized, rigid mandrel or "Go-No-Go" device approved by the Agency. The mandrel size shall be clearly labeled and shall be sized so as to provide a diameter of at least 92.5% of the "Base Internal Diameter" per ASTM F2306 and AASHTO M294. Elbow and wye type fittings should not be mandreled.

3.6 END OF SECTION 334700

SECTION 02525 CAST-IN-PLACE CURBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the installation of concrete field curbing as shown on the Drawings, or as specified herein.

B. The materials and methods specified herein are directly intended for placement of "new" concrete curbing.

1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section.

1. 02200 - Earthwork
2. 02830 - Chain Link Fencing and Gates

1.3 QUALITY ASSURANCE

1.4 REFERENCE STANDARDS:

A. The latest edition of the following standards, as referenced herein, shall be applicable.

1. American Society of Testing and Materials (ASTM).
2. American Concrete Institute. (ACI).

B. The Owner shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of materials with the specifications, if at any time during the Work, materials appear unsuitable in the opinion of the Owner's Representative.

1.5 SUBMITTALS

A. Concrete:

1. The Contractor shall furnish the name and location of the concrete supplier.
2. Submit the design mix for each class of concrete prior to use in the Work.

B. Product Data:

1. Submit manufacturer's catalog cuts, specifications, and installation instructions.

C. Test Results:

1. The testing laboratory shall submit written reports of all tests, investigations, and recommendations to the Contractor and Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete:

1. All cast-in-place concrete shall be ready mixed concrete meeting the following criteria:

   a. 28 day compressive strength-4000 psi
   b. Air entrainment-4% to 8%
   c. Slump-2" to 4"

2. Concrete shall be proportioned using methods 1 or 2 as outlined in ACI-301.

3. The approved mix design shall be used throughout this project unless changes are ordered or approved by the Owner's Representative.

B. Premoulded Expansion Joint Filler:

1. Concrete curbing shall be provided with a 1/2" premoulded expansion joint filler conforming to ASTM D 1751.

2. The premoulded expansion joint filler shall be "pre-cut" to match the concrete curbing cross-sectioned dimensions as detailed on the Drawings.

C. Reinforcement: Install a #4 bar in the middle of the curb for the full length of the installation. Overlap and tie at ends and starts of bars. Bend bar around fence posts where necessary.

D. Curing Materials:

1. Impervious Sheeting: ASTM C171.

2. Liquid Membrane Curing Compound: ASTM C309, compound shall be free of paraffin or petroleum.

3. "Kure-N-Seal 0800" by Sonneborn, "Cure & Seal" by Symons, or equal.

E. Sealants:

1. Joint Sealers: ASTM D 1850.

F. Forms:

1. Curb forms shall be of wood or steel, straight, and of sufficient strength to resist springing during depositing and consolidating the concrete. The outside forms shall have a height equal to the full depth of the curb. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form.

2. Straight forms of wood shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits, or other defects. Wood forms shall have a nominal length of 10 feet, with a minimum of three stakes per form, at maximum spacing of 4 feet. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness.

3. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self- aligning. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers. Forms shall have a nominal length of 10 feet, with minimum of two welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips, designed for use with steel forms.

4. Rigid forms shall be provided for curb returns, except that benders of thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form

with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together.

PART 3 - EXECUTION

3.1 INSPECTION

A. The Contractor shall notify the Owner's representative 24 hours before placing concrete in order to give the representative an opportunity to inspect the formwork and related items prior to placement of the concrete.

B. Delivery tickets shall show the amount of cement, brand, and amount of all admixtures, in addition to information required by ASTM C94, Section 14. Water added on the job shall be approved and the amount noted on the delivery ticket and initialed by the Contractor.

3.2 SUBBASE PREPARATION

A. Concrete curbing shall be constructed on a compacted granular subbase as shown on the Drawings.

B. The subbase shall be maintained in a smooth, compacted condition in conformity with the required section and established grade, until the concrete is placed.

C. The subbase shall be in a moist condition when concrete is placed.

D. The subbase shall be prepared and protected so as to produce a subbase free from frost when the concrete is deposited.

3.3 FORMWORK

A. Earth cuts may **not** be used as forms for vertical surfaces.

B. All forms shall be built mortar tight and of materials sufficient in strength to hold concrete without bulging between supports. Forms shall be maintained to eliminate the formation of joints due to shrinkage of the forms. Concrete, misshapen by bulges or deformations caused by inadequate forms, shall be removed or corrected as ordered by the Owners representative. All replacements or corrections shall be made at the Contractor's expense.

C. All surfaces of wooden forms that will be in contact with exposed concrete shall be thoroughly treated with an approved lacquer in the procedure recommended by the manufacturer. Forms so treated shall be protected from being damaged or dirtied prior to placing of the concrete.

D. Metal forms shall be treated with an approved form lacquer or may be treated with an approved form oil. The metal used for forms shall be of sufficient thickness to remain true to shape. All bolt and rivet heads shall be designed to hold the forms rigidly together and to allow removal, without injury to the concrete. Metal forms which do not have smooth surfaces, correct alignment and clean surfaces shall not be used.

E. The forms on the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. Forms back of curb shall remain in place until the face and top of the curb have been finished as specified for concrete finishing.

3.4 CONCRETE PLACEMENT AND FINISHING

A. Preparation:

1. Set approved forms true to line and grade. If curbs abut existing pavement, locate construction joints opposite existing pavement joints as directed.

2. Provide cut to size joint filler between 50 foot sections and where curb abuts existing concrete paving and fixed structures or appurtenances. Protect the top edge of the joint filler during concrete placement with a temporary cap and remove after concrete has been placed.

3. Expansion joints shall be constructed at right angles to the line of the curb.

B. Concrete Placement:

1. Concrete shall be placed in layers not to exceed 6 inches.

2. Concrete shall be thoroughly consolidated by tamping and spading or with approved mechanical vibrators, eliminating all air pockets, stone pockets and honeycombing.

3. Place concrete in accordance with ACI 301 unless otherwise specified herein.

4. Cold Weather Concreting: Comply with ACI 306 for placement at temperatures of, or expected to be, below 40°F.

5. Hot Weather Concreting: Comply with ACI 305 for placement at temperatures of, or expected to be, above 90°F.

C. Concrete Finishing:

1. The top of the curb shall be rounded with an edging tool to a radius of 1/2-inch and the surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes.

2. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The surface, while still wet, shall be brushed in the same manner as the curb top. Except at grade changes or curbs, finished surfaces shall not vary, from the testing edge of 10-foot straightedge, more than 1/8 inch for gutter and entrance and 1/4 inch from top and face of curb. Irregularities exceeding the above shall be satisfactorily corrected.

3. Visible surfaces and edges of finished curb shall be free of blemishes and form and tool marks, and shall be uniform in color, shape, and appearance.

4. No plastering shall be permitted.

5. Curbing forms shall be left in place at least twenty-four (24) hours, or until the concrete has sufficiently set.

6. Curbing being used to affix track surface shall have a rough finish as recommended by the track surfacing manufacturer/contractor.

3.5 CURING

A. Impervious Sheeting Method:

1. The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material. Sheets shall be laid directly on the concrete surface with the light colored side up and overlapped 12 inches when a continuous sheet is not used.

2. The curing medium shall not be less than 18 inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or by placing a bank of moist earth along edges and laps in the sheets.

3. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing. The curing medium shall remain on the concrete surface to be cured for not less than 7 days.

- or -

B. Membrane Curing Method:

1. The entire exposed surface shall be covered with a membrane forming curing compound.

2. Curing compound shall be applied in two (2) coats by hand operated pressure sprayers at a coverage of approximately 200 square feet per gallon for both coats, unless otherwise approved by the Engineer based upon manufacturer's data.

3. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. Apply an additional coat to all surfaces showing discontinuity, pinholes or other defects.

4. Concrete surfaces that are subjected to heavy rainfall within 3 hours after curing compound has been applied shall be resprayed by the above method and at the above coverage at no additional cost to the Owner.

5. Expansion-joint openings shall be sealed at the top by inserting moistened paper or fiber rope or covering with strips of waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint.

6. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action that might disrupt the continuity of the membrane. Any area covered with curing compound and damaged by subsequent construction operations within the 7-day curing period shall be resprayed as specified above at no additional expense to the Owner.

3.6 JOINTS

A. Saw cut or hand tool joints into the top of the curb every 10 feet along the full length of the installation.

B. Install expansion joints every 50 feet along the length of the curb installation. Install expansion joint at curb when abutting a concrete sidewalk or vertical site feature.

3.7 SEALING JOINTS

A. The approximately horizontal sections of expansion joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Sealing shall be done so that the material will not be spilled on exposed surfaces of the concrete.

B. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50°F. at the time of application of joint-sealing materials. Excess material on exposed surfaces of the concrete shall be removed immediately and exposed concrete surfaces cleaned.

3.8 BACKFILLING AND RESTORATION

A. After curing, debris shall be removed, and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

B. All lawns, pavements, driveways, shrubs, or other improvements affected by curbing placement shall be restored to their original condition.

3.9 PROTECTION

A. The Contractor shall protect the curbing and keep it in alignment and "first class" condition until the completion of the Contract. Any curbing, which is damaged prior to final acceptance of the Work, shall be removed and replaced at the Contractor's expense.

END OF SECTION 02525

SECTION 02830 CHAIN LINK FENCE AND GATES

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 and should be obtained via the General Contractor and Owner.

1.2 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the installation of chain link fence and gates, as shown on the Drawings and as specified herein.

B. All chain link fence shall be thermally-bonded polyvinyl chloride (PVC), plastic resin finish over galvanized steel wire.

C. All gates and gate hardware shall be powder coated.

1.3 RELATED WORK

A. 02910 – Natural Grass Playing Field System

B. 02525 – Cast in Place Concrete Curbing

1.4 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence and related gates as a complete system produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

C. Comply with ASTM A-53 for requirements of Schedule 40 piping.

D. Height of fence shall be measured from the top of concrete footing to the top of post.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails and fittings
2. Chain link fabric, reinforcements, and attachments.
3. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections details of post anchorages, attachment, bracing, and other required installation and operational clearances.

C. Samples for Verification: for each type of chain-link fence and gate indicated.

1. PVC coated steel wire (for fabric) in 6-inch (150-mm) lengths on shapes for posts, rails, wires and gate framing.

2. Two-stage powder coat finish, in 6-inch (150-mm) lengths on shapes for gate posts only.

D. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer.

1. Strength test results for framing according to ASTM F 1043.

E. Qualification Data: For installer

F. Field quality-control test reports.

G. Maintenance Data: For the following to include in maintenance manuals:

1. Polymer Finishes

2. Galvanized Finishes

3. Powder Coat Finishes

1.6 Quality Assurance

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

1.7 Project Conditions

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 STEEL FRAME WORK

A. Unless noted otherwise on drawings, minimum Nominal Framework Sizes shall be the following:

Top Rail 1-1/2 inch

Fence Height	Line Posts	End, Corner & Pull Posts	Mid Bottom Rails & Braces	Gate Frames	*Gate Posts	Concrete Foundation Dia. Diameters Line Posts	Concrete Foundation Dia. Corner/End Pull & Gate Posts	Depth
8'- 0"	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'

Schedule 40 S/L Pipe Table		
Nominal Size (In.)	Actual Outside Diameter (In.)	Weight *(lb/ft)
1	1.315	1.67
1-1/4	1.660	2.27
1-1/2	1.900	2.71

50,000 psi Hot Dipped Aluminized Steel Tubing		
Nominal Size (In.)	Actual Outside Diameter (In.)	Weight *(lb/ft)
1	1.315	
1-1/4	1.660	1.83
1-1/2	1.900	2.28

2	2.375	3.65
2-1/2	2.875	5.79
3	3.500	7.58
3-1/2	4.000	9.11

2	2.375	3.12
2-1/2	2.875	4.64
3	3.500	5.71
3-1/2	4.000	6.56

2.2 CHAIN LINK FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights for fence heights up to 10 feet measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Polymer-coated wire

a. 0.148 inch (9 gauge) diameter for fences and gates

B. Mesh Size:

1. 2 inches for fences

C. Selvages: Knuckled top and bottom.

2.3 SWING GATE FRAMES

A. Assemble gate frames with fully coped welds as shown on the Drawings or on Shop Drawings approved by the Engineer.

1. All ferrous metal components shall be blast cleaned to and SSPC-6 commercial blast clean.

2.4 GATE HARDWARE

A. Hinges: Non-lift-off type, offset to permit 180 degree swing, and of suitable size and weight to support gate. Provide 1-1/2 pair of hinges for each leaf.

B. Latch: Provide plunger bar type complete with flush plate set in concrete for all double gates and single gates. Padlock eye shall be an integral part of latch construction.

1. Provide plunger bar complete with flush plate set in concrete on each gate leaf

2. Provide flush plate set in concrete for both the full open position and full closed position

C. Keeper for Vehicle Gates: Provide keeper which automatically engages the gate leaf and holds it in open position until manually released

2.5 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Post Tops: Steel, wrought iron, or malleable iron

B. Stretcher Bars: One piece equal to full height of fabric, minimum cross-section 3/16 inch x 3/4 inch.

C. Metal Bands (for stretcher bars): Steel, wrought iron, or malleable iron, to secure stretcher bars to end, corner, pull and gate posts.

D. Wire Ties:

1. For tying fabric to line posts, rails and braces: 9 gauge steel wire.

2. For tying fabric to tension wire: 11 gauge steel hog rings.

E. Truss Rods: 3/8 inch diameter.

F. Tension Wire: 7 gauge coiled spring steel wire.

G. Angle Beams, I Beams and Steel Shapes: ASTM A-36.

H. Bolts and Nuts: ASTM A-307, Grade A.

2.6 FINISHES

A. Steel Framework:

1. PVC Coated Pipe

a. Metallic coating: Weight of Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating, ASTM F 1345, Type III, Class 2, 1.0 OZ./SQ. ft. (305 g/sq. m).

b. Thermally-bonded polyvinyl chloride (PVC), plastic resin finish, ASTM F 668, Class 2, not less than 10 mils (.010") thick over metallic-coated steel wire.

c. Color: Black, complying with ASTM F 934.

B. Chain Link Fabric:

1. PVC Coated Chain Link Fabric:

a. Metallic coating: Weight of Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating, ASTM F 1345, Type III, Class 2, 1.0 OZ./SQ. ft. (305 g/sq. m).

b. Thermally-bonded polyvinyl chloride (PVC), plastic resin finish, ASTM F 668, Class 2, not less than 10 mils (.010") thick over metallic-coated steel wire.

c. Color: Black, complying with ASTM F 934.

d. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.

C. Gates:

1. Colored Powder Coated Framework

a. Powder for coating shall be a polyester-based thermal setting resin.

b. Powder coat system shall meet or exceed the following test requirements:

1) Direct Impact Resistance: ASTM D 2794-93, up to 160 in.-lbs.

2) Flexibility: ASTM D 522-93, Method B, equal to or less than a ¼ inch mandrel

3) Pencil Hardness: ASTM D 3363-93a, HB-2H

4) Crosshatch Adhesion: ASTM D 3359-97, Method B, 5B

5) Salt Spray Resistance: ASTM B 117, plus 1,000 hours

6) Humidity Resistance: ASTM D 2247, plus 1,000 hours

a. Color: Black to match PVC Coated Chain Link Fabric.

2. Chain Link Fabric on gate same as finish same for fencing

D. Fence and Gate Hardware, Miscellaneous Materials, Accessories:

1. Fence Hardware, Materials and Accessories:

a. Per fence finish requirements

2. Gate Hardware, Materials and Accessories:

a. Per gate finish requirements

3. Angle Beams, I Beams, and Steel Shapes: Galvanized in accordance with ASTM A-123, 2.0 oz zinc per sq. ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work and other conditions affecting performance.

1. Coordinate footing installation timing with final installation of playing field materials and sidewalk so as not to contaminate, destroy or displace the playing field materials.

2. If unsatisfactory conditions are present, proceed with installation only after they have been corrected.

3.2 PREPARATION

A. Coordinate fence and gate installation with completion of finished grading and installation of adjacent finish field materials.

B. Stake locations of fence lines, gates and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, irrigation system, underground structures, benchmarks and property monuments.

3.3 INSTALLATION

A. Space posts equidistant in the fence line with a maximum of 10 feet on center or as shown on drawings.

B. Footings: Excavate holes as indicated for fence and gate posts. Excavate footings to depths and widths as noted in Specifications or on drawings. Install gravel drainage material in bottom of hole as shown on the drawings

C. Setting Posts and Footings at Concrete Areas: Set posts in center of hole. Embed post so that bottom of post is flush with the bottom of concrete footing and in gravel drainage layer. Fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish elevation on top of footing to be below the sidewalk thickness depth as shown on drawings so that the sidewalk is poured/installed over the top of the footing. Protect poles prior to pouring footing and throughout installation of sidewalk to prevent splash onto post. Do not attach fabric to posts until concrete has cured a minimum of 7 days.

D. Locate corner posts at corners and at changes in direction. Use pull posts at all abrupt changes in grade and at intervals no greater than 500 feet. On runs over 500 feet, space pull posts evenly between corner or end posts. On long curves, space pull posts so that the strain of the fence will

not bend the line posts.

E. Install top rail continuously through post caps or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.

F. Install intermediate and bottom rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

G. Diagonally brace corner posts, pull posts, and terminal posts to adjacent line posts with truss rods and turnbuckles.

H. Attach fabric to security side of fence. Bottom of fabric to be set on finished grade of curb, track or playing field except when indicated otherwise. Top of fabric to be flush with top rail. Thread stretcher bars through fabric using one bar for each gate and end post and two for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches oc. Fasten fabric to steel framework with wire ties spaced 12 inches oc for line posts and 24 inches oc for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

I. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and score excess threads.

1. Secure post tops, extension arms, and caps with one-way cadmium plated steel screws.

J. Install gates plumb and level and adjust for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary. Attach fabric as for fencing. Install ground-set items in concrete as shown on the drawings.

K. Touch Up: Small nicks or other blemishes shall be touched up with paint materials suitable for and matching the finish of the damaged material. Severely damaged fencing /gates deemed as unacceptable at the sole discretion of the Owner or its representatives shall be replaced at the contractor's expense.

END OF SECTION 02830

SECTION 02910 NATURAL GRASS PLAYING FIELD SYSTEM

PART 1 - GENERAL

1.1 INFORMATION PROVIDED FROM THE OWNER

A. The Owner shall make available:

1. Subsurface engineering analysis for the Playing Field System.
2. Irrigation system water and pressure on the site has been reported by the Owner at 150 GPM @ 100 PSI at the main proposed point of connection for this Contract.
3. Irrigation system water and pressure on the site has been reported by the Owner @ 85 PSI static at the fire hydrant which supplies the backup point of connection for this Contract.
4. An existing pump, backflow preventer and vault for the irrigation system shall remain in place for the main proposed source connection and remain connected to the new playing field irrigation system.
5. A new pump is proposed for the backup irrigation system connection location. Refer to Specification Section 02950 Playing Field Irrigation Booster Pump
6. A Topological Survey of site including contours and spot elevations, existing structures and utilities is included with the Documents as part of the Civil drawings
7. Contractor shall use existing Rain Bird EXP-LXD decoder controller and relocate to location on plan.

1.2 WORK INCLUDED

A. Provide equipment and materials, and do work necessary to construct the natural turf field playing system, as indicated on the Drawings and as specified. Work shall include but shall not be limited to:

1. Earthwork Requirements to Achieve Subgrade (Refer to Civil drawings and specifications) (This could be performed by separate Contractor and not Playing Field Contractor)
   a. Demolition
   b. Excavation, trenching, grading, backfilling, compaction to achieve subgrade.
   c. Laser grading
   d. Disposal of spoil materials.
   e. Acceptance and certification of Sub-grade elevations and compaction
2. Earthwork Requirements to Achieve Finish Subgrade
   a. Review and verify work performed on Subgrade if different contractor
   b. Laser grading
   c. Disposal of spoil materials.
   d. Grade elevation certification of finish sub-grade
3. Drainage System Requirements
   a. Filter Fabric
   b. Gravel drainage blanket material
   c. Drain pipe, collector pipe, laterals and fittings
   d. Clean outs and inline structures/manholes
   e. Grade elevation certification of gravel blanket installation
4. Sports Irrigation System Requirements
   a. System Piping, heads, valves, controllers and appurtenances

b. Automatic controls
c. Existing Booster pump
1) Verification by Contractor of working order, pressure boost, etc.
d. New Booster Pump (Section 02950)

5. Playing Field Requirements
a. Soil materials and amendments
b. Blended rootzone materials and amendments
c. Laser grading
d. Grass Installation (by Owner)
e. Grow-In Maintenance (by Owner)
f. Finish Grade survey certification of rootzone mix elevations

1.3 WORK BY OWNER

A. The Owner shall purchase, install and perform the grow-in and maintenance of the sod with the Owner's own forces. Owner shall purchase and provide all fertilization applications.

B. The Contractor shall provide the approved finish grade of the rootzone prior to Owner's installation.

C. The Contractor shall coordinate construction sequencing and timing with the Owner so the work remains on schedule.

1.4 RELATED WORK

A. Examine the Contract Documents for requirements that affect and or are related to the work of this section.

1. 02200 – Earthwork
2. 02511 - Concrete Sidewalk
3. 02525 - Cast In Place Concrete Curb
4. 02831 - Chain Link Fencing and Gates
5. 02950 – Playing Field Irrigation Booster Pump
6. 02975 - Outdoor Sports Equipment
7. 16522 - Sports Field Lighting System

1.5 REFERENCES STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Association of State Highway and Transportation Officials (AASHTO):
a. T 89 - Determining the Liquid Limit of Soils
b. T 90 - Determining the Plastic Limit and Plasticity Index of Soils
2. Occupational Safety and Health Administration (OSHA)
3. Department of Transportation Standard Specifications
4. American Society for Testing and Materials (ASTM):
a. D 3776 - Mass Per Unit Area (Weight) of Woven Fabric
b. D 3786 - Hydraulic Bursting Strength of Knitted Goods and Non-Woven Fabrics: Diaphragm Bursting Strength Tester Method,
c. D 4491 - Water Permeability of Geotextiles by Permitivity
d. D 4533 - Trapezoid Tearing Strength of Geotextiles
e. D 4632 - Breaking Load and Elongation of Geotextiles (Grab Method)
f. D 4833 - Index Puncture Resistance of Geotextiles, Geomembranes, & Related Products

g. F 405 - Corrugated Polyethylene (PE) Tubing and Fittings
h. F 449 - Subsurface Installation for Agricultural Drainage or Water Table Control
i. F 667 - 8, 10, 12 and 15-inch Corrugated Polyethylene Tubing and Fittings
j. C 136 Sieve Analysis of Fine and Course Aggregates
k. D 422 Particle-Size Analysis of Soils
l. E 11 Wire-Cloth Sieve for Testing Purpose
m. D 5268 Standard Specification for Topsoil Used for Landscaping Purposes

5. Irrigation System Standards: Comply with all applicable provisions of the latest edition of the following codes:
   a. All local and State codes.
   b. National Fire Protection Association, (NFPA): National Electrical code.
   c. American Society For Testing And Materials, (ASTM).
   d. National Sanitation Foundation, (NSF).
   e. The Irrigation Association, (IA).
6. Current NCAA Football Rules and Interpretations

1.6 DEFINITIONS

A. Excavation: Removal of material encountered to subgrade elevations indicated and subsequent disposal or placement of materials removed.

B. Unauthorized Excavation: Inadvertent or purposely removing materials beyond indicated subgrade elevations or dimensions without specific direction of the Architect. Unauthorized excavation, as well as remedial work resulting from unauthorized excavation directed by Architect shall be at Contractor's expense.
   1. Unauthorized excavation, including disposition of additional excavated materials and other work resulting from slides, cave-ins or remedial work shall be at Contractor's expense.

C. Additional Excavation: When excavation has reached required subgrade elevations, the Architect the Architect will be notified and will make an observation of conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, excavation shall be continued until suitable bearing materials are encountered and excavated material shall be replaced as directed by the Architect.
   1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below proposed playing field drainage or soil materials.

E. Finish sub-grade: Final elevations and grading modifications to be performed in this Contract on the sub-grade elevations. Playing field system to be installed above finish sub-grade.

F. Gravel Drainage Blanket material: Approved stone material used in drainage trenches surrounding perforated drainage piping and on top of finish playing field sub-grade. This material should bridge with the rootzone mix as described herein.

G. Rootzone mix: Blended mix containing processed sand, organics and or other amendments as described in the Contract Documents. Final mix as approved through a submittal and laboratory testing process.

H. Baseline Specifications – This refers to materials and blends approved by the Testing Agent for gravels and rootzone mix that will be used as a benchmark or baseline during the remainder of quality control testing during construction.

I. Certified grade elevations: As performed by a State Licensed land surveyor. Document to be signed, sealed and submitted for review and approval prior to next layer of work.

J. Sports Irrigation System: Refers exclusively to the irrigation system designed and to be installed in the playing field area. When noted, this may also include the mainline piping from the site water source to the playing field. When applicable, this may also include a booster pump for the playing field system.

1.7 SUBMITTALS

A. Manufacturer's Product Data: Submit manufacturer's specifications and installation instructions for all products in the playing field system, including certifications and other data as may be required to show compliance with the Contract Documents. Included but not limited to the following; drainage pipe materials, trench drains, geotextile fabric, irrigation system heads, valves, boxes, fittings, wire connectors, pipe and appurtenances.

B. Test reports: Field reports as indicated in PART 3 of this specification.

C. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System.

D. Material Certifications: Manufacturer's or vendor's certified analysis for:

1. Soil amendments
2. Sod – Owner representative shall provide a sample of the sod product to the Contractor showing soil and thatch content and location of the sod farm. Contractor shall share any concerns in writing if they occur in regards to the submittal.

E. Product Data: Submit manufacturer's product data and samples as noted for the following:

1. Geotextile fabric – 3 samples approximately 7" x 11".
2. Trench drains and grates – 3 samples of grate only at 6 inches in length.
3. Drainage pipe material and fittings
4. Drainage Structures
5. Irrigation system including heads, valves, boxes, fittings, wire connectors, pipe, pump, and appurtenances

F. Gravel Drainage Materials

1. Gravel Blanket / Trench drainage gravel: Minimum of one gallon sample of each source material for testing
2. Submitted and tested simultaneously with rootzone materials

G. Rootzone Material Samples:

1. Submit samples of each of the following materials to establish baseline specifications regarding ratios performed and recommendations made by Contractor's Testing Agent prior to bid and included in the Contract Documents. Testing Agent shall perform these tests after the bid throughout construction.
   a. Processed Sand Material: One-gallon sample of each potential sand source for testing.
   b. Organic Amendment: One – gallon sample of each amendment proposed for blending

H. Live Material Samples:

1. Owner to Submit prior to construction to the lab.
2. Sod: Owner to submit a one square foot sample of the proposed sod with minimum of 3/4 - inch of soil below the thatch layer. Ship in an overnight express package to reduce spoilage. Test rest results of soil composition to be made available to Owner, Contractor and Owner's Engineer/Architect. Owner to bear testing costs.

I. Irrigation Source Verification: Contractor to verify in writing the static pressure and gpm at water connection point for the irrigation system within one week of mobilizing on the site.

J. Shop Drawings: Submit shop drawings for the goal posts, footings and sleeves.

K. Irrigation Record Drawings:

1. The Contractor shall provide and keep up to date a complete set of "As Built" record set of prints which shall be corrected as the work progresses, and show every change from the original drawings and specifications and the actual "As Built" dimensions and kinds of equipment. This set of drawings shall be kept on site and shall be used only as a record set.

2. These drawings shall also serve as progress sheets, and the Contractor shall make neat and legible annotations thereon as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for inspection and shall be kept in the Contractor's mobile office on location at all times for inspection.

3. Record drawings shall show the location of all sprinklers, valve boxes, valve markers, controllers, pipe, wire trenches, multiple wire splice boxes, sensors and all pertinent material buried and not visible to the eye. Record drawings shall indicate dimensions from two permanent points of easily identifiable nature, if possible, such as sprinkler heads, permanent markers, concrete pads, etc.

a. Contractor shall install above the controller a laminated half-size copy of the as-built irrigation plan mounted under a 1/4-inch piece of Plexiglas.

L. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System.

M. Schedule: Work schedule for all work described in these documents. This schedule shall be regularly updated and submitted at project meetings as progress continues throughout ultimate completion.

N. Playing Field Contractor Reference List

1. Up to date contact information

2. Responsibility/scope of work for project

3. Similar projects – full fields

O. Playing Field Contractor Job Superintendent Resume

1. Similar projects and references if different that Contractor reference list

P. Subcontractor List: Contractor to submit list of key subcontractors for the project. Briefly describe the role of each as well as their experience with similar types of facilities such as being constructed in these Documents. This list should include but is not limited to:

1. Rootzone Blender

2. Fence installer

3. Irrigation installer

Q. If subgrade/liner installation is performed by a separate subcontractor, the Playing Field installer must accept Subgrade installation performed by others

1. Site Acceptance Statements:

a. Prior to beginning Work at playing field area: Submit a written statement signed by the General Contractor noting that the site has been reviewed and that documents showing compaction and certified elevations/planarity by the previous contract have been reviewed. Note all discrepancies, conflicts or other issues. If none are found this should be noted in the statement. Upon acceptance, Work shall begin with the assurance that all work shall be warranted for the period as specified in these Documents.

R. Photographic Documentation – Contractor to frequently provide Owner and its representative's digital pictures of in progress work documenting all layers and levels of work described in this Specification section.

1.8 QUALITY ASSURANCE

A. The complete Field System shall be installed by a firm meeting the following criteria:

1. A minimum of three (3) successful fields in the last five (5) years on projects comparable to this Scope of Work which includes but is not limited to

a. Certified Field Builder
b. Laser grading (not GPS) experience for subgrade, gravel and finished surface meeting the requirements for finish grade required in this Contract
c. Sports Field irrigation system installation
d. Blended rootzone material installation
e. Experience with testing protocols for gravels and rootzone mixes.

2. Firms must have been in business under the same Ownership for at least three years, and shall have been installing similar sports fields for that entire period.

B. Contractor shall be a Certified Field Builder with the American Sports Builders Association.

C. All playing field system installation shall be directed by one (1) Contractor with proven experience in this type of work.

D. The Playing Field Contractor shall be responsible for the protection of the field surface after it's installation through Project Completion.

E. Grade Certification: Certified surveys by a State licensed land surveyor shall be made at the top of the in-place finished sub-grade, the top of the finished gravel blanket layer and the top of the finished rootzone mix installation for conformance to specified final elevations. GPS survey laser equipment shall **not** be used for finish elevation determination unless approved in writing by the Owner and its representatives. Equipment mounted laser and hub or similar are required for playing field grading operations.

1.9 QUALITY CONTROL

A. Testing Agents

1. Sitework and Materials Testing Agents:

a. The Owner shall hire testing agents for items required by the Work including but not limited to compaction, concrete, geotechnical. The Playing Field Contractor shall notify the Owner regarding timing, scheduling and use of these agents.
b. The Engineer shall recommend for owner approval or rejection based on results and recommendations of the tests.

2. Playing Field Testing Agent:

a. The Playing Field Contractor shall hire an independent, A2LA accredited and insured Testing Agent to perform testing of the gravel and rootzone material components
b. The Playing Field Testing Agent is to report/submit test results as they are known and simultaneously to the Playing Field Contractor, the Owner and its representatives.
c. Testing Agent shall make recommendations and approve final rootzone and gravel materials for the baseline specification as well as final materials to be installed
d. Suggested Potential Agents for Contractor Consideration
1) Tifton Physical Soil Testing Laboratory, Powell Gaines, (229) 382-7292

2) Turf Diagnostic and Design, Sam Ferro, (913) 723-3700
3) Hummel & Co. Inc., Norm Hummel, (607) 387-5694
4) Approved equal.

B. Gravel and Rootzone Mix Materials Sampling, Testing and Approval Procedures

1. **Pre-bid** Optional Testing and Sampling:

a. Bidders are encouraged to:
1) Pre-test gravel and processed sand materials with the Playing Field Testing Agent listed in this specification prior to submitting a bid. This does not guarantee that the materials or source will be approved for final construction.
2) Pre-qualify any material deviating from that specified.
3) All costs associated with pre-bid testing shall be borne by the bidder.
4) Refer to sampling procedure in following sections.

2. **After Bid Award** and Prior to construction:

a. General
1) Contractor to submit gravel and rootzone materials simultaneously to Playing Field Testing Agent.
2) All shipping and testing costs are borne by the Contractor.
3) Submit one gallon samples, clearly marked and labeled to the Playing Field Testing Agent for each material to be tested.
4) Rootzone Materials and gravel materials shall be tested and analyzed simultaneously.
5) Test results and recommendations shall be made by the Testing Agent and distributed simultaneously to the Contractor, Owner and its representatives.

b. Gravel Drainage Material: Simultaneously submit one-gallon samples of each gravel to be used for testing. Refer to "2.3 Gravel Drainage Materials and Protocol Reporting" later in this Specification for the following gravels and Reporting Protocols:
1) Gravel trench drainage material (if different than gravel blanket material)
2) Gravel Blanket drainage material

c. Establishing the Gravel Baseline Specification
1) Approval by the Testing Agent of the submitted gravel materials shall serve as the Baseline gravel materials specification for the remainder of the project.

d. Rootzone Materials: Provide one-gallon samples of each of the following materials to be used for testing and approval by the Testing Agent. Refer to "2.4 Rootzone Material Components and Protocol Reporting" later in this Specification for the requirements of the following materials and Reporting Protocols:
1) Processed Sand
2) Organic amendment(s)

e. Verifying and establishing the Rootzone Baseline Specification
1) Approval by the Testing Agent of the submitted rootzone materials and blend shall serve as the Baseline rootzone mix specification for the remainder of the project.

f. Suggested Sampling Collection Procedures from material stockpiles:
1) Make a sample collection tube sized so that the material can be gained 4-5 feet deep into the pile.

2) Push this pipe into the stockpile at 6-8 random locations depending on the size of the stockpile. The material collected at each location shall be placed into a clean bucket. Do this for each stockpile or batch.

3) Thoroughly mix the samples in the bucket and fill a one gallon labeled zip lock freezer bag with material from the bucket. Repeat the procedure for each stockpile or batch.

4) Clearly note locations of composite samples and what stockpile it corresponds to. Include a transmittal letter to identify the source of samples and sample location. Do not use labels to identify samples. Use a waterproof marker and double bag the sample(s). Send the sample(s) to the Playing Field Testing Agent. Contractor to coordinate all sample deliveries, especially those on the weekend with Testing Agent.

3. **During Construction** (Quality Control Batch Testing)

a. General

1) All testing during construction shall be compared to the previously established Baseline Specifications for gravels and rootzone mix for the remainder of the testing protocol.

2) Submit a one-gallon sample for every 500 cubic yard batch of each gravel material or rootzone mix to be used during construction to the Playing Field Testing Agent for testing. This shall be the same Testing Agent used to establish the Baseline specifications.

3) Rootzone Materials and gravel materials shall be tested and analyzed simultaneously.

4) Test results and recommendations shall be made by the Testing Agent and distributed simultaneously to the Contractor, Owner and its representatives.

5) Samples submitted to the Testing Agent shall be clearly marked noting material pile sample was taken from, date taken, quarry used, etc. Contractor's representative shall witness sampling at quarry or pile location.

6) Samples for quality control testing shall not be taken from material that has been placed on the playing field location. If so, this will be completely at the Contractors own risk and subject to test results. If piles are placed and less than 500 cy in size, each separate pile shall be tested. If total number of tests exceed that normally required, additional cost shall be borne by the Contractor.

7) Additional testing costs due to deviations and out of general conformance shall be borne by the Contractor.

8) Contractor is encouraged to submit multiple samples for testing/approval simultaneously to shorten testing process duration.

b. Gravel Materials Batch Approval and Release for Placement:

1) Refer to "2.3 Gravel Drainage Materials and Protocol Reporting" later in this Specification for gravel Reporting Protocols during Construction Quality Control batch testing. Gravel test results shall meet general conformance to the previously approved Baseline Gravel(s) specification.

2) Approval by the Testing Agent of submitted gravel materials shall serve as notice to proceed with installation of that batch onto the field area. This approval and placement is on an individual batch by batch basis.

c. Rootzone Mix Batch Approval and Release for Placement:

1) Contractor shall use an experienced blender to provide a uniform and consistent mix for sampling and batch processing.
2) Refer to "2.4 Rootzone Material Components and Protocol Reporting" later in this Specification for the requirements and reporting of Full and Partial Protocol Batch testing.
3) Approval by the Testing Agent of submitted rootzone mix shall serve as notice to proceed with installation of that batch onto the field area. This approval and placement is on an individual batch by batch basis.

d. Suggested Sampling Collection Procedures from material stockpiles:
1) Same as suggested previously however an Contractor's representative shall witness samples taken from stockpiles during the Construction batch sampling Quality Control testing for both gravel and rootzone materials.

C. Earthwork Material Qualification and Testing

1. Refer to Civil drawings and Specification Section "Earthwork Moving – 312000 for the following items;

a. If found necessary, submit the following test data for each potential borrow source.
1) Particle Size Analysis:
a) Method: AASHTO D422.
b) Number of Tests: Three (3) per potential source.
c) Acceptance Criteria: Gradation within specified limits.
2) Maximum Density Determination:
a) Method: Modified Proctor Test - ASTM D 1557.
b) Number of Tests: Three (3) per potential source.

b. Re-establish gradation and maximum density of fill material if source is changed during construction

D. Earthwork/Compaction Testing (Refer to Civil drawings and specifications)

1. Refer to Civil drawings and Specification Section "Earthwork Moving – 312000 for the following items

a. All compaction testing shall be performed by the Owner's geotechnical testing agency. The Contractor shall coordinate all work with the Owner's geotechnical testing agency and the Playing Field Designer/Engineer. Notify the geotechnical agency and the Engineer at least one (1) working day in advance of all phases of filling and backfilling operations.

b. Compaction testing
1) In-place relative density:
2) Number of Tests:

c. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

d. Acceptance Criteria: The sole criterion for acceptability of in-place fill shall be in situ dry density. Minimum dry density for all fill or backfill shall be 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557). If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal, replacement of the material and retesting.

E. Sports Irrigation System Testing: The Playing Field Contractor is to notify the Playing Field Designer/Engineer and Owner in writing 7 days prior to testing. Owner's Representative shall be on premises for overall check of the system. Pipelines jointed with rubber gaskets or threaded connections may be subjected to a pressure test at any time after partial backfill.

Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least 24 hours before testing.

1. Hydrostatic Pressure Test: Subject all lateral pipes to a hydrostatic pressure equal to the anticipated operating pressure of the system. Backfill to prevent pipe from moving under pressure. Leakage will be detected by visual observation. Replace all defective products. Repeat the test until the pipe passes. Cement or caulking to seal leaks is not allowed.
2. Main Line Testing: Prior to the testing of the mainline pipe, pipe shall be backfilled. Purge all air from the mainline before the test. Maintain constant pressure by adding water. Subject mainline to a pressure of 100 psi for one hour without visual evidence of leaks. No pressure loss should occur. If a leak is discovered within this period, the Contractor shall immediately repair the break and the system then retested for the same period. Testing of the laterals shall be done on a zone by zone basis. Replace all defective products and repeat test as necessary to gain a successful result. Cement or caulking to seal leaks is not allowed.
3. Operational Test: Activate each remote control valve in sequence from the controller. The Owner's representative shall visually observe the operation, coverage and leakage. Replace, adjust, or move heads, couplers or other parts of the system as necessary to correct operational, coverage deficiencies or leakage. Repeat testing until each zone passes all tests.
4. Control System Grounding Test: Test for proper grounding of control system per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance. Replace defective wire, grounding rod or other equipment. Repeat test until the guidelines are met.

1.10 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered and stored within the Contractor's work limits or in an area approved by the Owner.

B. All material shall be stored in strict accordance with the manufacturer's recommendations.

C. Special care shall be exercised during delivery and storage to avoid damage to the products.

D. Products that are damaged will be removed and replaced, unless the product can be repaired in an acceptable manner by the Contractor, at his expense.

E. Packaged Materials:

1. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site. Store out of low lying or drainage areas.

F. Drainage Gravels and Rootzone Mix:

1. Deliver tested and approved lots in clean, washed and covered trucks to eliminate contamination during transportation. Place directly on playing field. Do not stockpile on site.

G. Rootzone Mix: If approved by Owner and its representatives, may be blended directly on site in a stockpile area that is clean and well-draining. Move to playing field area only after Testing Agent approval from Construction Quality Control Batch test results

H. Irrigation Materials

1. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
2. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends.
3. Store and handle materials to prevent damage and deterioration.

4. Provide secure, locked storage for valves, and similar components that cannot be immediately replaced, to prevent installation delays.

5. All piping and appurtenances shall be new, clean and in accordance with material specifications, unless specifically noted on the plans.

I. Sod: Owner shall be responsible for sod farm harvest, transport to site, off - loading of trucks and installation onto the approved finished rootzone surface. Contractor and Owner shall coordinate this schedule so that all sod can be placed within twenty-four (24) hours after cutting. The Playing Field Contractor shall be on site and observing this installation to provide guidance to the Owner avoiding damage to previously completed work.

1.11 COMPLETION AND ACCEPTANCE

A. General: Field completion shall be separated into 2 phases, "Punch List" and "Substantial Completion."

B. Punch List/Preliminary Completion: Scheduled date for Punch List shall be at least 15 calendar days before Substantial Completion. Notify the Playing Field Designer/Engineer and Owner in writing, 3 days prior to scheduled date for the Punch List. To be considered ready for this Punch List the following items shall be installed:

1. Drainage system installed.
2. Drainage gravels placed and to grade.
3. Rootzone mix in place, compacted and to grade
4. Trench drains, slotted drains installed.
5. Irrigation system tested, installed and adjusted.
6. Sod areas laid, joints and seams filled. While this part shall be the responsibility of the Owner, the Owners rep / Engineer shall still observe and make notes if necessary for potential fixes to this part of the work . Damage created by the Contractor to the sod installation shall be repaired by the Contractor to the Owner's satisfaction.
7. One top-dressing application over entire grass area complete by Owner. Top dressing material to be supplied by the Contractor and match rootzone mix use rootzone mix sand.

C. Substantial Completion: Contractor shall notify the Playing Field Designer/Engineer and Owner in writing, 5 days prior to a requested date for a site observation to meet "Substantial Completion." To be considered "Substantially Complete" or "Playable" the following items shall be provided:

1. All Punch List items are complete.
2. Submit five (5) copies of written operating and maintenance instructions. Provide format and contents as directed by the Engineer.
3. Maintenance Log compiled in a loose-leaf 3-ring binder detailing all work done on fields from installation through Substantial Completion. Log shall include product information sheets and manufacturer's representatives contacted with phone numbers
4. Submit (5) copies of all certified surveys performed during construction for Quality Control.
5. Instruct the Owner's personnel in the operation of the irrigation and other systems.
6. Smooth, level playing surface compacted and level to grading tolerances.
7. Irrigation system tested, installed and adjusted.
8. Stockpiling or storing of "attic stock" materials.
9. Written warranties/guarantees.

10. Upon completion, Contractor shall provide Owner with project as-built/record drawings.

1.12 WARRANTY/GUARANTEE

A. General: Warranties / Guarantees specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties/guarantees made by the Contractor under requirements of the Contract Documents.

B. The following are inclusive of the term "Playing Field System" for provisions of the guarantee:

1. Final grade tolerances to one-quarter inch in the length of 25' of finish grade in any direction.
2. All materials and products specified.
3. Working functions of the drainage system.
4. Rootzone mix shall be guaranteed to have a percolation rate of 6 inches per hour
5. Working functions of the irrigation system.

C. Installer Guarantee: Provide a "Full System Guarantee" agreement. The President of the Playing Field Contractor shall sign the guarantee. Provide a guarantee for repair or replacement of the Playing Field System including both materials and workmanship for the following period of time:

1. One year after date of Substantial Completion.

D. The Warranty does not cover any defect, failure, damage caused by or connected with abuse, neglect, deliberate acts, acts of God, casualty or loads exceeding the Contractor's recommendations.

1.13 SPARE PARTS/ATTIC STOCK

A. Stockpile Materials (Attic Stock): Provide the following additional materials stored as directed by the Owner. [Use only those that apply and size according to project size]

1. Rootzone Mix – 50 Tons

B. Irrigation spare parts: [appropriate to project]

1. Quick Coupler valve keys (1-1/2 inch) – 2
2. Hose Swivel (1-1/2 inch x 1 inch) – 2
3. Valve Stem Keys (48 inch long) – 2
4. Spare heads of each type used - 4

PART 2 - PRODUCTS

2.1 EARTHWORK

A. Refer to Civil drawings and Specification Section "Earthwork Moving – 312000 for the following items.

1. All fill material, regardless of intended use category, shall be clean and free from organic matter, roots, brush or other vegetation, trash, debris or other detrimental substances, and rocks or unbroken lumps larger than 3 inch, and shall be tested and approved by the soil testing and observation agency prior to placement
2. Suitable Material
3. Structural Fill: non-plastic, sound, durable, granular particles consisting of sand, gravel, stone or blends with these materials, free from organic, frozen, or other deleterious materials

4. Trench Backfill: Existing soils obtained from Playing Field System excavations, excluding broken and pulverized weathered bedrock

5. All stone shall be angular. Rounded or river stone is not allowed.

6. The existing natural or fill subgrade soils on-site do not meet the requirements for Suitable Material or Structural Fill.

2.2 DRAINAGE SYSTEM MATERIALS

A. Underdrain Collector Pipe and Fittings

1. General

a. Review drawings for locations of perforated and non-perforated piping.

b. Solid wall pipe shall be high-density polyethylene pipe (HDPE) and shall conform to the requirements of AASHTO M252 Type S for 4 to 10 inch diameters and AASHTO M294 or ASTM F2306 Type S for 12 to 60 inch diameters.

c. Perforated pipe shall be double wall high-density polyethylene pipe (HDPE) and shall conform to the requirements of AASHTO M252 Type SP for 4 inch to 10 inch diameters and AASHTO M294, Type SP or ASTM F2306 for 12 inch to 60 inch diameters.

d. HDPE Perforated pipe shall have Class 2 slotted perforations in accordance with AASHTO M252 and M294.

e. Virgin material for pipe and fitting production shall be high-density polyethylene conforming to the minimum requirements of cell classification 424420C for 4-inch to 10-inch diameters, and 435400C for 12-inch to 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 5%.

f. Provide drainage pipe complete with bends, reducers, adapters, couplings, collars, and joint materials.

g. Solid wall pipe joints and fittings shall meet the watertight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306. 4-inch through 60-inch shall be watertight according to the requirements of ASTM D3212. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

h. Solid wall HDPE 12-inch through 60-inch diameters shall have a reinforced bell with a bell tolerance device. The bell tolerance device shall be installed by the manufacturer.

i. Provided drainage pipe complete with all fittings such as bends, reducers, adapters, couplings, collars, and joint materials. Fittings and couplers for perforated HDPE pipe shall be split couplings or snap couplings manufactured by the same manufacturer as the corrugated HDPE.

j. Manufacturer's certification according to AASHTO M252 and M294 shall be submitted to the Engineer prior to installation of the pipe.

2. Products

a. Advanced Drainage Systems (ADS)

b. Approved Equal

B. Underdrain Panel Drains and Fittings

1. General

a. Corrugated panel drain shall conform to the requirements for Class B Geocomposite as defined in ASTM D7001-06. This geocomposite product shall be composed of a flat pipe design consisting of a full circumference polyethylene core.
b. All materials and fittings shall conform to ASTM D7001-06.
c. The corrugated panel drain shall have a nominal thickness of 1-inch and a nominal width of 12-inch or 18-inch.
d. The core shall have a minimum compressive strength of 7,500 psf.
e. Geotextile wrap shall not be used on panel drain.
f. Provided panel drain complete with all fittings such as bends, reducers, adapters, couplings, collars, and joint materials. All fittings shall be supplied by the same manufacturer as the panel drain.

2. Products
   a. "AdvanEDGE" Pipe – Advanced Drainage Systems (ADS)
   b. www.ads-pipe.com/us
   c. Approved Equal
   d.

C. Clean Out: Provide clean out fittings fabricated from ASHTO-M252 polyethylene pipe that includes threaded polyethylene cap.

D. Collector Pipe Inline Drainage Structures / clean outs and sized as per drawings:

1. General
   a. Inline structures only are to be used. Risers with fittings are not allowed.

2. Products:
   a. Cleanouts
      1) Nyloplast Drain Basin
      2) Nyloplast Inline Drain
   b. Grate
      1) Solid, Ductile Iron

3. Suppliers
   a. Nyloplast-ADS
      1) www.ads-pipe.com/us
   b. National Diversified Sales
      1) www.ndspro.com
   c. Approved equal.

E. Drain Basin: (located in area between playing fields)

1. Product: (or approved equal)
   a. Nyloplast Drainage Basin
   b. Grate
      1) Pedestrian
      2) Ductile Iron with lock
   c. Concrete Collar
      1) Re: Drawings and Concrete Specifications

2. Suppliers:
   a. Nyloplast-ADS
      1) www.ads-pipe.com/us
   b. National Diversified Sales
      1) www.ndspro.com
   c. Approved equal

F. Geotextile Fabric:

1. General:

a. Provide on playing field subgrade and playing field drainage trenches.

b. The geotextile shall be a nonwoven sheet of plastic yarn as defined by ASTM D123 and conform to the criteria presented in the following table. These requirements shall be based on the Minimum Average Roll Value (MARV) which is defined as the value that can be expected, with 95% confidence, to be the minimum test average obtained on a roll sampled and tested in accordance with ASTM D4759.

c. Geotextile shall meet the requirements of AASHTO M288 except as modified herein.

Geotextile Class 1			
Physical Property	**ASTM Procedure**	**Minimum Acceptance Criteria**	
		English	Metric
Grab Tensile Strength	D 4632	200 lbs	890 N
Grab Elongation at Break	D 4632	50%	50%
Puncture Strength	D 4833	80 lbs	355 N
Mullen Burst Strength	D 3786	260 psi	1790 Kpa
Trapezoidal Tear	D 4533	80 lbs	355 N
Apparent Size Opening (AOS)	D 4551	70-100 US Std Sieve	150 – 212 um

2. Product

a. Mirafi 180 N

1) www.mirafi.com

b. Propex Geotex 315ST

1) www.geotextile.com

c. Approved equal

2.3 GRAVEL DRAINAGE MATERIALS AND PROTOCOL REPORTING

A. Gravel Drainage Blanket Material: A washed and graded pea stone shall be used for placement on the entire subgrade directly below the rootzone mix. Material could also be used as the trench fill for laterals and collector lines. The size of the stone shall fit the following size criteria. The root zone and sand size data must be available for comparison to the following requirements:

1. Particle Size Distribution: (#78M Gravel)

a. 100% passing a 1/2 inch (12.5 mm) sieve

b. No more than 10% passing a 10 mesh (2.0 mm) sieve

c. No more than 5% passing a 18 mesh (1.0 mm) sieve

2. Bridging

a. D15 Gravel less than or equal to 8 x D85 Rootzone Mix

b. D15(gravel) = 4.00mm

c. 4.00mm greater than or equal to 1.00mm

d. D15(rootzone) = 0.20mm

3. Permeability

a. D15 (Gravel) greater than or equal to 5 x D15(Rootzone Mix)

b. D15(gravel) = 4.00mm

c. 4.00mm greater than or equal to 1.00mm

d. D15(rootzone) = 0.20mm

4. Uniformity Coefficient (Cu) = D90/D15: Cu shall be less than 2.5

a. D90(gravel) / D15(gravel) less than or equal to 3.0
b. D90 (gravel) = 8.30mm
c. 2.08 less than or equal to 3.0
d. D15(gravel) = 4.00mm

5. Stability - The gravel should meet one or both of the following requirements:

a. Sulfate Soundness (C-88)
1) Not to exceed 12% loss
b. LA Abrasion (ASTM C131)
1) Not to exceed 40

6. Infiltration Rate shall be greater than 50"/hr

7. Alternate Gravel Backfill for Drainage Laterals and Collector **trenches** only: Clean crushed stone or washed gravel. Gravel shall meet one or both of the above stability requirements using the stated test methods.

a. Particle Size Distribution:
1) 90% Passing a 1/ 2 inch (12.5 mm) sieve
2) No more than 10% passing a #10 mesh (2.0 mm) sieve
3) No more than 5% passing a #18 mesh (1.0 mm) sieve
b. Installed below the gravel blanket material
c. Must bridge with the gravel blanket material
d. Infiltration rate shall be greater than 50"/hr

B. The Testing Agent shall test the components and report results using Full or Partial Protocol as follows:

1. Full Protocol Reporting: This full reporting shall be performed to establish the Baseline gravel material specification **after** the bid and prior to construction. Items to be reported are as follows:

a. Particle Size Distribution
b. Bridging
c. Permeability
d. Uniformity Coefficient (Cu)
e. Stability (Sulfate Soundness and LA Abrasion)
f. Infiltration Rate

2. Partial Protocol Reporting: Partial reporting shall be performed after the Full Protocol batch test has verified conformance to the baseline approvals. The intent of the partial protocol is to speed up the results process **during** Construction Quality Control batch testing. If it is found that the Particle Size Distribution results are not in general conformance with earlier approved results, then a Full Protocol test shall be performed to determine the discrepancy. Results shall be published and approved prior to placement on field and items to be reported for Partial Protocol are as follows:

a. Particle Size Distribution

2.4 SPORTS FIELD IRRIGATION SYSTEM MATERIALS

A. General: Contractor/bidder shall submit and install a single manufacturer for the following components;

1. Sports turf irrigation sprinkler heads, automatic controller system (controller, remote control valves, radio system, flow sensors, rain sensors)

B. Plastic Pipe: Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles, and dents. The pipe and hose are continuously and permanently

marked with manufacturer's name, material type, size, and schedule or class and quality control identifications.

1. Mainline pipe and fittings 3 inches and greater in diameter: Rigid, unplasticized polyvinyl chloride (PVC) PR-200, SDR-21, Class 200 conforming to ASTM D2241 and D3139, NSF approved pipe, extruded from virgin material, PVC gasketed bell pressure pipe. Uniformly white in color.
2. Lateral pipe and fittings: Rigid, unplasticized polyvinyl chloride (PVC), SDR-21, Class 200, conforming to ASTM D2241 and D3139, NSF approved pipe, extruded from virgin material. Use solvent weld pipe and PVC solvent weld fittings. Uniformly white in color.
3. Sleeves: All new sleeves shall be PVC Schedule 80, with solvent welded joints. The sleeve diameter is to be twice that of the pipe or wiring bundle being sleeved.

C. Fittings:

1. Fittings for PVC main line piping shall be ductile iron gasketed fittings. The ductile iron fittings shall have deep bell push on joints with gaskets meeting ASTM F-477. These fittings shall be for change of direction and or tapped service tees. These fittings shall be manufactured by Harco Manufacturing or approved equal.
2. Fittings for PVC lateral piping shall be schedule 40 PVC fittings, suitable for solvent weld and threaded connections.

D. Nipples:

1. Plastic: Factory-threaded Schedule 80, Type 1, Grade 1 polyvinyl chloride (PVC) pipe, threaded both ends. Pipe shall be in conformance with ASTM D1784 and D1785, gray color.
2. Metallic: Schedule 40 red brass (35% copper, 15% zinc) pipe, threaded both ends. Pipe shall be in accordance with ASTM B43.

E. Solvents and Sealants:

1. Solvent Cement: Compatible with PVC pipe and of proper consistency conforming to ASTM D2564.
2. Threaded connections: All threaded pipe, fittings, and valve connections excepting the sprinkler body inlet, shall use thread sealant.

F. Triple Swing Joints

1. General:
   a. Shall be molded of rigid polyvinyl chloride (PVC), Schedule 80, pressure rated at 315 psi. Type 1, Cell classification 12454-B per ASTM specification D 1784, with NPT threads and pipe sockets per ASTM D 2464 and D2466, respectively. Each rotating joint shall be sealed with an EPDM rubber 0-ring, installed pre-compressed in a sealing groove free of parting lines to prevent leakage. Modified stub ACME threads shall have special engineered (S.E.) diameters and clearances to allow full circle (360°) movement and to reduce stress concentrations and joint fracture at thread roots.
   b. Factory Assembled.
2. Products: For Irrigation Head
   a. Lasco Unitized Triple Swing
      1) G-172-212
      2) 1 inch unitized, 4 inch spigot X MPT (to sprinkler)
   b. Spears
   c. Dura Plastic Products
   d. Approved equal

3. Products: For Quick Coupler
   a. Lasco Unitized Triple Swing
      1) G-172S-218
      2) 1 inch unitized with brass nipple with snaplock
   b. Spears
   c. Dura Plastic Products
   d. Approved equal
   e.

G. Sports Turf Irrigation Sprinklers
   1. General: All heads shall be as specified on the drawings or approved equal. Nozzle patterns are indicated and shown; however, specific site conditions may require that different nozzle patterns be used. Contractor shall adjust patterns to provide adequate coverage for misting or cooling of field area. All heads shown on the drawings shall be installed and have the following minimum characteristics:
      a. Rotary gear driven.
      b. Rubber covers affixed to top of head.
      c. Stainless Steel riser.
   2. Products:
      a. Rainbird
         1) 8005 series
      b. Approved equal

H. Valve Boxes
   1. General:
      a. Valve boxes shall be of sufficient size to still allow room for maintenance without having to excavate or perform similar operations conforming to ASTM D368 for tensile strength of 18 inch deep and furnished with a non-hinged cover.
   2. Products
      a. Carson
      b. Ametek
      c. Brooks Industries
      d. Approved equal

I. Manual Drain Valves
   1. General:
      a. 3/4"
      b. American Made
   2. Products:
      a. Mueller
      b. Nibco
      c. Or approved equal

J. Gate Valves:
   1. Non-rising Stem Gate Valves 3 inches and larger: AWWA C500, cast- iron double disc, bronze disc and seat rings or AWWA C509, resilient seated stem, cast-iron body and bonnet, stem nut, 200 pig working pressure, and ends that fit NPS dimension, PVC pipe. Include elastomeric gaskets.
   2. Bronze, non-rising Stem Gate Valves, 2.5 inches and Smaller: MSS SP-80, Type 1, solid wedge: non-rising, copper-silicon-alloy stem: Class 125, body and screw bonnet of ASTM B 62 cast bronze, with threaded or solder joint ends. Include

polytetraflouroethylene (PTFE)-impregnated packing, brass packing gland, and malleable-iron hand wheel.

3. American Made

K. Ball Valves

1. General:

a. Ball valves shall be of the size and type indicated on the plans.
b. Shall have a body constructed of cast bronze, stem and cross handle. Ball valves shall have a working pressure of not less than 150 psi and shall conform to AWWA standards.
c. American Made

2. Products

a. Champion
b. Approved Equal

L. Quick Coupler

1. General

a. One and one-half inch
b. Vinyl Cap Cover
c. American Made

2. Products

a. Rainbird #7 (1-1/2 inch)
b. Approved equal

M. Quick Coupler Anchor/Stabilizer

1. General

a. Ductile Iron Anchor with stainless steel bolt

2. Products

a. Harco
b. Approved Equal.

N. Pressure reducing valve (If Required)

O. Thrust Blocks: Use 3,000 PSI concrete and 2-mil plastic to wrap fittings and pipe.

P. Automatic Control System

1. Use existing Rain Bird ESP-LXD Decoder controller

2. Flow Sensor:

a. As per selected Controller System

3. Control Wire:

a. Two Wire Decoder MAXI Cable
b. UF-UL listed color-coded copper conductor direct burial size 14. Install wiring in a one inch conduit. Use waterproof DBY wire connectors at splices. Provide one color wire for each of the following:
1) Decoder Cable
2) Rainstat circuits

4. Decoder:

a. Rain Bird

5. Electric Remote Control Valves

a. Rainbird PESB1
b. Or approved equal.

6. Drainage fill shall be 1/2" to 3/4" crushed stone.

   a. Fill shall be clean soil free of stones larger than 2" diameter, foreign matter, organic material and debris.
   b. Provide imported fill material as required to complete the work. Obtain rights and pay all costs for imported materials.
   c. Suitable excavated materials removed to accommodate the irrigation system work may be used as fill material subject to the Engineer's review and acceptance.

2.5 ROOTZONE MIX COMPONENTS AND PROTOCOL REPORTING

A. Components: For bidding purposes, the blend shall generally possess the ratios of 85% processed sand: 15% organic materials. The Playing Field Testing Agent will have latitude during the mix design process to reasonably modify these ratios and to ultimately approve a final baseline specification mix as described earlier in this specification section. The materials used are as follows;

1. Processed Sand

   a. Particle Size Distribution (ASTM C136 and ASTM F1632 sand fractions retained)

Fraction Size/Name	U.S. Standard Sieve	Diameter of Sieve (mm)	Allowable Range % Retained on Sieve
Gravel	10	2.00	3% maximum
Very Coarse Sand	18	1.00	less than, equal to 3 – 10%
Coarse Sand	35	0.50	At least 60% Particles in this range
Medium Sand	60	0.25	
Fine Sand	100	0.15	20% maximum
Very Fine Sand	270	0.05	5% maximum
Silt		0.002	5% maximum
Clay		<0.002	3% maximum

      1) Less than or equal to 20% combined for sieve meshes 10 and 18.
      2) Minimum of 80% combined fractions for sieve meshes 35, 60 and 100.
      3) Combined fractions no more than 10% for "fines" (very fine sand, silt and clay)

2. Organic Amendments:

   a. Processed Peat:
      1) Performance Criteria:
         a) If selected shall have a minimum organic matter content of 85% by weight as determined by loss on ignition (ASTM D 2974-87 Method D) and shall be free of sticks, stones, hay, or any other deleterious matter.
      2) Peat Analysis:

Parameter	Specification
Total Ash	15% or less
pH	6.5 to 7.5
% Moisture	40% to 70%

Sieve Criteria	
2.0 mm sieve	0 to 5% retained
1.0 mm sieve	Less than 20% retained

3) Peat Suppliers
   a) Dakota Peat (701) 746- 4300
   b) Fafard Peat, www.fafard.com
   c) Peat Inc., (612) 840-3087
   d) Oglebay Norton Industrial Sands, Inc. (619) 277-1670
   e) Approved equal

b. Compost
   1) Performance Criteria:
      a) If selected shall have been composted in an in-vessel system, through a themophilic stage, to a mesophilic stabilization phase and with the approval of the Testing Agent. It shall have been aged for at least one year. The material shall have a total ash content of no more than 40%, shall be proven to be non-phytotoxic, and be screened to ½ inch

B. Rootzone Mix Requirements: The processed sand shall be uniform coarse sand screened and washed and when blended with the organic material by the Testing Agent shall be reported and meet the following requirements:

a. Particle Size Analysis meeting previous distribution chart
b. Physical Analysis (determined at 25 cm tension – 10 inches by USGA testing protocol ASTM F1815) – multiple mixes may be shown to determine the final selection
   1) Saturated Hydraulic Conductivity – 10 to 12 in/hr
   2) Total Porosity – 35 to 55% (Non capillary and Capillary)
   3) Bulk Density - 1.2 to 1.6 (ASTM F2396)
   4) Report Water Retention Percent at Field Capacity
   5) pH range of 6.0 to 6.5 (ASTM D4972 Method A water only)
   6) Organic Matter Percent by weight for the mix shall be 0.4 to 0.6% (ASTM F1647 Method 1)
   7) Uniformity Coefficient (Cu): 2.0 – 3.5
   8) Gradation Index (D90/D10): Less than 10

C. Protocol and Reporting: The Testing Agent shall test the individual rootzone components and the blended mix(es) and report results using Full or Partial Protocol as follows:

1. Full Protocol Reporting: This full reporting shall be performed to verify/establish Baseline spec **after** the bid and prior to construction ***and*** for the first 3 batches of the mix during Construction Quality Control batch testing. Items to be reported are as follows::

a. Particle Size Analysis / Distribution
b. Physical Analysis
   1) Saturated Hydraulic Conductivity
   2) Total Porosity (Non capillary and Capillary)
   3) Bulk Density
   4) Report Water Retention Percent at Field Capacity
   5) pH range
   6) Organic Matter Percent by weight for the mix
   7) Uniformity Coefficient (Cu):
   8) Gradation Index (D90/D10)

2. Partial Protocol Reporting: The remaining batches after the initial three during Construction Quality Control batch testing shall be tested and reported for the following unless it is determined at the sole discretion of the Owner or the Testing Agent to use the full protocol:

a. Particle Size Distribution / Analysis
b. Uniformity Coefficient
c. Infiltration Rate

D. Mix Adjustments and Recommendations: The Testing Agent shall make recommendations from the material reporting if necessary

1. pH recommendations

a. Testing Agent shall make appropriate recommendations to modify the pH rating of the rootzone mx to establish an optimum range of 6.0 to 6.5 for sports turfgrass.

2.6 SOD AND GRASS MATERIALS – **BY OWNER**

A. Bermuda grass Sod: Certified Tifway 419 Hybrid Bermuda shall be used.

1. Sod shall be grown in a sand based soil medium similar to the rootzone mixture/blend being used for the project and acceptable to the Contractor's Testing Agent in particle size and soil characteristics. Sample(s) shall be submitted to the Agent.
2. DNA testing results are required.
3. Sod shall be 10 -12 months old at time of harvest and machine stripped to a uniform thickness of no more than 3/4" soil below the thatch layer.
4. No more than 24 hours shall pass from harvest to installation.
5. Sod shall be free of objectionable grasses and broad leafed weeds.
6. Sod shall be big roll cut in approximate widths of greater than or equal to 30 inches and minimum lengths of 50 feet.

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Previous Work: Mass excavation and subgrade preparation if performed by different contractor than the playing field contractor. This includes playing field areas and areas adjacent to the fields.

B. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Review survey of mass grading work to verify that the subgrade elevations generally conform to one inch tolerances. Do not proceed with any work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

C. Protection of Work: Protect all on-going work, so as not to delay work due to weather or project related construction. This includes but is not limited to the use of tarps, geotextile, plywood and other protective measures.

D. Protection of Persons and Property: Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.

1. Protect adjacent construction throughout the entire operation. Protect newly graded areas from destruction by weather or runoff. Protect structures, utilities, pavements, and other improvements from damage caused by settlement, lateral movement, undermining and washout.

E. Unanticipated Conditions: Notify the Engineer immediately upon finding evidence of previous structures, filled materials that penetrate below designated excavation levels, or other conditions which are not shown or which cannot be reasonably assumed from existing surveys and geotechnical reports. Secure the Engineer's instruction before proceeding with further work in such areas.

3.2 EARTHWORK EXECUTION / PLAYING FIELD SUBGRADE & FINISH SUBGRADE

A. Layout and Control (Refer to Civil drawings and Specification Section "Earthwork" for further information)

1. The subgrade Contractor (May be different than Playing Field Contractor) during that part of the work shall be responsible for furnishing, setting and marking of all line, grade and location stakes, including offsets and general construction staking.

2. The Playing Field Contractor shall establish required lines, levels, contours and datum for his scope of work which may include preparation of subgrade (if in Scope of Work) finish subgrade and finish playing field surface grade. Contractor responsible for work shall coordinate and ensure that the final elevations of native topsoil will result in the final playing surface elevations shown on the Contract Drawings when the rootzone is installed.

3. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to the Owner.

4. Establish location and extent of utilities before commencement of grading operations.

5. Groundwater Control

   a. Where groundwater levels are sufficiently high, provide pumps in sumps as required maintaining groundwater at a minimum depth of two feet below excavation bottom at all times. Maintain dry conditions until completion and acceptance of the base, prior to synthetic turf placement.

   b. Provide standpipes or other means of monitoring groundwater levels during groundwater control operations. Sumps shall be lined with geotextile drainage fabric. Conduct dewatering operations in a manner which will limit the withdrawal of fines.

6. Surface Water Control

   a. All earthwork operations shall be conducted in a manner to prevent surface water from infiltrating into the subgrade and base. Drainage is to be maintained in all parts of the site to drain surface water without ponding at all times. The Contractor, at his own expense, shall undercut soils saturated by ponding and backfill per this Section at the direction of the Engineer.

7. Quality Control

   a. [If Applicable] Subgrade Ground Surface Requirements:

      1) Perform density tests in accordance with ASTM A1556, ASTM D2167, or ASTM D2022

      2) Perform moisture tests in accordance with ASTM D3017.

      3) Where field-testing is performed using nuclear test methods, verify calibration of both density and moisture gages at the beginning of work, on each different type of material encountered, and additionally as directed by the Owner

   b. [If Applicable] Fill and Backfill Materials: Test existing on-site soils and borrow materials proposed for use in filling and backfilling operations as follows. Allow testing services to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

Moisture Content:	ASTM D2216
Maximum Index Density:	ASTM D4253
Moisture Density Relations:	ASTM D698
Plasticity Index:	ASTM D4318

c. [If Applicable] Subgrade Material: One test for every 2500 square foot of compacted subgrade material, or major fraction thereof, but in no case less than two tests for each day's work

B. Excavation (Refer to Civil drawings and specifications)

1. Refer to Specification Section "Earthwork"and Civil Drawings for additional Earthwork requirements
2. Excavation shall consist, in general, of the excavation of whatever substance is encountered to the lines, grades and sections shown on the Drawings, including excavation as necessary for grading and other similar features.
3. During construction, the grading operations shall be executed in such a manner that the excavation will be well drained at all times. All grading shall be finished on neat, regular lines conforming to the sections and contours shown on the Plans.
4. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.
5. Excavation shall be performed in proper sequence with all other associated operations.
6. Maintain the slopes of excavation in a safe condition until completion of the grading operation.
7. All excavation work shall be reviewed and approved by the Engineer before proceeding with construction.
8. Any excess excavation shall be removed from the site to disposal areas at the Contractor's expense.

C. Fill (Refer to Civil drawings and specifications)

1. All site fill shall be "Structural Fill" unless otherwise shown on the Drawings, or directed by the Engineer. "Structural Fill" shall be placed in lieu of "Suitable Material" where directed by the Engineer.
2. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.
3. Prior to placing fill over undisturbed material, scarify to a minimum depth of six (6) inches.
4. The original ground or subgrade shall be proof rolled until the underlying soil is thoroughly compacted to the satisfaction of the Engineer. A steel-wheel tandem roller weighing 8 to 10 tons or equipment capable of obtaining the same compactive effort shall be used to obtain a thoroughly compacted subgrade. The subgrade shall be inspected prior to any fill operations or construction of improvements. Remove or recompact any soft or loose soils as determined by the Engineer prior to filling. Remove any material determined to be unsuitable by the Engineer and replace with compacted suitable material.
5. A thoroughly and satisfactorily compacted subgrade is defined as having a minimum dry density of 95 percent of the maximum density of the material used as determined by the Standard Proctor test (ASTM D 698). The subgrade material shall be compacted at moisture content suitable for obtaining the required density.

a. When existing subgrade ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface. Scarify existing subgrade to depth of 8 inch prior to compacting. Moisture condition between 3 percent below and 2 percent above optimum moisture content, and re-compact to at least 95 percent of standard Proctor density (ASTM D698).

6. Place backfill and fill materials in layers not more than six (6") in loose depth. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with six (6") as a maximum lift height. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water or extraneous debris.

7. When work is suspended during periods of freezing weather, measures shall be taken to prevent fill already in place from freezing. Upon resumption of work after any inclement weather, prepare the exposed surface by proof rolling to identify any zones of soft/loose soils. Soft/loose materials or frozen soils shall be removed and replaced by compacted select fill.

D. Moisture Control: (Refer to Civil drawings and specifications)

1. Where subgrade soil material, fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill as necessary to provide optimum moisture content. Prevent ponding or other free water on surface subsequent to, or during, compaction operations.

2. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

E. Modifications to existing storm structures/lids (Refer to Civil drawings and specifications)

1. Reconfigure existing top of structure elevation(s) to conform to new subgrade elevation as shown on drawings.

2. Cut into and install new connectors/fittings to the proposed underdrain collector piping. Connections to be leakproof.

F. Compaction Equipment (Refer to Civil drawings and specifications)

1. Compaction equipment used for the Work is subject to approval by the Engineer. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics

G. Playing Field Subgrade

1. Mass grade subgrade for the playing field areas may have been performed by a Contractor other than Playing Field contractor in previous contract.

a. Playing Field Contractor to inspect condition of subgrade, review compaction reports and testing and verify that subgrade has been prepared according to the specifications with regard to compaction, grade tolerances and is free of debris prior to beginning work. Review certified survey prepared by the Site Earthwork Contractor. Notify Construction Manager, Owner and Playing Field Designer/Engineer of any discrepancies.

1) After the Playing Field Contractor has reviewed the documents prepared by the Mass Excavation Contractor and or the Owner and is

satisfied with the conditions, only then shall he proceed to the fine grade subgrade grading operations.

2. Mass grade subgrade for playing field areas may be performed by the Playing Field Contractor in this contract.

   a. If so, all cutting, filling, backfilling and grading necessary shall be done to bring the playing field areas to the following subgrade tolerances:

      1) The final elevation of the finish playing field subgrade shall be plus or minus one inch at any point on the field and on a 25 foot by 25 foot grid of the finished grades indicated on the Contract Drawings. Laser controlled or indicated equipment shall be used for this part of the work.

   b. Playing Field Subgrade Elevation Certification: A certified survey by a State licensed land surveyor shall be performed at 25-foot centers for each field to verify grade and elevation of the subgrade. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work

H. Playing Field Finish Subgrade

1. General

   a. After verification and approval of the subgrade, the Playing Field Contractor shall then proceed with the fine grading of the subgrade. All fine grade cutting, filling, and backfilling necessary to be performed on the subgrade to bring the playing field areas finish subgrade to the required tolerances.

   b. Finish subgrade shall mirror the final finish elevation of the field surface in regards to slope except where noted on the drawings.

   c. Compaction for the finish subgrade shall meet 95% Standard Proctor as described in section 3.2 of this Specification.

   d. Proofrolling of the finish subgrade is required.

   e. Sufficient grading must be done during the progress of the work so that the entire site shall be well drained and free from water pockets.

2. Playing Field Finish Subgrade Tolerance Requirements: The final elevation of the finish subgrade shall be plus or minus one half inch at any point on the field and on a 25 foot by 25 foot grid grade as indicated on the Contract Drawings.

3. Playing Field Finish Subgrade Elevation Certification: A certified survey by a State Licensed land surveyor shall be performed at 25-foot centers for each field to verify required grade and elevation tolerances of the finish subgrade. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work.

3.3 COMMUNICATIONS/TIMING/POWER CONDUITS AND GROUND BOXES

A. Playing field contractor to coordinate and sequence playing field work with related items regarding conduits for power or other communications that cross under, are installed in or are adjacent to playing field.

B. Install communication conduits.

1. Conduits to be directly buried into subgrade with a minimum of 18 inches of cover from finish grade.

2. Conduits to turn upwards and terminate in a box where shown on plan on field sidelines.

3. Contractor to install pull wire for convenience to the Owner in the communications conduits.

4. All wiring connections/splices to be waterproof/watertight.

5. A drain pipe is to be placed in the bottom of each ground box and connected to the playing field underdrain collector system.

6. Contractor to display to Owner that devices are in working order prior to proceeding with other portions of the work.

3.4 DRAINAGE SYSTEM INSTALLATION

A. Collector and Lateral Pipe Trenching:

1. Only perform trenching, drainage pipe installation and backfilling operations that can be completed in one day. Exposed trenches that collapse due to rain or other occurrences shall be widened and filled as specified or refilled with subgrade materials, compacted, and retrenched.

2. Contractor to connect playing field drainage system to site storm drainage.

3. Excavate trenches for all piping to a uniform depth and width, sufficiently wide enough to provide ample working room.

   a. Minimum width of trench to be twice the pipe diameter.
   b. Abnormal conditions such as large cobbles or unstable conditions that may cause trench to lose integrity shall be reported to the Engineer immediately.

4. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil.

5. Contractor to remove or manipulate spoils from trenching excavation so that integrity of finished grade requirements is maintained prior to placing filter fabric

B. Installation of Geotextile Filter Fabric:

1. Install filter fabric onto bottom and sides of trenches.

2. Extend fabric a minimum of 12 inches past each side of top of trench on top of the subgrade.

3. The fabric shall be placed as smooth and wrinkle-free as possible.

4. All laps shall be at least thirty-six inches in width without tension, stress, folds, or creases.

5. At time of installation, fabric will be rejected if it has defects, ribs, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling, or storage. Damaged materials shall be removed and replaced at no additional cost to the Owner.

6. Install fabric to coordinate with trenching operation and other parts of the Work.

7. Sandbags or other devices may be used as required to hold the fabric in position during installation. Materials, equipment or other items shall not be dragged across the fabric or be allowed to slide down slopes on the fabric

8. Fabric shall be covered as soon as possible after placement to minimize exposure to sunlight and to other types of contamination such as surface run-off.

   a. Fabric shall not be exposed for more than 10 days.
   b. Fabric which becomes overly contaminated shall be removed and replaced with new fabric..

9. Contractor to temporarily fold fabric over at the tops of the trenches during construction to eliminate migration of soil materials into the gravel trench. Just prior to installation of gravel drainage blanket, this fold shall be undone and fabric shall be laid over the finished subgrade. Should contamination of the gravel trench occur,

Contractor shall remove contaminated material and replace with clean approved materials at no cost to the Owner

C. Installation of Collector:

1. Lay perforated pipe directly on geotextile fabric at trench bottom in accordance with pipe manufacturer's recommendations.
2. Provide collars and couplings as required for installation of these lines as well as for connections to drainage structures and trench drains.
3. Install collector as indicated on drawings so that it connects to site structures or extends to limits indicated.
   a. Protect any exposed ends of pipe until connected to detention or storm sewer system by playing field Contractor or others
4. Pipe laying work shall commence at the main collector line and shall proceed from low point of system to high point.
   a. Pipe shall be laid true to line and grade in such a manner as to assure a close concentric joint with the adjoining pipe.
   b. Protect any exposed ends of the pipe until final connections are made.
   c. After pipe installation has been observed by the Engineer, drainage material shall be placed around and over the pipe.
5. Install inline structures, drain inlets, catch basins per manufacturer's instructions
6. Install locator tape around or on the drainage pipe for future detection
7. After pipe installation has been observed by the Playing Field Designer/Engineer, approved drainage material shall be placed around and over the pipe to the top of the trench.
   a. If observation indicates poor alignment, debris, displaced pipe, infiltration or other defects, Contractor to take whatever steps are necessary to correct such defects prior to proceeding
8. Installation of drain lines from ground boxes
   a. Install drain lines from in ground boxes installed in the field area. Connect directly to field drainage system or minimally to the gravel perimeter trench.
9. Collector pipe Clean Out: A nyloplast or equal structure is to be used for the cleanout. Cap shall be placed flush with finish subgrade as shown on the drawings. Install bolt, washer and nut on cap for metal detection purposes

D. Installation of Panel Drains:

1. Install panel drains per the manufacturer's written instruction.
2. The panel drains are to be installed on top of finish subgrade and directly over the top of the geotextile fabric.
3. Connect panel drains to collector/header piping using panel drain manufacturer provided fittings, per manufacturer instructions and as shown on drawings.
4. Provide 48 hours notice to the Engineer to inspect the panel drains in place prior to covering.

E. Drainage Fill:

1. Trenches:
   a. Place approved drainage gravel fill material in the drainage trench in a single layer. Place material around drainage pipe until it is level with the surrounding subgrade.

b. Contractor to consider temporarily covering top of open gravel trench with the geotextile material overlapping the top of the trench to reduce contamination of the gravel material prior to placement of Gravel Blanket Layer.

F. Installation of drain lines from in ground boxes

1. Install drain lines from in ground boxes installed in the field. Connect directly to field drainage system or minimally to the gravel perimeter trench.

G. Clean Out/End Cap: Cap shall be recessed below the rootzone mix and flush with finish subgrade elevation. Install bolt, washer and nut on cap for metal detection purposes

3.5 GRAVEL DRAINAGE BLANKET INSTALLATION

A. General

1. The gravel blanket layer may be installed prior to or after the irrigation installation as per Contractor work schedule. If placed prior to irrigation, Contractor shall take care to avoid contamination or over compaction of gravel blanket materials.

2. The gravel blanket shall only be placed onto approved and certified finish subgrade elevations. This includes grade elevations and compaction.

3. Only gravel materials approved by the Testing Agent shall be installed. This approval shall be made prior to shipping to site.

B. Installation shall generally occur as follows;

1. Geotextile fabric folds shall be opened up to expose gravel trenches. Any contamination seen in the gravel trench shall be immediately removed with clean materials prior to blanket layer installation.

2. Contractor shall take care to place gravel blanket materials without driving over lateral drain trenches or rutting finish subgrade elevations.

3. Place materials in uniform depth over entire playing field or as otherwise indicated.

C. Playing Field Finish Gravel Blanket Layer Elevation Tolerance Requirements: The final elevation shall be plus or minus one quarter inch at any point on the field and on a 25 foot by 25 foot grid grade as indicated on the Contract Drawings.

D. Playing Field Gravel Blanket Layer Elevation Certification: A certified survey by a state licensed land surveyor shall be performed at 25-foot centers for each field to verify required grade and elevation tolerances of the Finish Grade. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work.

3.6 SPORTS FIELD IRRIGATION INSTALLATION

A. General: Plastic pipe and fittings shall be solvent welded using solvents and methods as recommended by manufacturer of the pipe, except where screwed connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush.

1. Coordinate crossings of irrigation and drainage trenches where occurring.

2. Pipe may be assembled and welded on the surface. Snake pipe from side to side of trench bottom to allow for expansion and contraction.

3. Connections between plastic pipe and metal valves shall be made using plastic male adapters and applying the recommended threaded joint compound.

4. All metal screwed joints shall be tightened with tongs or wrenches and employ the specified joint compound. Caulking of any kind will not be permitted.

B. Irrigation System Trenching:

1. Make trenches for main and laterals straight and true with the bottoms graded on uniform slopes to low points. Excavate trenches wide enough to allow a minimum of 4 inch between parallel pipelines, 8 inches from lines of other trades. Do not install lines parallel and directly over one another. Maintain 2-inch vertical clearance between irrigation lines; minimum transverse angle is 45 degrees. A maximum of 2 lines per trench.

2. Backfill for Irrigation Lines:

   a. Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than 2-inches in maximum dimension. Remove material not suitable for backfill from site. Backfill placed next to pipe shall be free of sharp objects, which may damage the pipe. Backfill material for mainline pipe is to be tamped in 4-inch layers under the pipe and uniformly on both sides of the full width of the trench or as shown, and the full length of the pipe. PVC pipe shall not rest on concrete, rock, wood blocks, or similar items.

   b. All irrigation pipe shall be immediately backfilled with preliminary backfill sufficient to prevent arching or slipping under pressure. Do not completely backfill trenches until the lines have been tested and reviewed.

3. Trenches for pipelines shall be made of sufficient depths to provide the minimum cover from finished grade as follows:

   a. 14 inch over RCV controlled lines (lateral)

   b. 18 inch cover over main lines 3 inches and less in diameter and quick coupling valves.

   c. 24 inch cover over main lines larger than 3 inch diameter.

4. Irrigation mainline may be installed into the perimeter collector drainage trench if shown on drawings or as approved by Engineer prior to commencement of the work.

5. Sleeving: All lines shall be laid under hard surfaces in a PVC 200 pipe with solvent weld joints. Sleeve diameter shall be equal to twice that of the pipe or wiring bundle or that as shown on the drawings. Depth of sleeves to be determined by the type of line placed in sleeve. In the case of new construction, all sleeves shall be place prior to laying of any hard surface. Extend sleeving 12 inches beyond edge of paved surface.

6. Pipe Penetrations: Core drill penetrations in a manner approved by the Owner. Provide metal sleeves for all irrigation lines wherever passing through a concrete wall or floor. Provide a water stop or membrane clamp for every pipe or sleeve penetrating an exterior concrete wall or floor, whichever is appropriate to the waterproofing method

7. Closing: Cap or plug openings in lateral and main lines leaving caps and plugs in place until removal is necessary for completion of installation. Take other precautions as necessary to prevent dirt and debris from entering pipe or equipment.

8. Automatic Controller(s): Refer to "Irrigation Controller Installation" in following section.

9. Flushing: Lines shall be thoroughly flushed out before installing quick coupling valves, sprinklers or emitters.

   a. After flushing, main line pipe may be partially backfilled, butt joints, fittings and connections shall remain free and visible.

10. Manual Drain Valves: Manual drain valve shall be installed at low points on mainlines only.

11. Gravel Sumps: Gravel sumps shall be located at all manual and automatic drain valves, control valves and gate valves.

12. Sports Field Heads: Nozzle patterns are indicated and shown on the drawings, however, specific site conditions may require that different nozzle patterns be used. Contractor shall adjust patterns to provide adequate coverage.

    a. Adjustment: Adjust alignment and coverage of all heads. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, make all necessary changes or make arrangements with the manufacturer to have adjustments made, prior to any planting. These changes or adjustments shall be made without additional cost.
    b. Placement: Install heads perpendicular to grade. Set top of head 1/2 - inch below finish grade.
    c. Location: Heads shall be located 6 inches from the edge of the playing field curb / fence at the entire field perimeter as shown on the drawings

13. Quick Couplers:

    a. Install all couplers inside field area immediately against fence line, outer extent of rootzone mix within the playing field or otherwise directed by the Owner. Install quick coupler anchor/stabilizer per manufacturer instructions. Place clean gravel in bottom of box. Top of box shall be flush with finish grade after installation of grass

14. Valve Boxes:

    a. Locate boxes as close to fencing, walls or other vertical construction as possible. Top of box shall be flush with finish grade after installation

15. Thrust Blocks: Use cast-in-place concrete bearing against undisturbed soil. Size, orientation, and placement shall be as shown on the drawings. Wrap fitting with plastic to protect bolts, joint, and fitting from concrete. Use wherever there is a change in pipe direction, at the end of the line and at all gate valves. Also use on all pipes 3 inches and greater in diameter or any slip joint connected pipe.

C. Purging and Testing: Refer to "Quality Control" in previously in this Specification section in regards to Sports Irrigation System Testing. These tests are to successfully achieved prior to placement of rootzone materials.

D. Water Connection to source: The new field mainline shall connect to the existing site mainline/source as shown on the plans

3.7 IRRIGATION CONTROLLER INSTALLATION

A. Automatic Controllers: Wall or pedestal mount in locking cabinets with direct surge protection. Verify power location and type, as well as power connection requirements. The contractor shall be responsible for any temporary controller installation.

    1. Contractor shall perform a radio reception survey to determine the best location for the hand held remote control antennae location.

B. Joint shall be waterproof to prevent leakage of water and corrosion build-up on the connection. All wiring shall be accomplished with as few splices as possible

C. Electrical Connection to Controller: As indicated on the drawings.

    1. The playing field Contractor may be responsible for utilizing a temporary controller depending on progress of construction in regards to the observation tower and the installation of the rootzone mix and sod on the fields.

D. Decoder System Installation

    1. Wiring

        a. Wire to be installed in a one inch conduit.
        b. All wire splices made on the communication wire shall be done with a King Industries splicing tool. Great care shall be taken to avoid nicks and cuts in the

Communication wire while splicing. Avoid cutting into the inner sleeve. No other tool will be accepted for making communication wire splices. All wire splices shall be made with an excess of 18" minimum. At no place in the system shall wire be tight.

c. 3M DBY's may be used when splicing two Communication wires together. Use 3M DBR's when splicing 3 or more wires.

d. Communication wire splices not at valves or valve-in-head sprinklers must be placed in a 10" round valve box and looped with a minimum of 18" excess in order to prevent stretching and to ease in troubleshooting. Locations and direction must be noted accurately on As-built plans.

2. Decoder Components

a. Install Rain Bird Golf FD-101 as shown in drawings. Clearly mark decoder address on valve box and As-built plans. Use 3M DBY or DBR waterproof connectors with a minimum of 18" excess at all locations. FD-101 located at valve-in-head sprinkler shall be taped under selector valve exactly for each sprinkler.

b. Install Rain Bird Golf LSP-1 surge protector as shown on the drawings. Each LSP-1 shall be installed in a 10" round valve box and to a minimum of 10 ohms or less. It may be necessary to add supplemental grounding to achieve 10 ohms or less. The Contractor will be responsible for all supplemental grounding. Contractor shall test each LSP-1 approximately 4 weeks after installation. Locations shall be clearly marked on As-built drawings.

3. Testing of the Decoder System

a. Before final acceptance the Engineer will perform a system current check. No more than ten 10% over current reading will be accepted. Each FD-101 decoder draws .5 milliamps. If the system fails this test the Contractor will be responsible to locate and repair the fault/faults immediately before final acceptance.

b. Before final acceptance the Engineer will perform a system current check between conductors. This reading must be less than five 5% between the red and black conductor. If the system fails this test the Contractor will be responsible to locate and repair the fault/faults immediately before final acceptance.

4. Programming of the Central Computer

a. Performed for the entire site irrigation system with observation by the Owners representative.

3.8 DOUBLE CHECK VALVES

A. Existing on site

B. Re Civil Drawings and Specs for new equipment and installation at new Irrigation Booster Pump Location

3.9 IRRIGATION PUMP STATION

A. Use existing station on site at well pump location.

B. Refer to Irrigation Booster Pump Specification Section 02950

3.10 ROOTZONE MIX INSTALLATION

A. General

1. Rootzone mix batches must be approved by Testing Agent prior to any shipping or installation of the mix on to the playing field area.

2. Rootzone mix shall only be placed on approved and Certified finish subgrade elevations.

   a. Footprints, tire tracks or other depressions in the gravel layer shall be removed/re-graded to a smooth surface prior to and during placement of rootzone material.

3. Irrigation system must be in working order prior to installation of rootzone mix.

   a. Contractor may install heads after rootzone installation. However, all water and electrical connections shall be shown to be ready prior to rootzone placement.

B. The Contractor shall take during rootzone installation to avoid damage to previously placed work and over compaction of the rootzone installation.

1. Under no circumstances will loaded rubber tired vehicles in excess of 1 ton be allowed on the finished subgrade (gravel base) prior to or during the spreading of the root zone mix. Equipment used on the rootzone mix/field shall be of a size and weight and shall utilize low pressure turf type tires, tracks or tires, which will not damage or overly compact the field installation.

C. The installation procedure shall generally occur as follows;

1. The tested and approved rootzone material shall be dumped at the edge of the field and systematically worked outward onto the field. Delivery vehicles shall not drive directly onto playing field area to dump rootzone materials.

2. The material shall be spread onto the field in an even depth/layer

3. The finish grade slope shall conform exactly to the subgrade slope, (unless indicated otherwise on drawings) when the root zone mix has been spread uniformly over the field and compacted.

   a. Operate the irrigation system as necessary to settle and compact the mix to a final uniform depth. Compaction equipment may also be utilized excluding vibratory rollers.
   b. The field shall be compacted, settled and firmed uniformly.
   c. Extra care/work shall occur at rootzone areas along curbs, in ground boxes, heads or other obstructions to achieve compaction and finish grade.

4. Finish grades shall be achieved by using a combination of laser-operated equipment, string lines, drag screens, rollers, and hand raking with a tolerance of 1/4 inch in 25 feet.

5. The rootzone material in the area of access for the rootzone installation shall be removed from the playing field at the end of installation and new rootzone material shall be installed in its place, firmed and compacted.

D. Playing Field Finish Rootzone Elevation Tolerance Requirements: The final elevation of the Finish Grade shall be plus or minus one quarter inch at any point on the field and on a 25 foot by 25 foot grid grade as indicated on the Contract Drawings.

E. Playing Field Finish Rootzone Elevation Certification: A certified survey by a state licensed land surveyor shall be performed at 25-foot centers for each field to verify required grade and elevation tolerances of the Finish Grade. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work.

3.11 GRASSING – **BY OWNER**

A. Pre-sod Fertilization – by Owner

B. Grass Installation – By Owner: The entire area shall be approved by the Architect/Engineer and the Owner prior to laying sod. Areas to receive sod shall be firm and the irrigation and drainage

system shall be operational. Contractor to coordinate schedule and completion of finish surface with Owner so that sod can be installed within 24 hours from time of harvesting/stripping.

1. Contractor to be on site and observe the complete sod installation providing guidance as necessary to avoid damage to completed work.
2. The following instructions are for the Owners sod installation crew.
   a. Owner's installation crew shall rake or drag rootzone surface to smooth condition immediately prior to sod placement eliminating ruts, footprints or other uneven surface conditions created by the crew or equipment laying the sod.
   b. Lay sod to form a solid mass with tightly fitted joint, do not overlap Wherever a break in the big roll occurs, overlap all ends or and trim to tightly fitted joint, removing the excess. Stagger strips to offset joints in adjacent courses. Sod lengths shall be installed so that they outline skinned or track areas. Work from boards when necessary to avoid damage to finish grade. Tamp or roll lightly to ensure contact with subgrade.
   c. If plastic mesh was used to help harvest big roll sod, this material should be removed and discarded from site.
   d. Patching: All patches necessary to fill in undesirable areas shall be a minimum size of 24 inches in length and width to match that of the roll. Patches shall be of the same source and type as the original installation and shall be installed at specified finish grade and watered in firm.
   e. Filling Joints: After laying and rolling of sod, fill joints and seams with approved rootzone mixture. Broom or sweep excess material to avoid smothering grass. Sod areas requiring more than 1/4 inch of topdress to meet specified grade shall be lifted. Rootzone mix shall be added below the sod area and thoroughly compacted prior to the re-installation of the sod area. Thoroughly walk all seams to verify that all have been filled and that all low or irregular areas have been brought to specified grade tolerances.
   f. Top Dress Sodded Field: One lift of 1/8 to 1/4 inch may be required using the same rootzone mix as specified previously. Additional topdressing as required insuring a smooth and safe playing surface may also be required at sole discretion of the Owner and or his representatives. Care shall be used to avoid smothering grass.
   g. Rolling of Turf: Initial rolling of the turf after sod installation shall be performed using the lightest weight equipment as practical. Intent is to initiate good contact of sod roll to the rootzone mix surface.
3. Contractor to provide the top dressing material to the Owner. Owner to install. Contractor to observe this top dressing operation.
4. Irrigation of Grass:
   a. General: Begin irrigation as sod is completed in any one section and water thoroughly. Water sod areas, as required, through Substantial Completion and until Owner takes possession. Adjust irrigation heads as required for spray pattern and depth to finish grade

3.12 PLAYING FIELD GROW IN MAINTENANCE – **BY OWNER**

A. General: The Owner shall perform all maintenance and grow in for the grass surface thru acceptance of the project. These operations include but are not limited to

1. Mowing
2. Rolling
3. Aerification
4. Sod Replacement/Patching

5. Top Dressing

6. Weed and Pest Control

7. Fertility

B. Sports Field Irrigation System:

1. The Contractor shall work with and assist the Owner as needed for the following:

a. The system shall be adjusted on a continual basis as necessary to maintain specified coverage. Heads shall be adjusted to elevation when necessary. All repairs to lines, valves, heads and field mixes shall be performed in a timely manner repairing to the previous condition and specifications. Heads shall be cleaned as necessary to insure full pop-up and flush lowered positions. Contractor shall use care not to contaminate the amended topsoil when making repairs that require deep excavation below the rootzone layer.

2. Controller shall be set for appropriate watering intervals with adequate instructions to the Owner. When possible, Contractor shall demonstrate the operation of the system and it's controls in the presence of the Owner's Groundskeeper until they reasonably understand the system

3.13 FIELD LAYOUT

A. General: Layout of the field regarding all chalk lines and markings shall be by the Owner following Substantial Completion.

B. The Contractor shall locate and install field markers at the corners, midpoint and other locations as indicated on the drawings.

C. The Football Goal Post shall be located on the centerline of the field and so that the leading edge of the upright is directly above the front edge of the back of the end zone marker. The top edge of the bottom of the crossbar shall be 10 feet above the centerline of the playing field finish grade. The location of the Goal post and sleeve shall be located at the beginning of the playing field construction. The Contractor shall verify that the above conditions can be met at that time.

3.14 SPORTS EQUIPMENT INSTALLATION

A. Coordinate installation or delivery of Outdoor Sports Field Equipment as appropriate. Refer to 02975 Outdoor Sports Equipment Specification

3.15 CLEAN UP

A. At the end of each day, remove all scraps and other debris created by the synthetic turf installation from the playing field area.

B. Remove all surplus excavated material not required for filling and backfilling, trash, and debris and dispose of it properly off of the Owner's property at Contractor's expense.

C. Leave the premises and work in clean, satisfactory condition.

3.16 SPORTS FIELD IRRIGATION WINTERIZATION AND SPRING START-UP

A. Winterize the Sports Irrigation System the first fall during and the first fall following construction and start-up the irrigation system the following springs. Repair any damage caused in improper winterization at no additional cost to the City. Coordinate the winterization and start-up with the Owner.

3.17 PROTECTION

A. Protection of materials and work shall be the responsibility of the Contractor during installation and thru acceptance/substantial completion. All material damaged prior to acceptance shall be replaced at no cost to the Owner.

END OF SECTION 02910

SECTION 02950 PLAYING FIELD IRRIGATION BOOSTER PUMP

A. BOOSTER PUMP STATION

1. The pump station performance (150 GPM @ 100 PSI Discharge Pressure) at enclosure limits shall be as noted in the technical specifications. The capacity, discharge pressure, maximum water lift or pump inlet pressure if a booster system and intake line dimensions shall be per the technical specifications. The pump shall operate at no more than 3600 RPM. The power supply to the station shall be as noted in the technical specifications.

2. The station shall be completely wired, piped, dynamically flow and pressure tested prior to shipment.

3. Operational sequence: The pump shall activate automatically by recognizing flow. Operation shall be maintained at an adjustable minimum demand. The pump shall be automatically retired when the demand falls below the minimum adjustable set point for an adjustable time delay.

4. Construction: Construction shall be of modular form utilizing a base structurally adequate to support pumps, piping, and electrical equipment as a single integral assembly. All nuts, bolts washers, and fasteners shall be zinc or cadmium plated for corrosion resistance.

5. Space heater to be included, to prevent freeze damage.

B. PUMP AND MOTOR

1. PUMP

Pump shall be electric motor driven, horizontal centrifugal with mechanical shaft seal, volute case and impeller. The shaft seal shall be a self-adjusting mechanical type to prevent leakage and eliminate the need for a drain piping. The volute case shall be precision machined from gray cast iron and engineered to modern hydraulic standards. It shall be possible to rotate the discharge connection to any of four positions. A heavy cast iron bracket shall maintain alignment between the motor and volute case. The impeller shall be an enclosed type and balanced to provide smooth operation. The impeller shall be keyed to the shaft and locked with a special cap screw and washer. The motor shaft is to be manufactured from high grade steel and of reduced length to increase shaft rigidity, extend bearing life, and reduce the overall length of the pump and motor assembly. The pump shaft shall be protected with a replaceable stainless steel sleeve. The pump, motor and impeller shall be removable from the back of volute case for service without disturbing the plumbing. Pump shall be manufactured by Goulds.

2. MOTOR

Pump motor shall be a squirrel cage induction horizontal solid shaft type. The pump impeller shall be direct mounted and keyed to the motor shaft with a stainless steel protective sleeve. The temperature rise of the motor shall be to NEMA Standard for class B or Class F insulation. Radial and thrust bearings of ample capacity to accommodate the hydraulic thrust of the pump shall be incorporated into the motor. Motor shall be manufactured by U.S. Electric.

C. PIPING MANIFOLD, VALVES, GAUGES AND OTHER MECHANICAL EQUIPMENT

1. FABRICATED PIPING

All fabricated piping shall conform to ASTM specifications A53 for Grade B welded or seamless schedule 40 pipe. All welded flanges shall be forged steel, slip-on or weld neck type. All welded fittings shall be seamless, ASTM Specification A234, with pressure rating not less than 150 PSI.

2. CHECK VALVE

On flooded suction and booster stations the pump check valve shall be cast iron bodied with a spring loaded single disc. Check valves shall be sized according to the maximum discharge flow of the pump. Pressure drop across the check valve shall not exceed 2.5 PSI at full flow. Check valve manufacturer shall be Val-matic, Keystone or approved equal. On suction lift stations the check valve will be removed and a pressure rated foot valve will be supplied to attach on the end of the suction pipe.

3. STATION DISCHARGE ISOLATION VALVE

Isolation valve shall be American made gate valve with a brass body, stem and disc, rated for 200 psi non shock, cold water use. The valve shall be manufactured by Hammond Valve or approved equal.

4. DRAIN VALVES

Drains shall be provided from all low points in the system and shall consist of 1/4" petcocks or ball valves.

5. PRESSURE GAUGES

Pressure gauges shall be located upstream and downstream of the pump for easy reading of the intake and discharge pressure. Pressure gauges shall be 304 stainless steel case and bezel construction. Gauges shall be 2-1/2" diameter, liquid filled. Pressure sensing connection shall be 1/4" NPT lower gauge connection. Pressure gauges shall be manufactured by ENFM USA or approved equal.

D. ELECTRICAL CONTROLS

1. GENERAL PANEL

The low voltage control panel assembly shall be built in accordance with the provisions of the National Electrical Code and shall bear the U.L. listing mark for NEMA 1 industrial control panels along with the pump station manufacturers' U.L. panel shop file number. The control panel will be mounted inside the station enclosure and contain terminal blocks, relays, and HOA switch.

2. MAIN STATION DISCONNECT AND FUSING

A three-pole, fusible main station disconnect shall be mounted in a separate NEMA 3R enclosure outside the pump station enclosure to completely isolate the pump station electrical system from incoming power. Each leg of the incoming power shall be fused with a time delay fuse of the appropriate amperage.

3. PUMP THERMAL SWITCH

The temperature of the pump shall be sensed by a thermal switch. The thermal switch shall be located on the pump volute. Externally mounted snap disc type thermal switches will not be accepted. The thermal switch shall activate upon a temperature rise above 120 degrees Fahrenheit. The thermal switch shall be model TM-2A-120R as manufactured by The Nason Company or approved equal.

4. FLOW SENSOR

The pump station discharge manifold shall incorporate an insertion type, pulse frequency output flow sensor for continuous output to pump station controls. The flow sensor output pulse shall be conditioned and fed directly to the processor for conversion and display in Gallons Per Minute. Flow sensor accuracy shall be no less than 2% for flow velocities ranging from 1 - 30 feet per second. Flow sensor will be manufactured by Data Industrial.

5. PRESSURE TRANSDUCER

A solid state pressure transducer shall provide a noise free, linear output proportional to discharge pressure. Transducer shall be solid state, strain gauge type with integral voltage regulating and output accuracy not less than 0.5%. Transducer shall be constructed of stainless steel and rated for the maximum pump station discharge pressure. Pressure transducer will be manufactured by GEMS, SSI or approved equal.

6. VARIABLE FREQUENCY DRIVE (VFD)

The variable frequency drive shall be IGBT based with selectable carrier frequency up to 15 KHZ. The VFD shall include terminals for incoming power, motor output power and control terminals.

The VFD shall generate a sine-coded, variable voltage/frequency, three-phase output for optimum speed control. The VFD shall incorporate power loss ride-through. VFD protective features shall include current limit, short circuit protection, electronic motor overload protection and ground fault protection. The VFD shall have push button programming display for easy access to operation parameters.
NATIONAL ELECTRICAL CODE STANDARDS

Electrical controls shall conform to National Electrical Code Standards.

E. CONTROL ALARMS:

1. LOW SYSTEM PRESSURE SAFETY SHUTDOWN

When the station discharge pressure remains below an adjustable set point for the time called out in the Technical Specifications, the pumps will be de-energized and remain so until the alarm is manually reset. The Low Pressure alarm will be indicated on the processor display.

2. HIGH PUMP VOLUTE TEMPERATURE SHUTDOWN

If the pump volute case temperature rises above 120 degrees F. for the pre-programmed time, the pump will be de-energized and remain so until the alarm is manually reset. The High Temperature alarm will be indicated on the processor display.

3. MOTOR OVERLOAD SHUTDOWN

If the over current condition lasts longer than the pre-programmed limit the motor will be de-energized and remain so until the alarm is manually reset. The overload alarm will be indicated on the processor display.

4. VFD FAULT SHUTDOWN

The VFD shall sense additional internal faults that will cause the VFD to shutdown for system protection. These faults will be indicated on the processor display.

5. LIGHTNING ARRESTOR

The main power supply to the pump station shall be equipped with a secondary lighting arrestor having a breakdown current rating of not less than 60,000 Amps at 14,000 Volts discharge. Power supplies 300 Volts and less shall use a 300 Volt arrestor with an 800 Volt spark-over Voltage. Power supplies up to 600 Volts shall use a 600 Volt rated arrestor with a 1,000 Volt spark-over Voltage.

6. CORROSION INHIBITING MODULES

Corrosion inhibiting modules shall be installed in the main electrical control enclosure in accordance with the manufacture's recommendations.

F. MOUNTING BASE AND ENCLOSURE

1. MOUNTING BASE:

Construction shall include a fabricated base assembly to support all components during shipping and to serve as the installed mounting base. Pump station base shall be formed from a single sheet of 1/4" plate resulting in a seamless, one piece base with rounded edges and corners. Height is to be 3-1/2" inches. The base shall be strategically reinforced beneath as required to provide additional support and strength. The base shall be drilled and tapped allowing the pump to be secured to the base. The base shall be shot blasted to bare metal prior to painting process.

2. ENCLOSURE:

Construction shall include a weather resistant, 14 gauge painted steel enclosure. The front side of the enclosure shall have oversized cooling vents. The enclosure is to be supplied with a two internally mounted gas struts that shall extend to keep the access door open. All components are to be accessible from top and front sides with the door completely open. Enclosure is to be suitable for mounting to the pump station base and shall include openings for suction and discharge piping.

3. EXHAUST FAN

For the purpose of cooling the pump motor, switchgear and control logic, an exhaust fan shall be located inside the pump enclosure, mounted to the enclosure lid. The exhaust fan shall be activated upon pump start and shall run until the pump stops. The fan shall be black die-cast aluminum construction with UL94V-0 rated polycarbonate propeller and rated for not less than 240 CFM. Fan motor shall be permanent split capacitor type with stainless steel ball bearings, class B insulation and automatic thermal protection.

4. PUMP ENCLOSURE HEATER

The pump station enclosure will include a thermostatically controlled 500 watt heater. The heater will include its own fan for air movement. The heater will have circuit protection.

G. PAINTING

1. Painting of the entire pump station shall consist of a multi-step coating system which includes metal preparation, rust inhibitive baked epoxy prime coat, and a two part ultraviolet light insensitive baked polyurethane finish having total dry film thickness of not less than 5 mils. Prime coat and finish coat shall be baked at 165 degrees for not less that 30 minutes to achieve a high gloss, corrosion resistant finish. Exterior pump station components shall be painted medium green. Electrical control enclosure shall be appliance white.

H. TESTING

1. The pump station and all its component parts shall undergo a complete hydraulic and electrical test prior to shipment from the factory. Testing shall be dynamic and include operation over the entire flow range of the pump station under specified suction and net discharge pressure conditions. A plot containing actual flow, pressure, KW consumption and motor RPM shall be furnished as part of the owners manual.

I. OWNERS MANUAL

1. Complete start up instructions shall be provided by the manufacturer in the form of an owners manual.

J. WARRANTY

1. The manufacturer shall warrant the pump station to be free of defects for one year from date of start up or fifteen months after shipment, whichever occurs first. Failures caused by lightning strikes, power surges, vandalism, operator abuse, or acts of God are excluded from warranty coverage.

K. MANUFACTURER

1. The pumping station shall be model number WMBV-5000-2-10-460-3-150-45 as manufactured by WATERTRONICS, INC. 525 Industrial Drive, Hartland, Wisconsin 53029, 1-800-356-6686, (262) 367-5551 (fax) or approved equal.

IRRIGATION PUMP STATION TECHNICAL SPECIFICATION

Design criteria:	Horizontal Centrifugal, automatic pump station for turf irrigation
Pump station model #:	WMBV-5000-2-10-460-3-150-45
Quantity of pumps:	1
Pump station capacity:	150 GPM @ 100 PSI Discharge Pressure
Station inlet pressure:	55 PSI
Power supply:	3 Phase, 460 Volt, 60 Hertz
Pump station disconnect size:	30 Amp
Pump station enclosure type:	Painted Steel
Station pressure regulation:	Variable Frequency Drive AMP RATING of VFD: 17.6 Amps

Pump Station Requirements

Parameter	Pump
Pump type	Horizontal Centrifugal 5BF
Pump Flow at design point	150 GPM
Pump pressure (TDH) at design point	122'
Pump efficiency at design point	67%
Motor RPM (nominal)	3500
Motor horsepower	10 HP
Motor full load amps (FLA)	12.9 Amps
Motor efficiency @ FL	87.5 %
Starting current (locked rotor)	78.9 Amps
Motor power factor @ FL	83.2 %
Motor service factor	1.15
Pressure regulation type	VFD
Low PSI cutout set point	20 PSI below regulate
Low PSI cutout time delay	240 Seconds
High PSI cutout set point	11 PSI above regulate
High PSI cutout time delay	120 Seconds
High volute temperature cutout setpoint	120 Degrees F
Station intake size	3"
Station discharge size	3"

Additional Station Details

Discharge Z pipe	3" x 4"
Suction pipe	3" x 3"
External disconnect panel	Lockable dead-front
Heater	

SECTION 02975 OUTDOOR SPORTS EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide equipment and materials, and do work necessary to construct or provide the following, as indicated on the Drawings and as specified. Work shall include but shall not be limited to:

1. Football Equipment
   a. Goal Post System
2. Ball Netting – Alternate #1
   a. Ball Netting

1.2 RELATED WORK

A. 02910 – Natural Grass Playing Field System

B. 02830 – Chain Link Fences and Gates (Inline Ball Net System)

1.3 SUBMITTALS

A. Shop Drawings:

1. Show application to project

B. Contractor to provide show drawings for ball net and goalpost footings.

C. Product Data: Submit manufacturer's product data and samples as noted for the following:

1. Ball Net Fabric and appurtenances
   a. 3 samples of netting one square ft each
2. Field Corner Markers
3. Goal Post System

1.4 QUALITY ASSURANCE

A. Installer of outdoor sports equipment for the playing field shall be the same Contractor. All installed equipment shall be under the observation of the Owner's groundskeeper.

B. Inline Ball Net System Installer – Contractor to restretch/tighten netting if necessary 60 days after substantial completion.

1.5 WARRANTY

A. General Warranty: Special warranties specified in this Section 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 Warranties:

1. Equipment: Written warranties, executed by the manufacturer of each piece of equipment specified agreeing to repair or replace equipment or components that fail in materials or workmanship with specified warranty period.

2. Netting: Installed netting shall prevent passage of kicked, struck or thrown balls or implements per designed sport use. If netting fails to do so, installer shall adjust netting to appropriate tension.

   a. Warranty Period: Per the manufacturer.

3. Windscreen Warranty – minimum of 3 years

PART 2 - PRODUCTS

A. Windscreen Option 1 – Fencing Open Mesh (Owner to select height and style)

1. General

   a. Vinyl coated Polyester fabric, weather resistant, woven open mesh curtain, weight 7.3 oz per square yard. Borders: 1-1/2 inch wide reinforced band with brass grommets spaced 18 inches on center on all four sides, center reinforcement center fastening. Attachment: Manufacturers standard self-locking tie wraps. Provide following or approved equal. Total height and width as shown on drawings.
   b. Standard color (dark green or black) to be approved by Owner
   c. Die Cut, reinforced air vents per manufacturers recommendations

2. Product

   a. Vinyl Coated Polyester, Open Mesh (VCP)
   b. 6' Height Model (With air vents), Carron Net
      1) Air vents reinforced with webbing at edges.
   c. Approved equal

3. Suppliers

   a. Douglas Sport Nets and Equipment, (800) 553-8907, www.douglas-sports.com
   b. Carron Net Co., (888) 289-6387, www.carronnet.com
   c. Approved Equal

B. Windscreen Option 2– Fencing Opaque, Solid (Owner to select height and style)

1. General

   a. 100% polypropylene fabric, weather resistant, woven closed mesh curtain, weight 7.3 oz per square yard. Borders: 1-1/2 inch wide reinforced band with brass grommets spaced 18 inches on center on all four sides, center reinforcement center fastening. Attachment: Manufacturers standard self-locking tie wraps. Provide following or approved equal. Total height and width as shown on drawings
   b. 6' Height
   c. Standard color (dark green or black) to be approved by Owner
   d. Reinforced air vent

2. Product

   a. PolyPro Plus, Closed mesh (CMP) 21650, Douglas
   b. Or approved equal

3. Suppliers

   a. Douglas Sport Nets and Equipment, (800) 553-8907, www.douglas-sports.com
   b. Carron Net Co., (888) 289-6387, www.carronnet.com
   c. Approved Equal

2.2 BALL NET SYSTEM

A. Inline Fabricated Ball Net System

1. General

a. Framing System

1) Refer to Specification Section 02813 - Chain Link Fence and Gates and Contract Drawings for lower fencing, upright posts and footings

2) Contractor to submit sealed engineering drawings verifying footing and upright post diameters / sizes.

b. Height

1) Total height of netting system as shown on drawings complete with pulleys, pull strings, connectors, cleats, etc per recommendations of the manufacturer.

c. Netting System

1) Provide

a) Four inch square mesh

b) Twisted, knotted nylon netting.

c) Minimum Strength – 350 lbs

d) Edge treatment: Hemmed with a 5/16 inch three strand twisted polyethylene rope spliced to the edge.

e) Weather treatment – UV and weather Treated black netting and cord

f) Cables, pulleys, accessories, etc., per drawing and manufacturers recommendations

2) Netting shall be sized so that when installed it shall be fastened tight, with no slack at top of chain link fence rail. Contractor shall retighten after 60 days.

2. Netting and hardware Suppliers

a. Keeper Goals, (800) 594-5126, keepergoals.com

b. Burbank Sports Nets, (866) 349-0057

c. West Coast Netting, Inc., www.westcoastnetting.com (888) 631-6387

d. US Netting (www.usnetting.com)

e. Carron Net, (800) 558-7768, www.carronnet.com

f. Approved equal

2.3 FOOTBALL EQUIPMENT

A. Football Goal Post System – Option One

1. Goal Posts and Appurtenances for the specific sport level by the following or approved equal:

a. Upright Height

1) 30 Feet (40 ft from playing surface to top of upright)

b. Crossbar Width

1) 18'- 6"

c. Gooseneck Depth

1) 6 feet

d. Material

1) Aluminum

2. Products and Suppliers

a. Sportsfield Specialties, Inc (www.sportsfieldspecialties.com)

1) Goal System, Model No. GP 4203 PL

2) Foundation Box and Cover, Model No. GP 4570

3) Goal Post Pads, Model No. GP 4590 R Full, 18 oz.

b. Triman Tele-Goal (800) 822-6886

c. Gilman Gear
   1) LNG23 (18'- 6"w), 6' Offset, Gilman Gear
d. UCS Sports and Recreation Equipment
   1) 6' Offset
   2) (800) 526-4856
e. Or Approved Equal

3. Paint [Verify color with Owner]
   a. Powder Coated Saturn Yellow
   b. Powder Coated White

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install in accordance with manufacturers recommendations and approved shop drawings.

B. Ball Netting System

1. Inline Fence Fabricated Ball Net System
   a. Inline fencing system and uprights to be in place and approved prior to beginning this installation.
   b. Install netting, pulleys, quick-clip net connects, nets and other appurtenances per manufacturer's recommendations
   c. Use nylon ties to fasten netting to top of lower fence. Space per recommendation of manufacturer or no less than 18 inches on center.
   d. Contractor to return after 60 days to retighten netting as required.

C. Field Accessories

1. Field Corner Marker Footings/Sleeves
   a. Locate and install concrete footings and sleeves at the corners and midpoints of the field.

D. Football Equipment

1. Football Goal Post System
   a. Install new equipment as per manufacturer's instructions for location, height of crossbar and level.

END OF SECTION 02975

SECTION 133613-13 PREFABRICATED STEEL OBSERVATION TOWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes complete services to provide a permanent grandstand seating system of size and capacity indicated, and with features indicated on the drawings.

B. Related Sections

1. Division 2 Site Construction
2. Division 3 Concrete
3. Division 5 Metals

C. Complete Scope of Work in this bid package includes the following:

1. Pre-fabricated Steel Observation Tower (56-feet high) with an Observation Platform at the 48 foot level (with roof), as shown on drawings. Maximum capacity = 8 persons with room for 4 viewing cameras on two sides for Tower 1. Maximum capacity = 4 persons with room for 4 viewing cameras at one side for Tower 2 & 3.

2. Steel (ship's ladder) stairs, landings, guardrails, and handrails.

3. 2"x2"x 3/16 " Woven Wire Mesh Guard Rail Panels (Galvanized)

4. Lockable door/gate and fencing at Ground Level

5. Galvanized or Heavy-duty Exterior Primer and Finish Paints.

6. Fully-Closed Steel Tread System

7. Stain Resistant and Slip Resistant Tread Finish

8. Concrete Slab on grade at base.

9. Concrete Mat footing.

10. Quality Assurance shall be provided as outlined in IBC Chapter 17. All associated special inspection and testing costs are included in this bid package.

1.3 REFERENCES

A. IBC 2012 International Building Code with the South Carolina Amendments

B. ASCE 07-10 Minimum Design Loads for Buildings and Other Structures

C. AISC Steel Manual Thirteenth Edition

D. ACI 318-11 Building Requirements for Structural Concrete

E. ASTM E985 Standard Specification for Permanent Metal Railing Systems

F. AWS D1.1 American Welding Society Structural Welding Code

G. OSHA 2000 29-CFR-1910.23 & 24 Occupational Safety and Health Administration Guidelines

1.4 PERFORMANCE REQUIREMENTS

A. Design Loads

1. Live Load: **100 psf**

2. Minimum Wind Speed **105 mph** (per State of South Carolina Wind Speed Map)

3. Seismic Design Criteria:

a. Risk Category I
b. Soil Site Class "D"
c. S_s=0.42, S_1=0.144
d. S_{ms}=0.615, S_{m1}=0.320
e. S_{ds}=0.410, S_{d1}=0.213
f. Seismic Design Category "D"

4. Guardrail Loads
a. 200 lb Concentrated Load at any point, any direction, at top, -or-
b. 200 lb Concentrated Load on any 1 sq.ft. area in any direction, -or-
c. 50 plf Horizontal + 100 plf Vertical Uniform Load at top

B. Serviceability Requirements

1. Deflection shall be limited to **1/200** of the span for all horizontal structural members.

2. Filming Tower Drift shall be limited to **H/400**, for filming purposes.

1.5 SUBMITTALS

A. Bid Submittals - Copies of these submittals MUST be submitted with the bid. Failure to do so will result in an incomplete bid.

1. Slip resistant deck testing results.

B. Post-Bid Submittals

1. Design Submittal:

a. Provide the following information signed & sealed by a licensed professional engineer within the state where the project is located.

1) Structural Calculations

2) Full drawings including level framing plans, sections, and details.

C. Delays caused by required resubmittals due to noncompliance with the specification shall not extend any milestone date in the contract. The contractor is responsible for complying with all aspects of this specification.

1.6 SITE REPRESENTATION

A. A qualified representative of the observation tower manufacturer must be onsite at all times during installation of the tower.

1.7 QUALITY ASSURANCE

A. Experience: Manufacturer of grandstand system shall have a minimum of 10 years' experience in fabrication of observation towers of the same height and shall, upon request, provide references to successful projects of similar size and project specific requirements.

B. Installation: Installation shall be performed by factory trained and certified representatives of the observation tower manufacturer.

1. Installer shall have completed at least three installations of similar size. Documentation shall be provided upon request.

2. Installation shall be performed using wage rates. Certified payroll & copies of payroll checks shall be provided upon request.

1.8 WARRANTY

A. Product shall be guaranteed for (1) year on the structure and (3) years on the finishes together with labor. Damage resulting from abnormal use, vandalism is not applicable.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The observation tower shall be supplied utilizing all of the supplied drawings and specifications including the specific features listed in both the drawings and specifications. The 'Basis of Design' Product shall be by Band Tower (Educational Steel Products). All manufacturers shall meet the minimum requirements of the Basis of Design product:

1. Porta-King (PK Structures), Earth City, MO www.portaking.com

2. Band Tower (Educational Steel Products), Noblesville, IN www.bandtowers.com

2.2 PRODUCT COMPONENTS

A. Tower Structure Materials:

1. Tower Structure Steel Framing Members shall be:
   a. Wide Flange Shapes: ASTM 992 or ASTM A572, Grade 50
   b. Hollow Structural Shapes: ASTM A500-Grade B
   c. Connection angles and plates: ASTM A36
   d. High-Strength Bolts: ASTM A325 or ASTM A490

2. Stair Members shall be:
   a. Stringer and Tread Components: ASTM A36
   b. Guardrails : ASTM A36

B. Decking System Materials

1. All decking shall be slip-resistant open steel floor grating.

2. The decking system shall satisfy 100 psf Floor Live Loading and L/360 deflection criteria.

C. Railing

1. Guard-railing shall be 42" high and to meet the height and loading requirements mentioned above in section 1.4.A.4.

2. Guardrails shall have a 4" high kickplate.

3. Guardrail infill shall be 2" x2" Woven Wire Mesh (6 gage) with Galvanized Finish.

2.3 MATERIALS

A. Concrete

1. All concrete work & materials shall comply with ACI 318.

2. Cast-in-place Concrete shall have a minimum compressive strength of 4,000 psi at 28 days.

3. All reinforcing steel shall be in accordance with ASTM A615 with a minimum yield strength of 60 ksi.

2.4 FINISHES

1. Powder coat system shall meet or exceed the following test requirements:

   a. Direct Impact Resistance: ASTM D 2794-93, up to 140 in.-lbs.

b. Flexibility: ASTM D 522-93, Method B, 100% Pass
c. Pencil Hardness: ASTM D 3363-93a, 3H-4H
d. Crosshatch Adhesion: ASTM D 3359-97, Method B, 5B, 100% Pass
e. Salt Spray Resistance: ASTM B 117, plus 1,000 hours
f. Humidity Resistance: ASTM D 2247, plus 1,000 hours

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all existing conditions with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the work.

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

3.2 INSTALLATION

A. Install observation tower and all components according to manufacturer's written instruction and the approved shop drawings.

3.3 CLEANING

A. Clean all surfaces according to manufacturer's recommendations.

B. Use cleaning solutions and methods that do not damage the finishes or the adjacent surfaces.

C. Remove all metal burrs, sharp edges or other cutting, unsafe conditions.

D. Touch up finishes as recommended by manufacturer to the satisfaction of the architect.

END OF SECTION

SECTION 260500 BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Basic administrative and procedural requirements, and general requirements for electrical products and installation applicable to all Division 26 work.

1.2 RELATED DOCUMENTS

A. Bidding Requirements, Contract Forms, and Conditions of the Contract (General and Supplementary Conditions) apply to all work of Division 26.

B. Comply with Division 1 - General Requirements.

C. All work under this Division shall be in accordance with the Contract Documents as defined in the General Conditions.

1.3 SCOPE OF WORK

A. Provide all labor, materials, tools, equipment, transportation and services necessary for and incidental to completion of all electrical work as indicated on the Drawings and/or as specified herein.

1.4 DRAWING USE AND INTERPRETATION

A. The Drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions or details. Install work substantially as indicated. Exact equipment locations and raceway routing, etc. shall be governed by actual field conditions and/or instructions of the Engineer and/or Owner's Representative.

1.5 COMPLETE SYSTEMS

A. General: Furnish and install all materials as required for complete systems, including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation prior to Owner's acceptance.

B. Wiring: The wiring specified and/or shown on the Drawings is for complete and workable systems. Any deviations from the wiring shown due to a particular manufacturer's or subcontractor's requirements shall be made at no cost to either the Contract or the Owner.

1.6 CODES AND REGULATIONS

A. General: Comply with the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.7 REFERENCE STANDARDS

A. All latest published standards of the following associations/organizations shall be followed and applied where applicable, as minimum requirements:

1.	(ADA)	Americans with Disabilities Act.
2.	(ANSI)	American National Standards Institute.
3.	(ASTM)	American Society for Testing and Materials.
4.	(CBM)	Certified Ballast Manufacturer.
5.	(ETL)	Electrical Testing Laboratory.
6.	(EPACT)	National Energy Policy Act of 1992.
7.	(IBC)	International Building Code 2012
8.	(ICEA)	Insulated Cable Engineers Association.
9.	(IEEE)	Institute of Electrical and Electronic Engineers.
10.	(IESNA)	Illuminating Engineering Society of North America.
11.	(NBFU)	National Board of Fire Underwriters.
12.	(NEC)	National Electrical Code 2011
13.	(NEMA)	National Electrical Manufacturers Association.
14.	(NFPA)	National Fire Protection Association.
15.	(UL)	Underwriter's Laboratories.

1.8 PERMITS

A. General: Obtain and pay for any and all permits required by all applicable agencies, prior to commencing work.

1.9 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Not less than three years experience in the actual production of the specified products.

B. Installers' Qualifications: Firm with not less than five years experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.

C. Incidental Work: Painting, patching, welding, carpentry and the like related to or required for Division 26 work shall be performed by craftsman skilled in the appropriate trade, but shall be provided for under Division 26.

1.10 SUBMITTALS

A. General: Prepare and submit for approval, per the procedures set forth in Division 1, all submittals required by Division 1, this section, and by all other Contract Documents.

B. Types: Required submittals may include: Schedule of Values; List of Subcontractors; Product Data; Shop Drawings; Samples; Test Reports; Certifications; Warranties; Maintenance Manuals; Record Drawings; and various administrative submittals.

C. Number of Copies: As indicated in Division 1, Division 26 or elsewhere in the Contract Documents. For quantities indicated in the Contract Documents or specification sections other than Division 26 sections, increase number of copies by one to allow for the Engineer's record copy. Minimum number of copies per submittal: three.

D. Product Data: Submit for equipment, devices, and materials as required in subsequent individual Division 26 sections. Product data to consist of manufacturer's standard catalog cuts, descriptive literature and/or diagrams, in 8-1/2" x 11" format, and in sufficient detail so as to clearly indicate

compliance with all specified requirements and standards. Mark each copy to clearly indicate proposed product, options, finishes, etc.

E. Shop Drawings: Submit for equipment and systems as required in subsequent individual Division 26 sections. Shop Drawing to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc, in sufficient detail so as to clearly indicate compliance with all specified requirements and standards.

F. Maintenance Manuals: Include operating and maintenance data in accordance with Division 1, for each Division 26 section requiring a Product Data and/or Shop Drawing submittal. Include the respective Product Data/Shop Drawing submittals as well as descriptions of function, normal operating characteristics and limitations, and manufacturer's printed operating, maintenance, trouble shooting, repair, adjustment, and emergency instructions, and complete replacement parts listing.

G. Record Documents: Prepare and submit in accordance with Division 1. In addition to Division 1 requirements, indicate actual installed locations for all equipment and devices, routing of major interior raceways, locations of all concealed and underground equipment and raceways, and all approved modifications to the Contract Documents, and deviations necessitated by field conditions and change orders.

1.11 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract, in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

D. Certificates: Submit all required inspection certificates.

PART 2 - PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

B. General Requirements: All materials and equipment shall be in accordance with the Contract Documents, and to the extent possible, standard products of the various manufacturers, except where special construction or performance features are called for. All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product of a specified or approved manufacturer will be acceptable only when that product complies with or is modified as necessary to comply with all requirements of the Contract Documents.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. UL Listing: All electrical materials and equipment shall be Underwriters' Laboratories (UL) listed and labeled, where UL standards and listings exist for such materials or equipment.

2.2 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Conditions of the Contract, and Division 1.

PART 3 - EXECUTION

3.1 GENERAL

A. The installation of all electrical work shall be in accordance with the letter and intent of the Contract Documents, as determined by the Engineer.

B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

C. Administration and Supervision: All electrical work shall be performed under the Contractor's direct supervision, using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer and Owner in all matters to resolve conflicts and avoid delays.

3.2 DELIVERY STORAGE AND HANDLING

A. Comply with Division 1 requirements.

B. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer's identification, and compliance labels.

C. Storage and Protection: Comply with all manufacturer's written recommendations. Store all products in a manner which shall protect them from damage, weather, and entry of debris.

D. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed, and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.4 COORDINATION

A. General: Sequence, coordinate and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the electrical work.

D. Supports and Sleeves: Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

E. Obstacles and Interferences: When installing equipment and raceways, provide offsets, fittings, accessories and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.

3.5 DIMENSIONS

A. Building Dimensions: For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.

B. Limiting Dimensions: Equipment outlines shown on detail drawings of 1/4" = 1'-0" scale or larger and dimensions indicated on the Drawings are limiting dimensions. Do not install equipment exceeding dimensions indicated by outlines on Drawings, or equipment or arrangements that reduce indicated clearances.

3.6 EQUIPMENT PROTECTION

A. Protect all electrical equipment, and materials and work from the weather elements, paint, mortar, construction debris and damage, until project is substantially complete. Repair, replace, clean all electrical work so affected.

3.7 CHECKOUT, TESTING, AND ADJUSTING

A. General: Schedule and provide testing equipment, materials, instruments, and personnel as necessary to checkout and to perform all test procedures and adjustments required by the Contract Documents and/or deemed necessary by the Engineer to establish proper performance and installation of electrical systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance, and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational, unless indicated or directed otherwise.

C. Manufacturer's Authorized Representatives: When required by subsequent Division 26 specification sections, arrange and pay for the services of the manufacturer's authorized representative(s) to be present at time of equipment or system start-up, to supervise the start-up, and to conduct and/or certify all required testing and adjusting.

D. Test Reports: Submit test reports neatly typewritten on 8-1/2 x 11" sheets indicating system or equipment being tested, methodology of testing, date, and time of test, witnesses of test, and test results. Submit test reports in (3) copies to the Engineer for review, within (5) days after test is performed, and include a copy with the appropriate operation and maintenance data.

E. Correction/Replacement: After testing, correct any deficiencies, and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken, and satisfactory results of retest.

3.8 SYSTEMS DEMONSTRATION

A. Instruct the Owner's representative(s) in the start-up, operation and maintenance of all electrical systems and equipment in accordance with Division 1, as required by subsequent sections, and as requested by the Owner's Representative.

3.9 CLEANING AND TOUCH-UP PAINTING

A. Perform cleaning required by Division 1.

B. General: Periodically remove from the project site, all waste, rubbish and construction debris accumulated from construction operations, and maintain order. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.

C. Electrical Equipment: Remove all dust, dirt, debris, mortar, wire scraps, rust, and other foreign materials from the interior and exterior of all electrical equipment and enclosures, and wipe down. Clean accessible current carrying elements and insulators prior to energizing.

D. Light Fixtures: Thoroughly clean all light fixtures and lamps, just prior to final inspection. Fixture enclosures, reflectors, lenses, etc. shall be cleaned free of dust, dirt, fingerprints, etc. by an approved method.

E. Touch-Up Painting: Restore and refinish to original condition, all surfaces of electrical equipment scratched, marred and/or dented during shipping, handling, or installation. Remove all rust, and prime and paint as recommended by the manufacturer.

END OF SECTION 260500

SECTION 260501 BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: General requirements, and basic electrical materials and methods applicable to all Division 26 work. Limited scope general construction materials and methods for application with electrical installations are also included.

1.2 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature for each type of fire-stopping material to be used on the project.

1.3 COORDINATION

A. Chases, slots, inserts, sleeves and openings: Coordinate with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

PART 2 - PRODUCTS

2.1 PIPE SLEEVES

A. Rigid steel conduit or iron pipe.

2.2 CONDUIT SEALS

A. For Cast-in-Place Concrete Applications: Acceptable Manufacturers: O-Z/Gedney Type "FSK"; Thunderline Corp. "Link Seal" with " Link Seal Wall Sleeve."

B. For Core Drilled and Pre-cast Opening Applications: Acceptable Manufacturers: O-Z/Gedney Type "CSML"; Thunderline corp. "Link Seal."

2.3 FIRESTOPPING MATERIALS

A. General: Firestop systems composed of firestop compounds and appropriate damming materials installed together with the penetrant (e.g., conduit) to form a complete firestop system, providing a fire resistant rating at least equal to the hourly fire resistance rating of the floor, wall or partition into which the firestop system is to be installed.

B. Test Standards: Firestopping materials shall be tested together as a system to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and be UL classified for up to 3 hours.

C. Firestop Sealants: Non-hardening, conformable, intumescent putties, sealants or other compounds, containing no toxic solvents or asbestos, and exhibiting aggressive adhesion to all common building materials and penetrants, while allowing reasonable movement of the penetrants, without being displaced. Compounds shall be waterproof, non-toxic and smoke and gas tight.

D. Firestop Mortars: Light-weight, water-based, cementatious, fast drying, low density mortar, non-shrinking and non-cracking during its cure, and which forms a surface capable of being sanded, bored and painted.

E. Damming Materials: Mineral wool or ceramic fiber.

F. Multi-Cable Transits: Assemblies consisting of a frame, a compression mechanism, and grooved insert sealing modules sized for multiple penetrating elements of various sizes.

G. Acceptable Manufacturers: Dow Corning; Heavy Duty/Nelson; International Protective Coatings; Specified Technologies, Inc.

2.4 SOIL MATERIALS

A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve, and not more than 5 percent passing a No. 4 sieve.

C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP, free of clay, rock, or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter.

2.5 CONCRETE WORK

A. Concrete:

1. Strength: 3000 psi (20.7 - MPa@ 28 days (compressive strength), Pads 2500 psi (17.3 - MPa) @ 28 days (trench)
2. Aggregate: 3/4" aggregate
3. Cement: 588 #/cu. yd. minimum, type I or II
4. Slump: 4" maximum
5. Air: 5% - 7%

B. Reinforcing: Grade 60 bars, sized as indicated, and 6" x 6" - W1.4 x W1.4 mesh, and other reinforcing as indicated.

C. Forms: Wood, metal or other approved materials, constructed so as to withstand the forces of the newly placed concrete.

D. Equipment Pads: Minimum 3-1/2" thick indoor, 12" thick outdoor (with 9" below grade), with 1" x 45° chamfer on all top edges. For on grade installations provide 12" layer of crushed stone beneath pad. For pads to be placed on concrete floors, provide anchors into concrete floor.

2.6 TOUCH UP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL INSTALLATION - GENERAL

A. Unfinished and Finished Areas: For the purposes of these electrical specifications, "unfinished" areas shall include mechanical, electrical and telephone equipment rooms. All other areas shall be considered "finished" spaces, unless indicated or approved otherwise.

B. In Unfinished Areas: Raceways, equipment and devices may be installed, concealed or exposed, unless indicated otherwise.

C. In Finished Areas: Conceal all raceway and flush mount all electrical boxes, equipment, and devices unless indicated or approved otherwise. The space above suspended ceilings or behind furred spaces is considered outside finished areas and electrical materials installed within these areas are considered concealed.

D. Headroom: Arrange and install components and equipment to provide the maximum possible headroom, unless otherwise indicated.

E. Dimensions and Clearances: Field measure all dimensions and clearances affecting the installation of electrical work, in relation to established datum, building openings and clearances, and work of other trades, as construction progresses.

F. Rough-In Locations: Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.

G. Door Swings: Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.

H. Ceiling Mounted Devices: The locations indicated on the architectural reflected ceiling plans take precedence over the electrical documents, in the event of conflict.

3.2 LAYOUT

A. General: Install electrical systems, materials and equipment level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

B. Serviceability: Install electrical equipment and raceways, etc. to readily facilitate servicing, maintenance and repair or replacement of components, and so as to minimize interference with other equipment and installations.

C. Clearances: Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances, in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches indicating proposed rearrangement, for the Engineer's approval. Do not rearrange without express written permission of the Engineer.

D. Right-Of-Way: When laying out electrical work, give priority in available space to steam and condensate lines, sanitary lines, drain lines, fire protection piping and sheet metal duct work. Provide offsets as required to avoid conflicts. Resolve all conflicts before commencing installation.

3.3 MOUNTING HEIGHTS

A. General: Indicated heights are measured from the center of the device outlet box to finished floor or grade, unless indicated otherwise. Request instructions for mounting heights not indicated.

B. Architectural Elevations: Heights and locations for outlets and equipment in specific areas when indicated on architectural elevations take precedence over mounting heights and locations indicated in electrical documents. If outlets and equipment are not indicated on the architectural elevations, the electrical documents govern.

C. Adjustments: Adjust mounting heights in exposed masonry construction so that bottoms of outlet boxes are along the edges of blocks, unless indicated otherwise.

3.4 HOLES, SLEEVES, AND OPENINGS

A. General: Provide all holes, sleeves, and openings required for the completion of Division 16 work and restore all surfaces damaged, to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage or disturb structural elements or reinforcing steel, unless approved, in writing, by the Project Structural Engineer.

B. Conduit Penetrations: Size core drilled holes so that an annular space of not less than 1/4" and not more than 1" is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide and annular space of not less than 1/4" and not more than 1" around the conduit. Patch around sleeve to match surrounding surfaces.

3.5 CONDUIT SEALS

A. Install conduit seal for each conduit penetrating an exterior building wall below grade (unless penetration is below lowest building floor slab), and elsewhere as indicated, and so as to achieve a sealed watertight installation.

B. Install conduit seal for each conduit passing from a heated building to a non-heated building and vice versa.

C. Install conduit seal for each conduit passing from a hazardous location to a non-hazardous location and vice versa.

3.6 FIRESTOPPING SYSTEMS

A. General: Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions which are time-rated fire and/or smoke barriers.

B. Preparation: Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.

C. Installation: Install firestop systems in accordance with UL approved design details and the manufacturer's instructions. Install sleeves, conduits and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit or cable by more than one inch or by less than 1/4" when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

3.7 CUTTING AND PATCHING

A. General: Provide all cutting, drilling, chasing, fitting and patching necessary for accomplishing the work of Division 26. This includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; install equipment and materials in existing structures; in addition to that required during the normal course of construction.

B. Comply with the cutting and patching requirements of Division 1.

C. Building Structure: Do not endanger the integrity of the building structure by cutting, drilling or otherwise modifying any structural member, without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.

D. Repairs: Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

3.8 WELDING

A. General: Where welding is required, such welding shall be performed in a skilled manner by certified welders. Verify that welds are free from cracks, craters, undercuts, and strikes, weld spatter, and any other surface defects. Clean and re-weld any welds deemed unacceptable in size or configuration. Do not weld to structural steel without prior written permission from the Project Structural Engineer.

3.9 UNDERGROUND ELECTRICAL WORK

A. General: Perform all excavating, trenching and backfilling, etc. as indicated or required for the installation of all underground electrical work. Coordinate work with other trades and verify existing underground services and conditions.

B. Conduit Burial Depth: 36" below finished grade, unless indicated otherwise. All excavation and burial depths indicated are below finished grade.

C. Excavating: Do not excavate below required depth, except as necessary for removal of unstable soil or when rock is encountered. When rock is encountered, excavate six inches below the required depth and backfill with a minimum 6" layer of crushed stone or gravel between rock bearing surface and the electrical installation. Stockpile satisfactory excavated materials where directed, until required for backfilling. Remove and legally dispose of excess excavated materials and materials not suitable for backfill use. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting off at an elevation of 30" below finished grade.

D. Protection: Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavations.

E. Existing Utilities: Remove existing electrical and other utility lines so indicated. Where existing utilities which are to remain exist within areas of excavation, locate such utilities and support and protect during excavation operations.

F. Trenching: Cut all trenches neatly and uniformly and so as to provide ample working room and at least six inches clearance on both sides of raceways, etc. Take necessary precautions when working near existing underground utilities, and coordinate with the installation of concurrent utilities by other trades. Unless indicated otherwise, pitch all electrical conduit runs downward away from buildings, manholes, and pad mounted equipment. Excavate trenches to depth indicated or required. Limit length of open trench to that in which installations can be made and trenches backfilled within the same day.

G. Sand Envelope: Install a minimum envelope of three inches (top, bottom, and sides: three inches each) of fine grain sand around all electrical cables and conduits installed below grade unless indicated otherwise.

H. Preparation for Backfilling: Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approvals, and recording of underground utility locations. Prior to backfilling, remove all concrete form work, shoring, bracing, trash and debris.

I. Backfilling: Use only approved materials free from boulders, sharp objects and other unsuitable materials. Match the final elevations and materials of areas affected by electrical excavating, trenching and backfilling. Replace conduit and cables damaged by improper backfilling. Replace surface materials to match existing surface materials if no other utility or site work is being done in area. Place specified soil materials in 4" - 8" layers to required subgrade elevations, for area classifications as follows:

1. Under Sidewalks and Pavements: Use combination of subbase materials and excavated or borrowed materials.

2. Under Building Slabs: Use drainage fill materials.

3. Under Piping and Equipment: Use subbase materials where required over rock bearing surfaces and for correction of unauthorized excavation.

4. For Raceways Less Than 36" Below Surface of Roadways: Provide 4" thick concrete base slab support. After raceway installation, provide 4" thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.

J. Backfill Placement: Place backfill and fill materials in layers of not more than 8" in loose depth for material compacted by heavy equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.

K. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

L. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D1557 and not less than the following percentages of relative density, determined in accordance with ASTM D2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

1. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive materials and 95 percent relative density for cohesionless materials.

2. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive materials, and 95 percent relative density for cohesionless materials.

3. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive materials, and 90 percent relative density for cohesionless materials.

M. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

N. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish),

add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.10 CONCRETE WORK

A. General: All concrete shall be prepared from approved materials and poured on clean, stable surfaces.

B. Exterior Base Surfaces: Six-inch layer of crushed stone over well consolidated, stable, undisturbed soil. Where the underlying soil contains excess organic material, trash or voids, or fails to provide solid bearing for any other reason, excavate to the depth required for solid bearing and re-establish the required elevation with approved granular materials.

C. Finishing: Trowel all exposed surfaces smooth. Round-off or chamfer all exposed edges.

D. Curing: Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures and mechanical injury. Maintain minimal moisture loss at relatively constant temperature throughout period necessary for hydration of cement and hardening of concrete.

3.11 REFINISHING AND TOUCH UP PAINTING

A. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

B. Repair damage to paint finishes with matching touch-up coating recommended by manufacturer.

3.12 CLEANING AND PROTECTION

A. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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 grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.
2. Ground bonding common with lightning protection system.
3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Instructions for periodic testing and inspection of grounding features at ground rings based on NFPA 70B.

1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. 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.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. Dossert; AFL Telecommunications LLC.
3. ERICO International Corporation.
4. Fushi Copperweld Inc.
5. Galvan Industries, Inc.; Electrical Products Division, LLC.
6. Harger Lightning and Grounding.
7. ILSCO.
8. O-Z/Gedney; A Brand of the EGS Electrical Group.
9. Robbins Lightning, Inc.
10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

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.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.

2. Stranded Conductors: ASTM B 8.

3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.

4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression and exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 12 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.

3. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

C. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

D. Metallic Fences: Comply with requirements of IEEE C2.

1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Ground Ring: Install a grounding conductor, electrically connected to each structure ground rod and to each indicated item, extending around the perimeter of area or item indicated.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.

2. Bury ground ring not less than 24 inches (600 mm) from foundations.

3.6 FIELD QUALITY CONTROL

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

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal at individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural

drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: **10** ohms.

2. Substations and Pad-Mounted Equipment: 5 ohms.

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Section 260548 "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

6. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- (14-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c., in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. Fabco Plastics Wholesale Limited.
d. Seasafe, Inc.

3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.

4. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

5. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

1) Hilti Inc.
2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, **zinc-coated** steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.

7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, PVC and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.

6. To Light Steel: Sheet metal screws.

7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirementsfor cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal with equipment manufacturer's installation manual.

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

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.3 DEFINITIONS

A. RMC: rigid Metal conduit.

B. PVC: Polyvinal Chloride Conduit

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

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

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney.
6. Picoma Industries.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. RMC: Comply with ANSI C80.1 and UL 6.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Fittings for EMT:

a. Material: Steel.
b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

G. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

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

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corporation.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; Hubbell.
12. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ENT: Comply with NEMA TC 13 and UL 1653.

D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Solvent cements and adhesive primers 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."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

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

1. Cooper B-Line, Inc.
2. Hoffman.
3. Mono-Systems, Inc.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 4 or Type 12 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged, Flanged-and-gasketed type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

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

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman.
7. Hubbell Incorporated.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney.
12. RACO; Hubbell.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, [ferrous alloy] [aluminum], Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Hinged-Door, Free Standing Enclosures: Type 4 or Type 12 with continuous-hinge doors.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

3. Hinged doors in front with flush latch and concealed hinge.

4. Key latch to match panelboards.

5. Accessory feet where required for freestanding equipment.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the followingor equal:

2. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. NewBasis.
d. Oldcastle Precast, Inc.
e. Quazite: Hubbell Power System, Inc.
f. Synertech Moulded Products.

3. Standard: Comply with SCTE 77.

4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.

5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.

6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

7. Cover Legend: Molded lettering, "ELECTRIC."COMMUNICATIONS.

8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

9. Handholes - Minimum 12 Inches Wide by 24 Inches Long (300 mm Wide by 600 mm Long)] and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: RMC.

2. Concealed Conduit, Aboveground: RMCEMT.

3. Underground Conduit: RMC, Type EPC-40-PVCType EPC-80-PVCdirect buried.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMTor RMC.

2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): use LFMC .

3. Damp or Wet Locations: RMC.

4. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.

4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm)of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m)intervals.

2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

3. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

4. Change from EPC-40-PVC to RMC before rising above ground.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat

metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

Q. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service raceway enters a building or structure.

3. Where otherwise required by NFPA 70.

T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Y. Locate boxes so that cover or plate will not span different building finishes.

Z. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

AA. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

BB. Set metal floor boxes level and flush with finished floor surface.

CC. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.

2. Install backfill as specified in Section 312000 "Earth Moving."

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.

   b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits but a minimum of 6 inches (150 mm) below grade. Align planks along centerline of conduit.

7. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line, below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260553 ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Provide nameplates, labeling and other identification means for electrical systems equipment, devices, raceways and wires, as indicated.

1.2 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature and/or samples for each type of nameplate, label, marker, etc. to be used on the project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Amp, Brady, Hermes, Ideal, Panduit, Seton.

2.2 NAMEPLATES

A. Three-layer laminated plastic with minimum 3/16" high white engraved characters on black background, and punched for mechanical fastening. Fasteners: self-tapping stainless-steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers.

2.3 UNDERGROUND WARNING TAPE

A. Six-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and "CAUTION." Colors are as follows:

1. Red - Electric.
2. Orange - Communications.

2.4 MARKING PENS

A. Permanent, waterproof, quick drying black ink. Acceptable Manufacturers: Sanford Fine Point "Sharpie," or equal.

2.5 WIRE TAGS

A. Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.

PART 3 - EXECUTION

3.1 GENERAL

A. Clean all surfaces to receive nameplates, label or marking, and prepare according to manufacturer's written instructions.

B. Install nameplates centered and parallel to equipment lines, and secure with screws as indicated. Do not use rivets or adhesives.

C. Locate nameplate, marking, or other identification means on outside of equipment or box front covers when above ceilings and when in mechanical or electrical equipment rooms or other unfinished areas, and on inside of front cover when in finished rooms/areas.

D. Legends: Use Contract Document designations for identification unless indicated otherwise.

E. Provide the following identification, in addition to identification required by the NEC, and equipment nameplates required by NEMA and UL.

3.2 NAMEPLATES

A. Provide an engraved nameplate (with minimum height characters indicated) for each:

1. Power center, switchboard, distribution panel, and motor control center (1/2" H.).

2. Overcurrent device, motor starter, and any other device mounted in any of the above (5/16"H).

3. Branch circuit panelboard, safety switch, individually mounted motor starter, individually mounted circuit breaker, transformer, relay and contactor enclosure, and miscellaneous electrical cabinet (5/16" H.).

4. Motor control station, and toggle switch located remote from load served or where function is not easily evident (3/16" H).

5. Communications and special system cabinet (5/16" H.).

B. Embossed "Dymo" tapes will <u>not</u> be an acceptable substitute.

3.3 UNDERGROUND WARNING TAPES

A. During trench backfilling for each underground electrical, telephone, signal and communications line, provide a continuous underground warning tape located directly above line, at six to eight inches below finished grade.

3.4 MARKING PEN LABELING

A. Mark each of the following, as indicated:

1. Distribution panel and branch circuit panelboard tubs (indicate panel designation on inside of tub so that panel may be identified when its cover is removed).

2. Branch circuit panelboard pole spaces (indicate respective circuit numbers). Note - Panelboard manufacturer supplied pole space identification means may be used in lieu of marking pen, except that pre-printed stickers will not be accepted.

3. Branch circuit and feeder pull and junction box covers (indicate appropriate panel and circuit number(s) of conductors enclosed).

4. Safety switch, individual circuit breaker and motor starter covers (indicate appropriate panel and circuit number serving the equipment).

5. Wiring device coverplates (indicate appropriate panel and circuit number(s) serving the device(s)).

6. Covers for communications and other special electrical systems pull, junction and outlet boxes. Indicate appropriate system and zone or circuit numbers, etc. as applicable. Use

easily recognized system abbreviations (e.g., "FA" for fire alarm; "I/C" for intercom; "TEL" for telephone; "TV" for television antenna; "PA" for public address; "SEC" for security; "V/D" for voice/data, etc).

3.5 WIRE TAGS

A. Power Circuits: Apply wire tag indicating appropriate circuit or feeder number to each conductor present in distribution panel and panelboard gutters, and to each conductor in pull and junction boxes where more than one feeder or multi-wire branch circuit is present. Where only a single feeder or multi-wire branch circuit is present, box cover labeling and conductor color coding is sufficient.

B. Control, Communications and Signal Circuits: Apply wire tag indicating circuit or termination number at all terminations and at all intermediate locations and boxes where more than one circuit is present.

3.6 BRANCH CIRCUIT PANELBOARD DIRECTORIES

A. For each panelboard, accurately complete the circuit directory card in typewritten form, identifying load served or "spare" or "space" for each circuit pole space. Use actual Owner designated room numbers or names (not construction room designations).

3.7 FUSES AND OVERLOADS

A. At each location where fuses are installed (safety switches, motor starters, control transformers, etc.) provide an adhesive label indicating fuse manufacturer, type, voltage and ampere rating, and affix to inside of enclosure front cover.

B. For each motor starter, provide adhesive label indicating overload element manufacturer, type, size and catalog number, and affix to inside of enclosure front cover.

3.8 MANHOLE DUCT ENTRIES

A. Provide an engraved nameplate for each duct entry in each manhole. Lettering to be minimum 3/4" high. Indicate feeder designation for power lines, system designation for telecommunications lines, and designation of manhole at opposite end of ductline. Exact wording to be as approved by the Owner.

END OF SECTION

SECTION 260583 EQUIPMENT CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Connect complete, all equipment requiring electrical connections, furnished as part of this Contract or by others, unless indicated otherwise.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment and materials as specified elsewhere in Division 26 or as indicated on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Equipment Variations: Note that equipment sizes and capacities as shown on the Contract Documents are for bidding purposes and as such may not be the exact unit actually furnished. Contractor shall anticipate minor variations in equipment and shall include in his Bid all costs required to properly connect the equipment actually furnished.

B. Verification: Obtain and review shop drawings, product data and manufacturer's instructions for equipment furnished by others. Examine actual equipment to verify proper connection locations and requirements.

C. Coordination: Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.

3.2 ROUGH-IN

A. Provide all required conduit, boxes, fittings, wire, connectors and miscellaneous accessories, etc. as necessary to rough in and make final connections to all equipment requiring electrical connections.

B. In general, motors and equipment shall be wired in conduit to a junction box (or safety switch) near the unit, and from there to the unit in flexible metal or liquid-tight flexible metal conduit.

3.3 CONNECTIONS

A. Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others.

B. Verify proper connections with manufacturer's published diagrams and comply with same.

C. Verify that equipment is ready for electrical connections, wiring and energization, prior to performing same.

D. Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc. as required.

END OF SECTION

SECTION 262100 ELECTRICAL SERVICE - UTILITY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all work and coordination for work indicated below and on the drawings and pay all associated costs for the electric service.

1.2 SERVING UTILITY

A. The serving utility is South Carolina Electric and Gas.

1.3 ELECTRIC SERVICE SOURCE

A. Electrical service is to be obtained as indicated.

1.4 EXISTING CONDITIONS

A. Field verify all existing conditions, and report any discrepancies.

1.5 SUBMITTALS

A. Product Data: For all equipment furnished as part of the electric service indicate compliance with specified requirements and all utility company requirements. Written approval is required.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide all products as specified and/or indicated.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to commencing work on the service, contact the serving utility and the governing municipal authorities to ascertain their latest standards and requirements. Obtain all applicable details, specifications and other requirements pertaining to the service for the project. The installation of all service equipment, components and wiring shall comply with the requirements of the serving utility and the National Electrical Code.

3.2 INSTALLATION

A. Direct buried primary conductors shall be routed in Schedule 40 PVC Conduit when below roadways, parking lots, sidewalks and when required by the serving Utility Company. If not indicated, the minimum depth shall be as specified in the NEC Table 300.5.

3.3 DIVISION OF WORK

A. Provide all work as indicated in the contract documents and as specified by the Utility Company standards.

END OF SECTION

SECTION 262200 DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Provide dry type transformers as indicated.

1.2 SUBMITTALS

A. Shop Drawings: Indicating ratings, dimensions and features for each transformer and all accessories used on project.

B. Test Data: (for transformers of identical design to proposed units). Include: Losses at 0, 25, 50, 75, 100% rated load; percent regulation at 80% and 100% power factor; % X and % R values; maximum sound level of transformer in enclosure; and maximum hot spot and average temperature rise over 40°C ambient.

1.3 QUALITY ASSURANCE

A. Transformers shall be UL listed and labeled, and meet all applicable NEMA and IEEE standards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General Electric; Siemens; Square D; Cutler-Hammer; Acme.

2.2 DRY TYPE TRANSFORMERS

A. Enclosure: Ventilated, drip-proof code gauge steel housing with bolted removable access panels, phosphatized and finished with corrosion inhibiting undercoat and ANSI-61 gray baked enamel. Transformers shall be suitable for mounting on floor or other substantial structure, except for 15 KVA size and smaller which shall be suitable for wall mounting. NEMA 3R enclosures for all installatiosn,.

B. Core and Coil: Constructed of continuous copper or aluminum windings and high grade non-aging, grain oriented silicon steel core laminations having high magnetic permeabilities and low hysteresis and eddy current losses. Core and coil of units rated 15 KVA or more shall be completely isolated from the enclosure using vibration absorbing mounts and shall have flexible grounding strap connected to the enclosure. Connections to primary and secondary bushings shall be made using fully rated flexible straps.

C. Insulation System: Minimum 220°C temperature class.

D. Temperature Rise: Winding temperature rise by resistance limited to 115°C referenced to 40°C ambient temperature. Hot spot temperature shall not exceed 30°C above winding temperature rise rating. Case temperature shall not exceed 35°C above 40°C ambient temperature.

E. Transformers shall be energy efficient, Energy Star® / NEMA TP-1 qualified.

F. Taps: Two 5% FCBN taps for transformer sizes below 30 KVA; and two 2-1/2% FCAN and four 2-1/2% FCBN taps for transformer sizes 30 KVA and larger; referenced to nameplate voltage.

G. Noise Levels: Less than ANSI standards.

H. Ratings: KVA rating, voltages, phases and configuration as indicated. Minimum impedance: 4.5%.

I. Shielding: Provide an electrostatic shield between primary and secondary windings grounded to a common point on the enclosure. Minimum attenuation required 100:1.

J. Nameplates: Per 16195 - Electrical Identification.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mounting: Install transformers on floors or walls, or suspend from building structure as indicated, with mounting provisions, supporting means and methods as required for the weights and types of building construction encountered, and in compliance with all building and seismic codes. All floor mounted transformers to be set on 3-1/2" high concrete housekeeping pads.

B. Conduit Connections: Make all conduit connections to transformer cases using flexible metal conduit.

C. Grounding: Comply with 16450 - Grounding.

D. Sound Dampening: Comply with manufacturer's instructions related to relaxing tension or removal of shipping hold down provisions on the sound dampening system.

E. Ventilation Openings: Do not obstruct transformer ventilation openings.

F. Taps: Set transformer taps for proper secondary voltage.

3.2 TESTING

A. Visual and Mechanical Inspections:

1. Compare equipment nameplate data with drawings and specifications.

2. Inspect physical and mechanical condition.

3. Verify that the unit is properly mounted and that all shipping brackets are removed.

4. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or UL 486A.

5. Verify that the transformer neutral and case are properly bonded to building steel or other grounding means.

B. Electrical Tests

1. Perform insulation-resistance tests winding-to-winding and each winding-to-ground with 1000V DC tester, to insure that there are no short circuits or grounds.

2. Verify proper phase rotation.

C. Test Reports

1. Provide test report, number of copies as indicated elsewhere.

END OF SECTION

SECTION 262416 PANELBOARDS AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Provide branch circuit panelboards, and/or distribution panels and circuit breakers as indicated.

1.2 SUBMITTALS

A. Product Data: Manufacturer, type and general catalog information for panelboards, circuit breakers, and related equipment.

B. Shop Drawings: On 8-1/2" x 11" sheets, indicating panelboard identification, short circuit rating, bus rating (volts, phase, amps), box dimensions, quantities and ratings of overcurrent protective devices (volts, amps, poles, RMS symmetrical amperes interrupting capacity), details of panel covers and fastening, locks and latches, and all special modifications of each panel (e.g. shunt-trip breakers, ground busses, barriers, contactors). For individual circuit breakers, include enclosure description.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General Electric; Siemens/ITE; Square D; Cutler-Hammer.

2.2 PANELBOARDS

A. General: Panelboard rating, mains, mounting, and complement of breakers to be as indicated on the Panelboard Schedules.

B. Cabinet Rough-In Boxes: Code gauge galvanized steel, with inturned flanges on all sides of front, and minimum 20" wide. For panelboards with gutter taps, provide oversized cabinets as required for adequate gutter space. For double-tub panelboards, provide cabinets of identical height.

C. Panelboard Front Covers:

1. General: Dead front, sheet steel, with rust inhibitive primer and baked light grey enamel or lacquer inside and out for surface mounted panelboards, and with non-glossy prime finish, suitable for final finish for flush mounted panelboards.

2. Surface Mounted Panelboards: "Door-in-door" type covers with two doors for access into panels: a standard door and an outer door with minimum clear access into panel gutters of 2.5" on sides and 4.0" at top and bottom. Doors over protective devices with hinges concealed and welded to the back of the door and cover with door stops on the other three sides. Provide NEMA 3R type enclosure for panels mounted exterior to building.

D. Latches:

1. Metallic, flush type with lock. Non-metallic, non-flush type latches or catches will not be acceptable.

2. Vault handle with 3 point catch: Provide for doors over 48" high.

E. Interiors and Bussing:

1. Panelboard Assemblies: Removable and with provisions for front trim adjustment. Panels to be designed so that removal of any branch circuit device does not disturb adjacent devices.

2. Mains: Where no main overcurrent protective devices are scheduled, provide panelboards with main lugs only, and sub-feed or through-feed lugs when indicated. Main lugs with anti-turn feature.

3. Bussing: Copper only. Bussing to be arranged for alternating phase connection of branch devices, all spaces equipped to receive branch circuit devices. Phase bus ampacity as indicated, and with neutral bussing having ampacity at least equal to phase bus ampacity. Provide box lugs or screw terminals for each conductor terminated plus not less than five spares.

4. Equipment Ground Bus (Copper Only): In each panel, securely fastened to inside of panelboard box near bottom of enclosure. For branch circuit panelboards provide terminals for at least (20) #14-8 conductors and a lug for the feeder equipment grounding conductor. For distribution panels provide terminals for all grounding conductors present, plus at least 25% spares.

F. Short Circuit Ratings: As indicated (minimum). Each panelboard shall be labeled with the required short circuit rating, taking into account the bus bracing and overcurrent protective device interrupting ratings. All devices shall be fully rated. Lower rated overcurrent protective devices based on series ratings with upstream devices will not be acceptable.

G. Panelboard Types:

1. Branch Circuit Panelboards: Two-row, circuit breaker type.
2. Distribution Panels: Circuit breaker type.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. General: 100% rated, Bolt-in type, indicating open, closed, or trip by handle position, with common trip for all poles, trip free toggle mechanism, long time and instantaneous tripping characteristics, and minimum RMS symmetrical interrupting capacities of: 10,000A for all breakers in 208/120V panelboards; 14,000A for all breakers in 480/277V panelboards. Provide breakers with higher ratings where indicated or necessary to meet required panel short circuit ratings.

B. Panelboard Mounted:

1. Branch breakers in branch circuit panelboards to be arranged in the order as indicated in the panelboard schedules, unless approved otherwise.

C. Individually Mounted:

1. Provide individually mounted circuit breakers where indicated, with NEMA-1 enclosures unless indicated otherwise.

2.4 NAMEPLATES AND CIRCUIT IDENTIFICATION

A. Nameplates per 260553 - Electrical Identification.

B. Plastic covered circuit directory card mounted on the inside of the panel front covers, with plastic protectors.

PART 3 - EXECUTION

3.1 CABINET INSTALLATION

A. As recommended by the manufacturer, secured to building structure or to steel framing, independent of conduits and raceways.

B. Surface Mounted Cabinets: Supported by at least 4 fasteners with spacing not to exceed 30 inches.

C. Flush Mounted Cabinets: Supported by the wall construction wherever possible.

D. Operation: Verify that all breakers switch properly.

3.2 MOUNTING HEIGHT

A. General: 78" from the top of the cabinet to the finished floor, except that 8" of clearance from the cabinet bottom to the floor shall be maintained unless doing so would exceed the maximum 6'-6" disconnect height allowed by the NEC.

B. Masonry Wall Joints: Even with the top of flush mounted panelboards.

3.3 CLOSURE PLATES

A. Cover all unused overcurrent device spaces.

3.4 FLUSH TRIMS

A. Paint (or arrange for painting) separately from related wall surfaces so that future removal of cover does not damage wall finish.

3.5 SPARE RACEWAYS

A. For each flush mounted panelboard, provide (4) 3/4 inch raceways extending into the ceiling cavity at an accessible location. Terminate each raceway with a cap end, and tag capped end to indicate "Spare Use."

3.6 IDENTIFICATION

A. Refer to 260553 - Electrical Identification.

3.7 PANELBOARD SCHEDULES

A. Refer to the Panelboard Schedules that follow, or that are on the Drawings. Final panelboard schedules shall be typed with date, contractors name and telephone number.

END OF SECTION

SECTION 262726 WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Provide wiring devices and accessories as indicated.

1.2 SUBMITTALS

A. Product Data: Manufacturer's descriptive literature for each type of wiring device and coverplate to be used on project.

PART 2 - PRODUCTS

2.1 GENERAL

A. All devices shall be UL-listed and meet all applicable ANSI, FS and NEMA standards.

2.2 DEVICE COLOR

A. As selected by Architect, Engineer or Owner.

2.3 GENERAL-USE SWITCHES

A. 20 amp, 120-277 volt, A.C. only, toggle type, and single pole, double pole, three-way or four-way as indicated.

B. Acceptable Manufacturers: Leviton; Arrow-Hart; Hubbell; Pass and Seymour.

2.4 KEY SWITCHES

A. Same as above, except operated by keyed cam lock. Furnish at least two keys per key switch.

B. Acceptable Manufacturer: Pass and Seymour; Leviton.

2.5 GENERAL-USE RECEPTACLES

A. NEMA 5-20R configuration, 20 amp, 125 volt, A.C., duplex type as indicated, with wrap-around steel strap attached to back of receptacle and securely anchored into receptacle body near receptacle face, and with automatic grounding feature.

B. Acceptable Manufacturers: Leviton; Arrow-Hart; Hubbell; Pass and Seymour.

2.6 GFI RECEPTACLES

A. Ground fault circuit interrupter, feed through, duplex receptacle, NEMA 5-20R configuration, 20 amp, 125 volt A.C. with solid-state ground-fault sensing and 5 MA trip level.

B. Acceptable Manufacturers: Leviton; Arrow-Hart; Hubbell; Pass and Seymour.

2.7 SPECIAL RECEPTACLES

A. As indicated on the drawings by ratings and/or NEMA configuration. Furnish to the Owner, a matching 10' cord and plug set for each special receptacle. Provide submittals for each special receptacle type indicated.

B. Acceptable Manufacturers: Leviton; Arrow-Hart; Hubbell; Pass and Seymour.

2.8 COVERPLATES

A. General: Number of gangs, and openings to suit the number and type of devices.

B. General Use: Struck-up type, minimum .032" thick Type 430 stainless steel with U.S. #32D satin finish.

C. Weatherproof Coverplates: Suitable for the device indicated and type of outlet box used, cast aluminum or lexan. Receptacles installed in damp or wet locations shall comply with NEC 410-57. Metal coverplates only, plastic plates are not allowed.

D. Acceptable Manufacturers: Same as for general use switches and receptacles.

PART 3 - EXECUTION

3.1 MANUFACTURERS

A. Use only one manufacturer for all switches and general use receptacles. Use only one manufacturer for each type of device.

3.2 GENERAL

A. Switches: Install single pole switches so that the circuit is on when the handle is up.

B. Receptacles: Install receptacles with ground pin up where vertically mounted, and on left when horizontally mounted.

3.3 GFI RECEPTACLES

A. For each receptacle designated or indicated to be "GFI," provide a GFI receptacle. Do not substitute general use receptacle with feed-through GFI protection from upstream GFI receptacle. Do not use feed-through feature of any GFI receptacle.

3.4 COVERPLATE INSTALLATION

A. Install coverplates tight to wall, plumb, and level. Install receptacles so that device face is flush with or slightly ahead of coverplate face minimum of 0.015 in (381 micrometers). Install blank fillers in coverplate openings not used. Grout or caulk as required to provide watertight seal for weatherproof coverplates.

3.5 CIRCUIT IDENTIFICATION

A. Refer to 260553 - Electrical Identification.

END OF SECTION

SECTION 265668 SPORTS LIGHTING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The following specification describes a Musco "Green" Sports Lighting System. The Musco Light-Structure Green™ System was selected as the basis-of-design for this project. As such, Musco Lighting, Inc. is an approved manufacturer for this project. Other manufacturers whose products are of like quality and are thus approved for this project include Hubbell Lighting, Inc. Qualite Sports Lighting, Inc. and General Electric. The selection of Musco as the basis-of-design is not intended to indicate that Musco is the preferred manufacturer, but was done to allow a design to be prepared and to set the standard of quality for the project. It is understood that other approved manufacturers may require different quantities of fixtures, in total and per pole, as well as other subtle differences that make a generic design that is applicable to all manufacturers impossible to achieve. Sports lighting equipment by the named manufacturers that meets the intent and quality standards of this specification will receive full consideration during Contractor submittal reviews. The system shall be a six pole lighting layout designed for the 2 side-by-side fields.

B. Control panels shall be sized and/or provide capacity for the future field lights.

C. The Contractor shall provide all labor, materials, tools, transportation, equipment, insurance, temporary protection, permits, and all necessary and miscellaneous items required to provide the sports field lighting system shown on the plans and described herein complete and in good operating condition whether or not these miscellaneous items are specifically described in these Specifications or shown on the Drawings.

D. Work of this Section to include, but not be limited to: The installation of a complete Sports Field lighting system in accordance with the criteria set forth in the drawings and as specified herein. Provide necessary equipment for unloading, assembling, and installing: field lighting fixture assemblies; pole bases for field lighting fixture assemblies; underground feeders to, and final connections at each field lighting fixture assembly; lighting control equipment; testing/adjusting each field lighting fixture.

E. Install all work in accordance with all applicable codes and prepare additional Design Drawings and Shop Drawings as necessary to obtain approval of public authorities having jurisdiction over this Project.

F. The system shall light the two side by side fields with a maximum of six light poles. The fields shall be able to be controlled individually and operate under practice function with an initial light level of 105 fc with 75 fc average maintained level at .70 Recoverable Light Loss Factor as recommended by NCAA Best Practices.

G. Controls shall set to enable three distinct functions at the following light levels – Practice 75 fc, Maintenance 15 fc and Security 2 fc.

1.2 SUBMITTALS

A. Submittal Package: Submit the shop drawings, product data, samples, candlepower distribution curves, and quality control submittals specified below at the same time, as a complete package.

B. Shop Drawings: For poles, bases, and enclosures.

C. Product Data: Catalog sheets, specifications, and installation instructions for all fixtures and accessories to be used on the project.

1. For each pole, include data which shows that the effective projected area rating of the pole (at the required wind velocity) is greater than the total effective projected area of luminaries, brackets, and other equipment mounted on the pole.

2. Controller, include project specific schematic diagram, description of operation, and shop drawings for all enclosures.

D. Pole Foundations: Light pole manufacturer shall provide the foundation design for each different light pole application. The design shall be stamped and signed by a licensed professional engineer. Provide shop drawings to the Owner's Representative prior to commencement of work.

E. Candlepower Distribution Curves: For each type fixture.

F. Quality Control Submittals:

1. Company Field Advisor Data:

a. Name, business address and telephone number of Company Field Advisor secured for the required services.

b. Certified statement from the Company listing the qualifications of the Company Field Advisor and approval from the lighting system manufacturer.

1.3 ADDITIONAL SYSTEM REQUIREMENTS FOR OTHER THAN BASIS-OF-DESIGN MANUFACTURER

A. Design Approval: The owner / engineer will review shop drawings from the manufacturer to ensure compliance to the specification.

B. Light Level Requirements: Provide computer models guaranteeing light levels on the field for 5000 hours. If a constant light level cannot be provided, a manufacturer determined Recoverable Light Loss Factor of .7 shall be applied to the initial light level design to achieve the maintained light levels of 75 fc. A photometric plan for both initial and maintained light levels shall be submitted.

C. Revised Electrical Distribution: Provide revised electrical distribution plans shall include changes to service entrance, panel, conduit, and wire sizing, as required.

1.4 QUALITY ASSURANCE

A. Company Field Advisor: Provide the services of a Company Field Advisor for a minimum of 16 working hours for the following:

1. Determine and recommend final luminaire aiming points.
2. Render advice and witness completion of luminaire aiming at night.

B. All equipment shall be new and of high quality. All equipment furnished under these Specifications shall be listed by Underwriter's Laboratories and bear the UL label.

1. The lighting equipment shall have a UL listing for all electrical components from its connection to the feeder conductors, to its completion at the lamp socket including all connections. This listing shall be based upon UL testing and evaluation of the compatibility of the enclosures and the components for use in combination in this application in addition to the individual components being UL listed or recognized.

C. The lighting fixture/pole manufacturer shall furnish to the Contractor all equipment as outlined in the following Specifications and Drawings. The Contractor shall install the equipment and provide all wiring and conduit required to interconnect the various components.

D. All electrical equipment shall be located as indicated in the Specifications and on the Drawings. It is the responsibility of the Contractor to verify actual field conditions to determine exact locations and avoid interference with existing systems and with new installations. Final locations for the components specified herein will be verified by the Owner's Representative prior to installation.

E. Manufacturer's Guarantee: The manufacturer shall submit in writing a letter guaranteeing compliance to the specifications for light levels, light loss factor, and uniformities.

1.5 INSPECTION AND TESTING PROCEDURES

A. The lighting manufacturer shall guarantee the specified illumination levels and uniformity ratios for 10 years of operation. The measured illumination levels must be equal to or greater than the specified constant average illumination levels. Corrective action shall be taken, by the Manufacturer, to bring the installation into conformance with these criteria.

B. Test the system with entire facility illuminated. After any manufacturer recommended burn-in period and after a 30 minute warm-up.

C. Horizontal foot-candle readings shall be taken with the meter positioned horizontal 36 inches above grade. Test stations for footcandle readings shall cover 30ft x 30 ft for football.

D. Testing equipment for measurement of foot-candle levels shall be a United Technology Model 61, a calibrated Gossen Panalux Electronic 2, or an approved equal. The testing equipment shall be identified with the latest calibration date.

E. For final approval of the project the manufacturer shall provide a final report from the test results that shall provide the following items:

1. Identification of number and location of the test stations.
2. Actual horizontal foot-candle readings taken at each test station.
3. Number of hours of operation.

F. Point by Point Analysis: Measurement of light shall be demonstrated on a computer generated model which consists of a grid of a specified number of points covering a stated area on an equally spaced grid as defined by I.E.S.

1.6 MANUFACTURER'S WARRANTY

A. 10-Year Warranty: Manufacturer shall supply a signed warranty covering the entire system for 10 years. Warranty shall guarantee light levels; lamp replacements; system energy consumption; monitoring, maintenance and control services, spill light control, and structural integrity.

Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

PART 2 - PRODUCTS

2.1 SPORTS LIGHTING SYSTEM

A. Provide a complete Sports Lighting system meeting the following criteria:

1. Light Poles

a. Effective projected area (sq ft) rating of each pole greater than the total effective projected area of luminaries, brackets and other equipment mounted on pole. Poles shall be designed to withstand a minimum 95 MPH winds with 1.3 gust factors. Pole stress allowances shall be based on AASHTO 2009 design criteria.

b. Poles shall be high strength low alloy tapered tubular steel meeting ASTM-A595 standards. Poles and crossarms shall have hot-dipped galvanized coatings.

c. Minimum 4 x 6 inch handhole or larger as required to work with conductors specified. Handhole cover attached to pole with vandal resistant fasteners. Grounding lug at base of pole.

d. Provide for mounting and wiring of Public Address Speakers at a height of 25' AFG. Public Address Speakers, as specified on project drawings, to be provided by the Contractor.

e. Provide climbing rungs for maintenance of light fixtures.

2. Foundations

a. The lighting system shall be designed so that the foundation will withstand winds of 95 mph. Foundation design is to be provided by the light pole manufacturer with certification by a Professional Engineer, licensed in the State of the Installation. Direct burial steel poles will not be accepted

b. Soil Conditions: The design criteria for these specifications are based on soil design parameters as outlined in the geotechnical report.

c. Submit shop drawings to Project Engineer for review and approval prior to commencement of installation.

3. Lighting Performance

a. Performance Requirements: Playing surfaces shall be lit to an average constant light level and uniformity as specified in the chart below. Light levels shall be held constant for 25 years. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Measured average illumination level shall be +/- 10% of predicted mean in accordance with IESNA RP-6-01, and measured at the first 100 hours of operation.

Lighting Function	Average Constant Light Levels	Grid Points	Grid Spacing
Practice	75 fc	96	30' x 30'
Maintenance	15 fc	96	30' X 30'
Security	2 fc	96	30' x 30'

4. Uniformities

   a. The uniformity of the playing field shall be measured by comparing the maximum reading to the minimum reading. The ratio shall not exceed 1:5:1 for the fields at 75 fc.

5. Weight Reduction of the Crossarms

   a. The ballasts shall be mounted in an electrical components enclosure on the pole 10' above grade and separate from the fixture mounting.

6. Structural Strength

   a. The crossarm, reflector and its attachment to the pole shall be provided by the manufacturer such that it will structurally withstand winds of 150 m.p.h. without misalignment of any luminaire and without any damage to the crossarms or its components. Luminaries shall be attached to the crossarm by a minimum of two bolts, which shall be stainless steel and coated with a clear thermoset polymer coating. There shall be no penetrations of the top or sides of the crossarm.

7. Mounting Heights

   a. In order to obtain proper aiming angles for reduced glare and playability, the pole mounting heights from the playing field surface shall be as indicated on light fixture schedule.

8. Aiming Recapturing Device

   a. Light fixtures shall have a positive latching device for each luminaire on the assembly. The device shall provide for automatic repositioning of the aiming after relamping. In addition, provide a stainless steel bolt and nut to secure the alignment.

9. Enclosed Wiring

   a. All wiring shall be contained inside the crossarms, enclosures and pole.

10. Operating Temperatures of Electrical Components Enclosure

    a. The ambient air temperature of the electrical components enclosure shall not exceed 90°C.

11. Knuckle and Cone Assembly

    a. The knuckle and cone assembly for each fixture shall be of die cast aluminum construction and anodized to mil-A-8625E specifications and coated with polyurethane.

12. Fasteners, Bolts and Hinges

a. All latches, hinges and non-current carrying fasteners shall be stainless steel and shall further be coated with a clear thermoset polymer coating.

13. Electrical Components Enclosure

a. The electrical components enclosure shall be a NEMA 3R rated gasketed enclosure to house the ballasts, capacitors, fuses, thermal magnetic circuit breakers, distribution lugs, etc.

14. Factory Assembled Wire Harness

a. Provide internal (pole) wire harness assembled in the factory as a part of the lighting equipment to insure quality and consistency. Wire harness will be covered under the manufacturer's equipment warranty. Minimum size #14 AWG.

b. The wire harness shall be supported at the top of the pole by a stainless steel wire mesh grip matched to the size of the harness. There shall be not more than 13 conductors supported by a single wire mesh grip. If the harness is longer the 70 ft., an interim wire mesh grip support shall be located approximately half way down the pole.

15. Lightning Protection

a. All structures shall be equipped with lightning protection meeting standards established by NFPA 780.

16. Disconnecting Device

a. Each pole shall include, in an electrical enclosure, UL listed thermal magnetic circuit breaker or safety switches such that electrical power to all equipment on the pole served by the feeder circuit shall be disengaged by the operation of one switch. The breaker shall be located in a compartment separated from any capacitors or ballasts. Provide distribution terminal blocks which shall be factory wired from the breaker to the blocks. These blocks shall provide for termination of all ballast connection wiring. Provide fuse blocks and fuses for each ungrounded conductor feeding each ballast.

17. Lighting Controls & Contactor Cabinets

a. 480 volt AC, with ampere rating and number of poles as indicated on Drawings. Normally open, electrically held, 120 volt coil, with "On-Off Auto" selector switch. Components installed in NEMA enclosure with hinged, lockable cover and engraved nameplate "SPORTS LIGHTING CONTROL PANEL".

b. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position (Manual or Auto) and contactor status (open or closed).

c. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

d. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute "early off" commands by phone.

e. Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

f. Management Tools: Manufacturer shall provide a web-based database of actual field usage and provide reports by facility and user group.

g. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.

18. Metal Halide Luminaries

a. Practice Function and Maintenance Function Lighting Fixtures: Metal halide lamp, 1500W lamp based on a maximum of 155,000 Lumens, with assembly complete with reflector, glass lens, factory wiring through cross arms. Reflector assemblies constructed of Alzak finish, high purity, reflective aluminum. UL listing for wet locations.

b. Security Function Lighting Fixtures: Metal halide lamp, 1000W lamp witha minimum12,000 hour lamps life with assembly complete with reflector, glass lens, factory wiring through cross arms. Reflector assemblies constructed of Alzak finish, high purity, reflective aluminum. UL listing for wet locations.

c. Constant Wattage Auto Regulating metal halide lamp ballast which maintains lamp wattage within ± 10 percent upon ± 10 percent variation in line voltage and with starting current lower than operating current. UL rated and listed for 40 degrees C ambient temperature, start and operate to -20 degrees F. Suitable for operation on 60 Hz circuit, voltage rating to suit branch circuit voltage.

19. Spill & Glare Control

a. Provide external aluminum visor to minimize glare and spill light.

b. Maximum horizontal foot-candles at a distance of 200' feet from the perimeter of the field shall not exceed 0.11 fc.

20. Emergency or Momentary Power Interruption Illumination (MPI): During a power interruption, following the restoration of power after an interruption, and during each initial start up of the sports lighting system, this project shall have auxiliary lighting fixtures and control in order to provide illumination immediately after the system is energized. Quantity and location shall be as defined below.

a. The sports lighting manufacturer shall provide controls to turn on the MPI luminaire at every system startup, and turn off the MPI luminaire once the metal halide luminaries are providing substantial illumination.

b. Electrical Requirements: The contractor shall be responsible for providing adequate 277 volt, AC power to the MPI luminaires per manufacturer's requirements.

c. The sports lighting manufacturer shall submit a wiring diagram of the MPI system and electrical power requirements.

d. The sports lighting manufacturer shall submit a project specific lighting contour diagram of the MPI system.

21. Auxiliary Mounting Provisions: The pole manufacturer shall coordinate and provide an integral means for mounting the Public Address system speakers. Coordinate with Owner on concurrent product.

B. Manufacturers

1. Musco Light Structure Green – Remote ballast system with glare control (basis of design)
2. Qualite Lighting Green Star - Remote ballast system with glare control.
3. General Electric – Remote Ballast System with ULC optics.
4. Hubbell Sportsliter - Remote Ballast System with SG-V optics

PART 3 - EXECUTION

3.1 PREPARATION

A. Before performing any Work, lay out the proposed routing for the conduits, location of light poles, etc. and have it approved by the Owner's Representative and Company Field Adviser.

3.2 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaging and Transportation:

1. Require supplier to package finished products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture.

2. Protect sensitive equipment and finishes against impact, abrasion and other damage.

3. Remove and replace with new, products that are damaged prior to final acceptance by Owner.

B. Delivery and Receiving:

1. Arrange delivery of products in accordance with construction schedule. Allow time for inspection prior to installation.

2. Coordinate deliveries to avoid conflict with work and conditions at site, limitations on storage space and availability of personnel and handling equipment.

3. Deliver products in undamaged, dry conditions, in original unopened containers or packaging with identifying labels intact and legible.

4. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

5. Immediately on deliver, inspect shipment to assure:

   a. Product complies with requirements of Contract Documents and reviewed submittals.

   b. Quantities are correct.

   c. Accessories and installation hardware are correct.

   d. Containers and packages are intact and labeled

   e. Products are protected and undamaged.

C. Product Handling:

1. Provide equipment and personnel to handle products by methods to prevent soiling and damage.

2. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

3. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

D. Storage:

1. Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

2. Arrange storage to provide access for maintenance of stored items and for inspection.

3. Exterior storage:

   a. Provide substantial platforms, blocking or skids to support fabricated products above ground; slope to provide drainage.

   b. Protect products form soiling and staining.

   c. For products subject to discoloration or deterioration form exposure to elements, cover with impervious sheet material.

   d. Provide ventilation to avoid condensation.

   e. Store loose granular materials on clean, solid surfaces such as rigid sheet materials or pavement. Prevent mixing with foreign matter.

f. Prevent mixing of refuse or chemically injurious materials or liquids with building materials.

4. Periodically inspect stored products to verify proper storage.

3.3 INSTALLATION

A. Light Poles

1. Install each light pole in accordance with the manufacturer's recommendations, and the approved shop drawings.

2. Install light pole vertical. Prepare a level surface on/in compacted earth, undisturbed earth or concrete footing. Set bases on the prepared surface. Have all bases checked and approved by the Director's Representative for proper level and elevation prior to making any conduit connections.

B. Conduit System

1. Use rigid galvanized steel conduit and rigid nonmetallic conduit as specified or indicated. Where conduits enter concrete light pole bases, provide rigid galvanized steel conduit.

2. All electrical service from the panel box to the poles is to be located below grade.

3. Cleaning Conduits: Take precautions to prevent foreign matter from entering conduits during installation. After installation, clean conduits with tools designed for the purpose.

C. Grounding

1. Provide a equipment grounding conductor installed within each conduit. Connect equipment grounding conductor to ballast enclosure and ground lug on pole.

2. Provide a ground rod at each pole. Connect grounding electrode conductor to ground lug on pole.

3.4 CLEANUP

A. Remove excess materials and leave project site in a clean, neat, undamaged condition.

3.5 ACCEPTANCE

A. Basis of acceptance for sports field lighting shall be the complete installation of all items specified herein in accordance with the plans, specifications, approved shop drawings, and to the satisfaction of the Owner's Representative and Company Field Advisor.

END OF SECTION

SECTION 290500 - COMMON WORK RESULTS FOR ELECTRICAL SERVICE DISTRIBUTION

PART 1 - GENERAL

1.1 IMPOSED REGULATIONS

A. Applicable provisions of the State and Local Codes and of the following codes and standards in addition to those listed elsewhere in the specifications are hereby imposed on a general basis for electrical work: codes and standards listed on the electrical drawings.

1.2 SCOPE OF WORK

A. Provide all labor, materials, equipment and supervision to construct complete and operable electrical systems as indicated on the drawings and specified herein. All materials and equipment used shall be new, undamaged and free from any defects.

1.3 RELATED DOCUMENTS AND OTHER INFORMATION

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the portions of work specified in each and every Section of this Division, individually and collectively.

1.4 EXISTING SERVICES AND FACILITIES

A. Damage to Existing Services: Existing services and facilities damaged by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored to previous conditions by the Contractor without additional cost to the Owner.

B. Interruption of Services: Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at prearranged times approved by the Owner. Interruptions shall only occur after the provision of all temporary work and the availability of adequate labor and materials will assure that the duration of the interruption will not exceed the time agreed upon.

C. Removed Materials: Existing materials made unnecessary by the new installation shall be stored on site. They shall remain the property of the Owner and shall be stored at a location and in a manner as directed by the Owner. If classified by the Owner's authorized representative as unsuitable for further use, the material shall become the property of the Contractor and shall be removed from the site at no additional cost to the owner.

1.5 PRODUCT WARRANTIES

A. Provide manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the manufacturer, when and if the product fails within certain operational conditions and time limits. Where the warranty requirements of a specific specification section exceeds the manufacturer's standard warranty, the more stringent requirements will apply and modified manufacturer's warranty shall be provided. In no case shall the manufacturer's warranty be less than one (1) year.

1.6 PRODUCT SUBSTITUTIONS

A. General: Materials specified by manufacturer's name shall be used unless prior approval of an alternate is given by addenda. Requests for substitutions must be received at the office of the A/E at least 10 days prior to opening of bids.

1.7 ELECTRICAL DRAWINGS

A. Electrical contract drawings are diagrammatic and indicate the general arrangement of electrical equipment. Do not scale electrical plans. Obtain all dimensions from the Architect's dimensioned drawings and field measurements. The Contractor shall review Architectural plans for door swings and built-in equipment; conditions indicated on those plans shall govern for this work.

B. Coordinate installation of electrical equipment with the structural and mechanical equipment and access thereto. Coordinate exterior electrical work with civil and landscaping work.

C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be installed to provide the better quality or greater quantity of work; or, comply with the more stringent requirement; either or both in accordance with the A/E's interpretation.

1.8 SYSTEMS REQUIRING ROUGH-IN

A. Rough-in shall consist of all outlet boxes/raceway systems/supports and sleeves required for the installation of cables/devices by other Divisions and by the Owner. It shall be the responsibility of this Contractor to determine the requirements by reviewing the contract documents and meeting with the Superintendent of the trade involved and Owner's representative to review submittal data, shop drawings, etc.

1.9 SUBMITTALS

A. Refer to section 260510

PART 2 - PRODUCTS – Not Used.

PART 3 - EXECUTION

3.1 PRODUCT INSTALLATION, GENERAL

A. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing, charging, lubrication, startup, test operation and shut-down of operating equipment. Consult with manufacturer's technical experts, for specific instructions on unique product conditions and unforeseen problems.

B. Protection and Identification: Deliver products to project properly identified with names, models numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.

C. Permits and Tests: Provide labor, material and equipment to perform all tests required by the governing agencies and submit a record of all tests to the Owner or his representative. Notify the Architect five days in advance of any testing.

D. Install temporary protective covers over equipment enclosures, outlet boxes and similar items after interiors, conductors, devices, etc. are installed, to prevent the entry of construction debris and to protect the installation during finish work performed by others.

E. Clean all equipment, inside and out, upon completion of the work. Scratched or marred surfaces shall be touched-up with touch-up paint furnished by the equipment manufacturer.

F. Replace all equipment and materials that become damaged.

3.2 EQUIPMENT PROTECTION

A. Equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to panelboards, transformers, controllers, circuit protective devices, cables, wire, electronic equipment, and accessories.

C. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

D. Damaged equipment shall be, as determined by the Engineer or USC Project Manager, placed in first class operating condition or be returned to the source of supply for repair or replacement.

E. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.

F. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

3.3 UTILITY CONNECTIONS:

A. Coordinate the connection of the electrical system with the local power company. Comply with the requirements of governing regulations, franchised service companies and controlling agencies. Pay all utility fees and charges.

END OF SECTION 290500

SECTION 290502 - ELECTRICAL SERVICE DISTRIBUTION ACCEPTANCE TESTS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Refer to section 290510

1.2 References

A. ANSI/NETA ATS, "Standard for Acceptance Testing Specifications

1.3 SCOPE OF WORK

A. Acceptance tests shall be performed in accordance with the current version of ASNI/NETA ATS and by an independent testing agency.

B. Tests shall be performed in accordance with applicable codes, standards, and equipment manufacturers' instruction.

C. The Contractor shall provide all test equipment, materials and labor necessary to perform the tests, and shall coordinate with the other trades for necessary services, such as scaffolding and the uncoupling of motors.

D. Tests shall consist of visual inspections, manual operations, and electrical testing under all normal and expected abnormal operating conditions.

E. The Owner shall be notified at least 2 weeks in advance of all tests.

F. The Engineer shall be provided with a written test report, signed and dated, for all tests.

1.4 TESTING CRITERIA

A. High potential tests shall be performed at the AC or DC voltage listed in ASNI/NETA ATS unless specified otherwise herein. Do not perform more than one high potential test on any item without authorization from the Owner.

B. Dielectric absorption tests shall be performed with a 2,500 volt DC megger.

C. Megger tests shall be performed at a DC voltage of 1,000 volts for 600 volt rated equipment, and at a DC voltage of 500 volts for 120-300 volt rated equipment.

D. Continuity checks shall be performed with a low voltage DC meter, light or bell.

E. The resistance to ground shall be measured using either the three point method or the fall of potential method.

F. Test instruments shall be calibrated to national standards to insure the accuracy of tests. These calibration reports shall be made available to the Owner when requested. Depending upon

frequency of use, the instruments shall be calibrated at least every 12 months.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 VISUAL INSPECTIONS

A. Prior to manual operation and electrical testing, verify the following:
   1. The equipment is free from damage and defects.
   2. The equipment has been lubricated.
   3. The ventilation louvers are open and unobstructed.
   4. Electrical connections have been tightened.
   5. Voltages, phases, and rotation have been identified.
   6. Terminations have been identified.
   7. Equipment labels have been installed.
   8. The equipment has been calibrated.
   9. The equipment is ready to be electrically tested

3.2 MANUAL OPERATIONS

A. Prior to electrical testing, verify the following:
   1. Mechanical components operate smoothly and freely.
   2. Mechanical stops, limit switches, etc., are properly adjusted.

3.3 ELECTRICAL ACCEPTANCE TESTS

A. 600 Volt Power Cables
   1. A continuity check and a 1,000 volt DC megger test shall be performed on 600 volt power cables No. 4 AWG and larger. The megger test shall be performed between each pair of conductors and from each conductor to ground. Each test shall be performed for 15 seconds or until the insulation resistance value stabilizes.
   2. The insulation resistance between conductors, and from each conductor to ground, shall be 100 megohms minimum in one minute or less. In addition, the lowest insulation resistance value shall not differ from the highest value by more than 20 percent. If all megger readings for a given circuit are above 1000-meghoms, the 20 percent balance requirement may be waived.
   3. Proper rotation shall be verified.

B. Transformers and Panelboards
   1. A continuity check and a 1,000 volt DC megger test shall be performed on distribution and isolation transformers, and on line reactors.
   2. A 1,000 volt DC megger test shall be performed on buses, motor starters, circuit breakers, and disconnect switches. This test may be combined with the power cable megger test by testing the devices and terminated cables together.
   3. A continuity check shall be performed on motor control circuits and control panel internal wiring.
   4. An operational test shall be performed on the motor controls.
   5. Motor heater sizes shall be checked for proper size.

6. Test all shunt trip and under voltage circuit breakers. :
7. Measure the resistance of each winding at each tap connection.
8. Overpotential test on all high- and low-voltage windings-to-ground.

C. Grounding

1. Upon completion of installation of electrical grounding system, test resistance of each ground rod installation using the "Fall of Potential" method. Ground resistances shall be measured in normally dry conditions not less than 48 hours after rainfall and at low tide. Where tests show resistance to ground is over the specified value, take appropriate action to reduce resistance by driving additional sections of ground rods and then retest to demonstrate compliance. Tests shall be conducted in the presence of the Project Electrical Engineer. Provide forms to record the data as the tests are conducted. Forms shall be signed by the person conducting the test and included with project closeout documents.

END OF SECTION 290502

SECTION 290510 – ELECTRICAL SERVICE DISTRIBUTION SUBMITTALS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Comply with the applicable requirements of the Division 1 specifications (013300) and the requirements of this Division of the specifications.

1.2 SUBMITTALS

A. Submit for review by the Engineer Architect a schedule with engineering data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, i.e., catalog sheets, product data sheets, diagrams, performance curves and charts published by the manufacturer, warranties, etc., to show conformance to Specifications and Plan requirements; model numbers alone shall not be acceptable. Data submitted for review shall contain all information to indicate compliance with Contract Documents.

B. The purpose of shop drawing review is to demonstrate to the Architect that the Contractor understands the design concept. The Architect's review of such drawings, schedules, or cuts shall not relieve the Contractor from responsibility for deviations from the drawings or specifications unless he has, in writing, called the Architect's attention to such deviation at the time of submission, and received written permission from the Architect for such deviations.

C. Where cut sheets include an entire product family, mark all specific items to be utilized for this project on equipment cut sheets. Generic cut sheets with no indication of which items on the cut sheet shall be used will be rejected.

D. Response to Submittals: Shop drawings shall be stamped and signed by the Electrical Engineer with the following classifications:

E. "No Exceptions Taken": No corrections, no marks. Contractor shall submit copies for distribution

F. "Make Corrections Noted": A few minor corrections. Items may be ordered as marked up without further resubmission. Submit copies for distribution.

G. "Amend and Resubmit": Minor corrections. Item may be ordered at the Contractor's option. Contractor shall resubmit drawings with corrections noted.

H. "Rejected - Resubmit": Major corrections or not in accordance with the contract documents. No items shall be ordered. Contractor shall correct and resubmit drawings.

I. Prior Approvals and Shop Drawings must be hand delivered, received by mail, or email.

J. Submittal data received by facsimile will not be reviewed.

K. Equipment and materials requiring submittals:
   1. Section 290500 – Common Work Results for Electrical Service Distribution
      a. Product Warranties

2. Section 290502 – Electrical Service Distribution Acceptance Tests
   a. Test Reports
   b. Testing Company Qualifications.

3. Section 290511– Electrical Work Closeout
   a. Record Drawings
   b. Record Manuals
   c. Close out submittals

4. Section 290519 Low-Voltage Conductors and Cables for Electrical Service Distribution
   a. Wire

5. Section290526 – Grounding and Bonding for Electrical Service Distribution Systems
   a. Ground Rods
   b. Grounding Connections
   c. Ground Wire
   d. Bonding Bushings
   e. Bonding Jumper Braid

6. Section 290533 – Raceway and Boxes for Electrical Service Distribution Systems
   a. Raceway
   b. Boxes
   c. Enclosure ratings
   d. Dimension data
   e. Corrosion Protection

7. Section 290543 – Underground Ducts and Raceways for Electrical Service Distribution Systems
   a. Raceway
   b. Handholes
   c. Covers
   d. Cover Logo
   e. Cover/ Box Traffic Ratings
   f. Box Installation Details

8. Section 290553 Identification for Electrical Service Distribution Systems
   a. Product data for all labeling products
   b. Samples of device name plates

PART 2 - PRODUCTS

2.1 Not Used.

PART 3 - EXECUTION

3.1 MANUFACTURER'S DATA

A. Include the manufacturer's comprehensive product data sheet and installation instructions. Where operating ranges are shown, mark data to show portion of range required for project

application. Where pre-printed data sheet covers more than one distinct product-size, type, material, trim, accessory group or other variations, delete or mark-out portions of the pre-printed data which are not applicable.

END OF SECTION 290510

SECTION 290511 - ELECTRICAL SERVICE DISTRIBUTION WORK CLOSEOUT

PART 1 - GENERAL

1.1 SUBMITTALS

A. Refer to section 290510

1.2 RELATED SECTIONS

A. Refer to section 017839 for additional requirements.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Except where otherwise indicated, electrical drawings prepared by Engineer are diagrammatic in nature and may not show locations accurately for various components of electrical system. Shop drawings, including coordination drawings, prepared by the Contractor show portions of work more accurately to scale and location, and in greater detail. It is recognized that actual layout of installed work may vary substantially from both Contractor drawings and shop drawings.

B. The electrical superintendent shall maintain a white set of contract documents and shop drawings in clean, undamaged condition, for mark-up of actual installations which vary substantially from the work as shown. Mark-up whatever drawings are most capable of showing installed conditions accurately. However, where shop drawings are marked, record a reference note on appropriate contract drawings. Mark with erasable pencil, and use multiple colors to aid in the distinction between work of separate electrical systems. These documents shall be used for no other purpose. In general, record every substantive installation of electrical work which previously is either not shown or shown inaccurately, but in any case record the following:
   1. Post all addenda prior to beginning work.
   2. Underground feeder conduits, both interior and exterior, drawn to scale and fully dimensioned.
   3. Work concealed behind or within other work, in a non-accessible arrangement.
   4. Mains and branches of wiring systems, with panelboards and control devices located and numbered, with concealed splices located, and with devices requiring maintenance located.
   5. Scope of each change order (C.O.), noting C.O. number.

C. Upon each visit by the Architect/Engineer, the Contractor shall demonstrate that the record documents are being kept current, as specified hereinbefore.

2.2 RECORD MANUALS

A. Record manuals shall include the following the following:
   1. Manufacturer's operation and maintenance manuals for:
      a. Enclosures
      b. Electrical Meters

2. Shop drawings, revised to reflect all review comments, supplemented with the installation instructions shipped with equipment.
3. All field test Reports
4. Electrical Contractor's Warranty

B. Submit record manuals in quantities and in the format prescribed in the Division 1 specifications.

PART 3 - EXECUTION

3.1 INSPECTIONS

A. At all construction observations by the Architect/Engineer, the Contractor shall demonstrate to the Architect/ Engineer that all work is complete in accordance with the contract documents and that all systems have been tested and are fully operational. The Contractor shall furnish the personnel, tools and equipment required to inspect and test all systems.

END OF SECTION 290511

SECTION 290519 – LOW-VOLTAGE CONDUCTORS AND CABLES FOR ELECTRICAL SERVICE DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the requirements for the following:
   1. Wire and cable for 600 volts and less.
   2. Wiring connectors and connections.

1.2 SUBMITTALS

A. Refer to section 290510.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; current edition.

B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; current edition.

C. NFPA 70 - National Electrical Code; National Fire Protection Association, current edition.

PART 2 - PRODUCTS

2.1 WIRING REQUIREMENTS

A. Exterior locations (above or below grade) XHHW or USE in raceway.

B. Use conductors not smaller than 12 AWG for power and lighting circuits.

C. Use conductors not smaller than 14 AWG for control circuits.

2.2 BUILDING WIRE

A. Conductor: Copper.

B. Insulation Voltage Rating: 600 volts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pull all conductors into raceway at same time.

B. Use suitable wire pulling lubricant for building wire 4 AWG and larger. Do not exceed manufacturers recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Neatly train and lace wiring inside boxes, equipment, and panelboards.

E. Clean conductor surfaces before installing lugs and connectors.

F. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

G. Use split bolt connectors or compression fittings for splices and taps on conductors 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

H. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

I. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

J. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values or UL 486A and UL 486B.

K. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

L. For each electrical connection/termination, provide a complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other materials necessary to complete splices and terminations. Torque all connections according to installation instructions.

M. Splicing of feeder conductors shall not be acceptable, unless specifically indicated on the drawing. Where splicing of feeder conductors is indicated, splices shall be made using compression type butt splice.

3.2 LABELING

A. Color Coding
   1. Color shall be green for grounding conductors and green with yellow stripe for isolated grounding conductors.
   2. The color of the circuit conductors shall be as follows:

120/208 volt, 3-phase	Phase A - Black Phase B -Red Phase C - Blue Neutral - White
277/480 volt, 3-phase:	Phase A - Brown Phase B - Orange Phase C - Yellow Neutral – Gray

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS, except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION 290519

SECTION 290526 – GROUNDING AND BONDING FOR ELECTRICAL SERVICE DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Grounding and bonding components.

B. Provide all components necessary to complete the grounding system(s) consisting of:
   1. Concrete-encased electrode.

1.2 SUBMITTALS

A. Refer to section 290510.

1.3 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.4 REFERENCES

A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; current edition.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; current edition.

C. NFPA 99 - Standard for Health Care Facilities; National Fire Protection Association; current edition.

D. IEEE Standard 142 "Green Book" – Recommended Practices for Grounding of industrial and Commercial Power Systems; current edition.

1.5 PERFORMANCE REQUIREMENTS

A. Maximum grounding system resistance: 15 ohms.

B. Services at power company interface points shall comply with the power company ground resistance requirements.

PART 2 - PRODUCTS

2.1 ELECTRODES

A. Sectionalized steel with copper-welded exterior, 3/4" dia. x 10'. One 10-foot section shall be required at each ground rod location, unless as otherwise directed in this specification.

2.2 CONDUCTORS

A. Bonding Jumper Braid: Copper braided tape, sized for application.

B. Electrical Grounding conductors: Unless otherwise indicated, provide bare or green insulated stranded copper electrical grounding conductors sized according to NEC or as shown or specified. Provide green insulated for conductors sized No. 10 AWG and smaller.

2.3 GROUND CONNECTIONS

A. Below Grade: Exothermic-welded type connectors.

B. Above Grade:
1. Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lock washers.
2. Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.
3. Rack and Cabinet Ground Bars: one-hole compression-type lugs using zinc-plated or copper alloy fasteners.

C. Install exothermic connectors and terminals as recommended by the connector and terminal manufacturer for intended applications.

D. Bolted clamp will not be accepted between grounding rods and ground conductors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 CORROSION INHIBITORS

A. When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

B. Where concrete penetration is necessary, non-metallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground wire and the opening shall be sealed with a suitable compound after installation of the ground wire.

3.3 MEDIUM-VOLTAGE EQUIPMENT AND CIRCUITS

A. Pad Mounted Transformers:
1. Provide a driven ground rod and bond with a grounding electrode conductor to the transformer grounding pad metal steel.
2. Ground the secondary neutral.

B. Lightning Arresters: Connect lightning arresters to the equipment ground bus or ground rods as applicable.

C. Metallic Conduit: Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided

with grounding bushings. Connect bushings with a bare grounding conductor to the equipment ground bus.

3.4 SECONDARY EQUIPMENT AND CIRCUITS

A. Panelboards; Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.

B. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders and power and lighting branch circuits, sized in accordance with Article 250 of NFPA 70.

C. Boxes, Cabinets, Enclosures, and Panelboards:
   1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
   2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
   3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

D. Metallic Conduit: Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect bushings with a bare grounding conductor to the equipment ground bus.

3.5 INSTALLATION

A. Install ground electrodes at locations indicated. Provide additional electrodes as required to achieve specified resistance to ground.

B. Make rebar in concrete pad electrically continuous such that the resulting installation consists of a concrete encased electrode per Article 250 of the NEC. Extend No. 1/0 THWN grounding electrode conductors from convenient points along the "ground ring" to the following points:

C. If it is determined that the rebar cannot be made electrically continuous, install a No 1/0 bare copper conductor in the footing around the perimeter of the building.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.

E. Bond together metal siding not attached to grounded structure; bond to ground.

F. Bond together reinforcing steel and metal accessories in pool and fountain structures.

3.6 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA STD ATS except Section 4.

B. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

C. Upon completion of installation of electrical grounding system, test resistance of each ground rod installation using the "Fall of Potential" method. Ground resistances shall be measured in normally dry conditions not less than 48 hours after rainfall and at low tide. Where tests show resistance to ground is over the specified value, take appropriate action to reduce resistance by driving additional sections of ground rods and then retest to demonstrate compliance. Tests shall be conducted in the presence of the Project Electrical Engineer. Provide forms to record the data as the tests are conducted. Forms shall be signed by the person conducting the test and included with project closeout documents.

END OF SECTION 290526

SECTION 290533 – RACEWAY AND BOXES FOR ELECTRICAL SERVICE DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Refer to section 290510

1.2 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); current edition

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); current edition

C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); current edition

D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; current edition

E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; current edition

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; current edition

1.4 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 - PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Conduit Size: Comply with NFPA 70.
   1. Minimum Size: 3/4 inch

B. Wet and Damp Locations:
   1. Exterior above ground: RMC, IMC, or LTFMC
   2. Exterior below ground and in pipe basements: RNC schedule 40/80

3. Where ENT Schedule 40 is installed below grade, the elbows required to turn the raceway up through the slab shall be RMC.

C. Areas subject to physical damage: RMC, IMC, or LTFMC(LTFMC shall be only used with restrictions, see conduit installation)

2.2 METAL CONDUIT

A. Rigid Steel Galvanized Conduit (RMC): ANSI C80.1.

B. Intermediate Metal Conduit (IMC): ANSI C80.6.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.
1. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
2. Standard threaded couplings, locknuts, bushings, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
3. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
4. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
5. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
6. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.

2.3 NONMETALLIC CONDUIT

A. RNC: Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high density polyethylene (PE).

B. RNC: NEMA TC 2, schedule 80 PVC

C. Fittings shall meet the requirements of UL 514C and NEMA TC3

D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.

2.4 EXPANSION AND DEFLECTION COUPLINGS

A. Conform to UL 467 and UL 514B.

B. Accommodate, 0.75 inch deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.

C. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.

D. Jacket: Flexible, corrosion resistant, watertight, moisture and heat resistant molded rubber

material with stainless steel jacket clamps.

2.5 CORROSION PROTECTION

A. Corrosion protection for conduits passing through concrete slabs shall be by one of the following means: field-wrapped with 3M Scotchrap No. 50, 2-inch wide (minimum), with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough-in.

B. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to provide a complete wiring system.

3.2 CONDUIT INSTALLATION

A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 101.

B. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.

C. Arrange supports to prevent misalignment during wiring installation.

D. Arrange conduit to maintain headroom and present neat appearance.

E. Route exposed conduit parallel and perpendicular to walls.

F. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

G. Route conduit in and under slab from point-to-point.

H. Maintain adequate clearance between conduit and piping.

I. Maintain 12 inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

J. Cut conduit square using saw or pipecutter; de-burr cut ends.

K. Bring conduit to shoulder of fittings; fasten securely.

L. For power conduits install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch (50 mm) size.

M. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

N. Provide suitable pull string in each empty conduit except sleeves and nipples.

O. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

P. Complete the installation of electrical raceways before starting installation of cables within raceways.

END OF SECTION 290533

SECTION 290543 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SERVICE DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTALS:

A. Refer to section 290510

PART 2 - PRODUCTS

2.1 HANDHOLES

A. Handholes shall be constructed of steel reinforced 3,000 pound, 28-day strength concrete, or reinforced polymer concrete manufactured in molded structural shapes, on undisturbed or thoroughly compacted earth and shall conform with details and dimensions indicated on the drawings. Neoprene or other suitable water-stops shall be provided at all concrete construction joints.

B. Locations of handholes shall be as dimensioned. Where no locating dimensions are given, handholes shall be approximately where shown, with possible interferences with other utilities, etc.

C. Frames and covers for handholes shall be heavy duty, top quality, close grained gray cast iron or reinforced polymer concrete, both being milled to provide a true fit. Covers shall be equipped with drop lift handles and with the word "ELECTRIC" cast thereon. Type and style of frames and covers shall be as indicated on the drawings.

D. Hardware shall be of gray cast iron or hot-dip galvanized steel.

E. Water, mud, and trash shall be periodically pumped or otherwise removed from handholes by the Contractor until final acceptance of the work.

F. Metal Frames and Covers: Shall be made of cast iron. Cast iron frames and covers shall meet Fed Spec. RR-F-621. Covers shall be rated AASHTO H20. The words "electric" shall be cast in the top face of the covers.

2.2 WARNING TAPE

A. Provide a plastic warning tape in the backfill above all underground cables, conduits and duct banks. The tape shall be 3 inches wide, shall be bright, fade-resistant yellow in color, and shall include an imprinted legend, ""WARNING - BURIED HIGH VOLTAGE LINE", "WARNING - BURIED FIBER OPTIC LINE" or "WARNING - BURIED TELEPHONE LINE", as applicable., repeated continuously throughout the entire length. Tape shall be buried 12 inches below top of trench.

PART 3 - EXECUTION

3.1 GENERAL

A. Layout of underground raceway is the responsibility of the Contractor. Coordinate layout

with existing site conditions, and work by other trades.

B. Excavation, Trenching and Backfilling: Provide as required to install underground raceway in the manner indicated on the drawings.

C. Provide barricades with warning lights, around all trenches. Barricades shall be orange mesh type supported by rods driven into the earth. Barricades shall remain in place at all times, not just at night. Maintain the integrity and appearance of the barricades until the trenches have been backfilled and compacted.

D. Clearance from Other Utilities: Do not install lines installed under this contract in the same trenches with other utilities. Maintain horizontal and vertical separation as required by ANSI C2.

3.2 INSTALLATION

A. During construction, partially completed lines shall be protected from the entrance of debris such as mud, sand and dirt, by means of suitable conduit plugs. As each section is completed, a testing mandrel not less than 12 inches long with a diameter 1/4-inch less than the size of the conduit, shall be drawn through each conduit, after which a brush having the diameter of the conduit, and having stiff bristles, shall be drawn through until the conduit is clear of all particles of earth, sand, and/or gravel; conduit plugs shall then be immediately installed.

B. Ducts crossing roadways and parking lots shall be reinforced as indicated on the drawings. Cutting and patching shall conform to the details shown on the Civil drawings. Engage the services of the paving and grading contractor to perform all cutting and patching.

C. Install warning tape 12" below grade along the entire length of, and centered on duct banks.

D. Bends: Except at conduit risers, changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet. Sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 48".

E. Connections to Handholes: Connections shall be constructed to have a flared section adjacent to the manhole to provide shear strength. Underground structures shall be constructed to provide for keying the concrete envelope of the duct line into the wall of the structure. Vibrators shall be used when this portion of the envelope is poured to assure a seal between the envelope and the wall of the structure. Conduits shall terminate in end-bells where duct lines enter manholes.

F. Connections at Pad Mounted transformers: Terminate encasement at underside of concrete pad.

3.3 RECONDITIONING OF SURFACES

A. Ground covering and vegetation disturbed during installation, shall be restored to original elevation and condition.

B. Sod or topsoil shall be preserved carefully and replaced after the backfilling is completed.

Sod that is damaged shall be replaced by sod of quality equal to that removed. When the surface is disturbed in a newly seeded area, the restored surface shall be re-seeded with the same quantity and formula of seed as that use in the original seeding.

3.4 CABLE PULLING

A. Pull cables down grade with the feed-in point at the handhole or enclosures of the highest elevation. Use flexible cable feeds to convey cables through the handhole opening and into the conduit. Cable slack shall be accumulated at each handhole where space permits. Minimum allowable bending radii shall be maintained.

B. Lubricants: For assisting in the pulling of cables shall be those specifically recommended by the cable manufacturer. The lubricant shall not be deleterious to the cable sheath, jacket, or outer coverings.

C. Cable Pulling Tensions: Shall not exceed the maximum pulling tension recommended by the cable manufacturer.

D. Grounding Conductor: Secondary cable runs, 600 volts and less, in non-metallic conduit shall, although not indicated, include an insulated copper equipment grounding conductor sized as required by the rating of the overcurrent device supplying the phase conductors.

END OF SECTION 290543

SECTION 290553 – IDENTIFICATION FOR ELECTRICAL SERVICE DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Refer to section 290510

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic, black letters on white background unless noted otherwise.

B. Locations:
   1. Each electrical distribution and control equipment enclosure.

C. Letter Size:
   1. Use 1/4 inch (6 mm) letters for identifying grouped equipment and loads.

D. Labels: Embossed adhesive tape, with 3/16 inch (5 mm) white letters on black background. Use only for identification of individual wall switches, receptacles, and control device stations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install nameplates and labels parallel to equipment lines.

B. Secure nameplates to equipment front using corrosion resistant screws.

C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.

D. Provide name plates on all disconnects and motor starters.

END OF SECTION 290553

SECTION 329200 - 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. Coordination with Owner provided and Owner installed sod areas.

B. Related Sections:

   1. Section 31200 for earthwork.
   2. Division 32 Section "Irrigation System" for turf irrigation.
   3. Division 32 Section "Plants".

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.

J. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass and other unspecified growth.

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, quantity, 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.

C. Certification of Sod (Owner provided and Owner installed): From sod 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.

D. Qualification Data: For qualified landscape Installer.

E. Product Certificates: For soil amendments and fertilizers, from manufacturer.

F. Material Test Reports: For existing in-place surface soil and imported or manufactured topsoil.

G. Written Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required initial maintenance periods.

H. Soil analysis report for each soil type.

I. If hydroseeding, submit methods (including rate of application, mixture, ratios, etc.) and materials for review and approval by Owner's Rep.

J. Peat moss quantity.

K. Plant fertilizer analysis.

1.5 QUALITY ASSURANCE

A. All landscaping and irrigation shall be performed by the same contractor and shall be a firm specializing in this work and must have a minimum of 5 years' experience in turfgrass installation.

B. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress
2. Pesticide Applicator: State licensed, commercial.

C. Sod Producer (Owner provided and Owner installed): Company specializing in sod production and harvesting with a minimum 5 years experience and certified by the State of South Carolina or Georgia.

D. Soil-Testing Laboratory Qualifications: 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.

E. 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; 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 Owner's Rep. 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.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 "Project Meetings". Contractor shall discuss the following:

1. Development of critical path schedule.
2. Coordination of grassing with other trades (i.e., Owner provided/Owner installed grassing, underground utilities, irrigation, installation of practice field grassing, fencing installation, etc.).

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 (Owner provided, Owner installed): Harvest, deliver, store and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turgrass 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. Deliver sod in pallets. Do not deliver more sod than can be laid within 24 hours. Do not harvest or transport sod when moisture content may adversely affect sod survival.

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.

D. Protect all products from weather damage, excessive temperatures and construction operations.

1.7 WARRANTY

A. It is the responsibility of the Contractor to make known any site conditions which may be harmful or growth inhibiting to the plant materials specified, prior to the installation of said materials.

B. Special Warranty: (Excludes Owner provided and/or Owner installed)Installer agrees to repair or replace plantings and accessories that he has installed and fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control. Warranty shall cover any plant loss due to weather damage to plants installed out of normal planting season.

2. Warranty Periods from Date of Substantial Completion (Excludes Owner provided and/or Owner installed) :

   a. Seed, Hydroseed, Sod: 12 months.

1.8 PROJECT CONDITIONS

A. Planting Restrictions: Coordinate installation of seed during normal planting seasons for each type of plant materials required.

B. Temporary Grassing: If project requires grassing outside of the recommended planting season, the Contractor shall install, at his expense, an altered or "temporary" grass blend utilizing the following timeframes:

1. Install temporary grassing between dates of September 1st- March 30th.
2. Install permanent grassing between dates of March 30th and September 1st.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and when winds do not exceed 10 mph velocity.

1.9 MAINTENANCE SERVICE

A. Initial Maintenance Service (Excludes Owner provided and/or Owner installed): 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 cover is established but for not less than the following periods:

1. Seeded or Hydroseeded: From time of installation until time of Final Acceptance or 60 days from date of Substantial Completion, whichever is greater.

a. When initial maintenance period has not elapsed before end of planting season, or if acceptable cover is not fully established, continue maintenance during next planting season.

2. Sodded Turf (Owner provided, Owner installed): From time of installation until time of Final Acceptance or 60 days from date of Substantial Completion, whichever is greater.

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: Seed of grass species as follows, with not less than 85 percent germination, not less than 98 percent pure seed, and not more than 0.5 percent weed seed:

1. Permanent Grass Seed Mix: Triangle Blend Hulled Bermudagrass Seed.
2. Temporary Grass Seed Mix: Triangle Blend Unhulled Bermudagrass Seed with overseed of Annual Ryegrass Seed.
3. Purple Lovegrass Seed: (ERSP): Eragrostis spectabillis- Purple Lovegrass

2.2 TURFGRASS SOD (OWNER PROVIDED, OWNER INSTALLED):

A. Turfgrass Species: Certified approved nursery grown grade; cultivated grass sod; minimum age 18 months; type indicated on Drawings with fiberous root system, free of stones, burned or bare spots, disease, nematodes, soil borne instects and containing no more than 5 weeds per 1,000 square feet:

1. Tifway 419

2.3 ACCESSORIES

A. Topsoil: Specified in Section 31200, and amended as required by soil analysis.

B. Peat: Canadian sphagnum peat, brown in color, clean, low in mineral and woody content, mildly acidic and either granulated or shredded; with water absorption capacity of 1100 to 2000 percent by weight.

2.4 SOIL CONDITIONING AMENDMENTS

A. For pH ranges above 7.3, use Aqua-Phix to acidify soil (lower pH), as recommended by soils test report.

B. For pH ranges below 6.3, use NeutraLime to decrease acidity of soil (raise pH), as recommended by soils test report.

C. Water: Potable

2.5 FERTILIZERS

A. Commercial Fertilizer: Conforming to applicable Federal and State laws, uniform composition, dry, free-flowing and delivered to site in original unopened containers. Application rate an minimum analysis shall be as recommended by soils test report.

1. Nitrogen shall be urea-based fertilizer.

2.6 PLANTING SOILS

A. Lawn Planting Soil: ASTM D 5268 soil, with pH range of 6.3 to 7.3 for Bermuda grass.

1. Peat Moss: Adjust percentage of organic material of existing soils that are unacceptable according to minimum requirements specified by soil tests. Spread peat moss uniformly on soil surface.
2. Incorporate peat moss and soil conditioners into topsoil to a depth of 4 – 6 inches by disking or rototilling. Use hand tools where power equipment is inaccessible.
3. Add required fertilizer at rate specified by laboratory test. If season does not permit immediate fertilization, then apply fertilizer in the following spring at recommended rate. Do not apply nitrogen fertilizer between October 1 and March 1, except as directed by Owner or Owner's rep.
   a. For bid purposes only, the application rate shall be 19-19-19 commercial fertilizer at 250 pounds per acre. This rate shall be altered as required by soil testing.
   b. Incorporate fertilizer into topsoil by disking or rototilling to depth of 1 inch for seeded areas. Use hand tools where power equipment is inaccessible.
   c. Recompact soil to density specified in Section 02200.

2.7 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded Hardwood.
2. Color: Natural.
3. Location: All plant beds and tree rings, unless otherwise indicated.

B. Shredded Hardwood Mulch: Shall be free from deleterious materials and suitable as a top dressing of trees and shrubs, in areas as indicated on Drawings.

2.8 PESTICIDES AND HERBICIDES

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. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting 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 Owner's Rep and replace with new planting soil.

D. Beginning of installation means acceptance of existing condition.

E. Do not start grass installation until fine grading has been approved by Owner's Rep.

F. Contractor shall install grass as indicated on Drawings. Notify Owner's Rep for approval prior to installing. Contractor shall make reasonable adjustment of grass areas as recommended by Owner's Rep.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations. On a daily basis, dispose of trash and debris created by operations.

B. Protect adjacent turf and plant bed areas from overseeding or overspray during installation.

C. 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.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted in the immediate future.

B. Perform grassing only after other work affecting ground surface has been completed. (See Planting Soils section.)

C. Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1/2 inchin any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them 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 1/10 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 acceptance of finish grading from Owner's Rep; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

A. Sow seed with rotary or drop-type distributor. Do not broadcast or drop seed when wind velocity exceeds 10 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 as indicated below:

1. Permanent grass seed: Triangle Hulled Bermuda Blend Seed- 88 pounds per acre.
2. Temporary grass seed (if planting season requires): Triangle Unhulled Bermuda Blend Seed: 106 pounds per acre; overseeded with Annual Rye seed at 10-12 pounds per 1000 square feet.
3. Purple Lovegrass: 6 pounds per acre.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.

E. Place Flextera FGM mulch on seeded areas within 24 hours of seeding. Place mulch uniformly in continuous blanket in accordance with manufacturer's instructions.

3.5 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. Apply slurry uniformly to all areas to be seeded. Apply slurry at a rate to obtain the specified seed-sowing rate.

3.6 SODDING (OWNER PROVIDED, OWNER INSTALLED)

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.

C. 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.

D. 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 4 inches below sod.

3.7 TURF MAINTENANCE (Excludes Owner provided and/or Owner installed turf)

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 2 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. If required, lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. For permanent grass, water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon roots are established and top growth is tall enough to cut; or 4 – 6 weeks after planting. 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 bermudagrass to a height of 3/4 to 1 inch.

D. Turf Post-fertilization: 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. in accordance with soil test recommendations.

E. Fungicides and Insecticides: Apply as required to control diseases and turfgrass pests. Notify Owner before each application.

F. Spot weed.

3.8 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Owner's Rep:

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. Scattered bare spots exceeding 4 inches by 4 inches shall not total more than two square feet (2 SF) in any 100 square foot area.

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. Scattered bare spots exceeding 4 inches by 4 inches shall not total more than two square feet (2 SF) in any 100 square foot area.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.9 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 329200

SECTION 310519.16 GEOMEMBRANE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes smooth high density polyethylene (HDPE) geomembrane.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Submit product data, schedules, and shop drawings describing the work to be performed. Work covered by these submittals shall not proceed until they have been approved by the Engineer.

B. Required submittals include:

1. Geomembrane Manufacturer's qualifications.

2. Geomembrane liner installer's qualifications.

3. Geomembrane manufacturer's product data and specifications for geomembrane components.

4. Geomembrane manufacturer's detailed description of recommended seaming and testing equipment and procedures.

5. Proposed geomembrane panel layout detailing seams and sequence of installation.

6. Installation schedule.

7. Details of joints, anchoring, penetrations and other construction details.

C. Submit pertinent record documents including:

1. Geomembrane manufacturer's quality control certification for all material delivered. Submit certification upon delivery.

2. Record drawings showing panel layout, number, installation sequence and date, locations of non-destructive tests, all seam test failures and all repairs and patches.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Geomembrane manufacturer's Qualifications:

a. The geomembrane manufacturer shall have manufactured 10 million square feet of geomembrane of the type listed in this specification.

2. Geomembrane Installer's Qualifications:

a. The liner installer shall submit to the Engineer documented evidence of their ability and sufficient capacity to perform the work by having previously successfully installed a minimum of five (5) million square feet of similar type geomembrane.

b. Geomembrane installer shall have quality assurance/quality control personnel on site at all times. These personnel will be dedicated solely to performing quality assurance/quality control functions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle geomembrane in accordance with the manufacturer's recommendations. Each roll shall be clearly labeled with the name of the manufacturer, product type, roll number, physical dimensions and date of production.

1.6 WARRANTY

A. Geomembrane manufacturer shall furnish a material warranty for the geomembrane material to the Owner. Material warranty shall be for 20 years commencing with the date of final acceptance of the installation.

B. The geomembrane installer shall guarantee the geomembrane installation against defects in materials, installation and workmanship for 2 years commencing with the date of completion. The guarantee shall include the services of qualified service technicians and all material required for repairs at no expense to the Owner. All welds shall be included in the guarantee. Where the double wedge welding technique is used, both the inner and outer welds along the seam shall be guaranteed.

PART 2 - PRODUCTS

2.1 MATERIAL

A. General:

1. All geomembrane components shall be new.

2. Geomembrane material shall be a high density polyethylene geomembrane having a nominal thickness of 40 mils and shall be smooth on both sides.

3. The geomembrane material shall be free of holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Geomembrane with holes, blisters, undispersed raw material or signs of contamination by foreign material shall be removed from the site and replaced at no additional cost to the Owner.

4. The geomembrane material shall be a minimum 20.0' seamless width. Labels on the roll shall identify the thickness, length, width, manufacturer's mark number, and the direction to unroll the material.

B. Geomembrane shall be manufactured from first quality polyethylene resins and meet or exceed the following specifications:

PROPERTY	TEST METHOD	QUALIFIER	REQUIREMENT
Thickness (mils)	ASTM D 5199	Nominal	40
Thickness (mils)	ASTM D 5199	Minimum	36
Carbon black Content (%)	ASTM D 4218	Range	2-3
Carbon Black Dispersion (category)	ASTM D 5596	-	*
Density (g/cc)	ASTM D 792 Method B	Minimum	0.940
Tensile Properties (each direction)	ASTM D 6693 Type IV		

PROPERTY	TEST METHOD	QUALIFIER	REQUIREMENT
1. Tensile Strength at Yield (pounds/inch width)		Minimum Ave.	84
2. Tensile Strength at Break (pounds/inch width)		Minimum Ave.	150
3. Elongation at Yield (percent)		Minimum Ave.	12
4. Elongation at Break (percent)		Minimum Ave.	700
Tear Resistance (pounds)	ASTM D 1004	Minimum Ave.	28
Puncture Resistance (pounds)	ASTM D 4833	Minimum Ave.	70
Oxidative Induction Time (minutes)	ASTM D 3895	Minimum	100
Environmental Stress Crack Resistance (hours)	ASTM D 5397, Appendix	Minimum	300
Oven aging with HP OIT (% retained after 90 days)	ASTM D 5885	Minimum Ave.	80
UV Resistance with HP OIT (% retained after 1600 hours)	ASTM D 5885	Minimum Ave.	50

* Only near spherical agglomerates for 10 views: 9 views in cat. 1 or 2, and 1 view in cat. 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The geomembrane installer shall certify daily in writing that the subgrade surface on which the geomembrane is to be installed is acceptable.

3.2 PREPARATION

A. Surfaces to be lined shall be smooth and free of rocks, sticks, roots, sharp objects, and all debris that may puncture the geomembrane. The surface to be lined shall be firm and unyielding, with no sudden changes or breaks in grade.

B. Moisture Content:

1. Allow no standing water or excessive moisture within construction area.

3.3 INSTALLATION

A. The geomembrane material shall be cleaned of all debris or other materials that may negatively affect the membrane system.

B. Sheet Placement:

1. The first ten (10) feet of material of each roll shall be inspected prior to placement by the Engineer. Material deemed unsuitable for placement by Engineer shall be discarded at no additional cost to the Owner.

2. Sheets shall be placed only on surfaces which have been prepared to conform with these specifications and found acceptable for geomembrane installation. A subgrade acceptance form provided by the installer shall be prepared and signed daily by the Installer and Engineer. Copies of these documents shall be included in the final record documents.

3. The overlap between adjacent geomembrane sheets shall be a minimum of four (4) inches.

4. The geomembrane shall be placed over the prepared surface in such a manner as to assure minimum handling. The sheets shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Only those sheets of geomembrane material which can be anchored and sealed together that same day shall be unpackaged and placed in position. Placement methods shall minimize formation of wrinkles. Wrinkles shall be repaired at the direction of the Engineer.

5. In areas where wind is prevalent, geomembrane installation shall be started at the upwind side of the project and proceed downwind. The leading edge of the geomembrane shall be secured at all times with sandbags or other means sufficient to hold it down during high winds.

6. Sandbags or rubber tires may be used as required to hold the geomembrane in position during installation. Tires shall not have exposed steel cords or other sharp edges which may snag or cut the synthetic geomembrane. Materials, equipment or other items shall not be dragged across the surface of the geomembrane. All parties walking or working upon the geomembrane material shall wear soft-sole shoes.

7. Geomembrane sheets shall be closely fit and sealed around protrusions through the geomembrane. All piping, structures and other protrusions through the geomembrane shall be sealed with approved sealing methods, or as shown on the Drawings.

8. Smoking shall not be permitted by personnel working on the geomembrane.

9. All areas of the geomembrane damaged during installation as determined by the Engineer shall be repaired by the installer as specified at no additional expense to the Owner.

10. No vehicles of any sort will be allowed to operate directly on the geomembrane unless otherwise approved by the Engineer.

C. Field Seams:

1. All seams shall be made using either the extrusion welding technique or the double wedge welding technique. Field seaming is prohibited when either ambient air or sheet temperature is below 32°F, when the ambient air temperature is above 120°F, when the sheet temperature is above 160°F, during periods of precipitation, or when winds are in excess of 20 miles per hour.

2. Welding equipment which exhibits an excessive number of "burn-outs" or failing tests, as determined by the Engineer, shall be removed from the project until proof of repair is shown. The engineer may require continuous monitoring of the welding machine by the installer.

D. Extrusion Welding:

1. Field joints shall be made by overlapping adjacent sheets a minimum of four (4) inches and extruding a ribbon of extrusion joining resin between overlapped sheets or over the seam between the sheets according to procedures recommended by the geomembrane manufacturer.

2. Prior to extrusion welding of the seams, all areas which are to become seam interfaces shall be cleaned of dust and dirt. The slick surfaces of the sheet which are to become seam interfaces shall be roughened with a wire brush, grinding wheel or other acceptable means before extrudate is placed between the overlapping sheets or over a lapped seam.

E. Double Wedge Welding:

1. Field joints shall be made by overlapping adjacent sheets a minimum of four (4) inches or as recommended by the welding machine manufacturer or geomembrane manufacturer.

2. Prior to double wedge welding of the seams, all areas which are to become seam interfaces shall be cleaned of dust and dirt.

3. Self-propelled double wedge welders shall be used for welding the lapped seams between sheets.

4. Double wedge welding shall not take place unless the sheet is dry.

F. Defects and Repairs:

1. All seams and non-seam areas of the geomembrane shall be examined by the geomembrane Installer for identification of defects, holes, blisters, excessive scuffing, wrinkles, distress, undispersed raw materials and any sign of contamination by foreign matter.

   a. Defective or damaged materials shall be documented by the geomembrane installer. Actions taken to resolve or correct the problem shall also be documented.

   b. Defects, wrinkles, holes, blisters, undispersed raw materials, signs of contamination by foreign matter, unacceptable welds in geomembranes and other unsatisfactory conditions shall be documented by the geomembrane installer. The repair or corrective action to "correct" the problem shall also be documented.

   c. All such documentation must be received and approved by the Engineer prior to covering the geomembrane.

2. Each suspect location both in seam and non-seam areas shall be non-destructively tested as specified. Each location which fails the non-destructive testing shall be marked by Installer and repaired. Work shall not proceed with any materials which will cover locations which have been repaired until passing tests results are obtained.

G. Geomembrane Repair Procedures:

1. Any portion of the geomembrane failing a non-destructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be decided by the Engineer. The procedures available include:

   a. Patching - used to repair large holes, tears, wrinkles, and contamination by foreign matter;

   b. Buffing and re-welding - used to repair small sections of extruded seams;

c. Spot welding or seaming - used to repair small tears, pinholes, or other minor localized flaws;

d. Capping - used to repair large lengths of failed seams or wrinkles;

e. Topping - used to repair areas of inadequate seams which have an exposed edge;

2. In addition, the following provisions shall be satisfied:

a. Surfaces of the geomembrane which are to be repaired shall be abraded no more than one hour prior to the repair;

b. All surfaces must be clean and dry at the time of the repair;

c. All seaming equipment used in repairing procedures must be approved;

d. The repair procedures, materials, and techniques shall be approved in advance of the specific repair by the Engineer.

e. Patches or caps shall extend at least 6 in. beyond the edge of the defect, and all corners of patches shall be rounded with a radius of at least 3 inches.

H. Geomembrane Verification of Repairs:

1. All repairs shall be identified on the as-built drawing. Each repair shall be non-destructively tested using the methods described in this specification as appropriate.

3.4 FIELD QUALITY CONTROL

A. Geomembrane installer shall employ on-site physical inspection of all geomembrane materials and installation procedures.

B. Geomembrane installer shall perform physical nondestructive testing on all welds to document airtight homogeneous seams. Testing shall consist of pressure testing on fused seams and vacuum box testing on extrusion welded seams. Engineer shall observe and document that all non-destructive testing of the geomembrane was performed.

1. Air Pressure Testing (ASTM D5820):

a. Equipment for Air Testing:

1) Air pump capable of generating and sustaining a pressure between 20 to 60 psi.

2) Rubber hose with fittings and connections.

3) Sharp hollow needle, or other approved pressure feed device with a sealed and liquid filled pressure gauge capable of reading and sustaining a pressure between 0 and 60 psi in one pound increments.

b. Procedure for Air Testing:

1) Seal both ends of the seam to be tested.

2) Insert needle or other approved pressure feed device into the sealed channel created by the fusion weld.

3) Inflate the test channel to a pressure of approximately 25 to 30 psi, and allow the pressurized channel to stabilize for two (2) minutes. Re-inflate to a minimum of 25 psi as necessary. The initial pressure reading shall be recorded once stabilization has taken place. Close valve, observe and record the initial pressure.

4) Observe and record the air pressure five (5) minutes after the initial pressure setting is recorded. If loss of pressure exceeds 4 psi or if the pressure does not stabilize, locate the suspect area and repair.

5) At the conclusion of all pressure tests, the end of the air-channel opposite the pressure gauge shall be cut. A decrease in gauge pressure must be observed or the air channel will be considered "blocked" and the tests shall be repeated from the point of blockage. If the point of blockage cannot be found, cut the air channel in the middle of the seam and treat each half as a separate test.

6) Remove the pressure feed needle and seal the resulting hole be extrusion welding.

c. In the event of a Non-Complying Air Pressure Test, the following procedure shall be followed:

1) Check seam and seals and retest seams.

2) If a seam will not maintain the specified pressure, the seam shall be visually inspected to localize the flaw. If this method is unsuccessful, remove the overlap left by the wedge welder and vacuum test the entire length of seam.

a) If a leak is located by the vacuum test, repair by extrusion fillet welding. Test the repair by vacuum testing.

b) If no leak is discovered by vacuum testing, the seam will be considered to have passed non-destructive testing.

d. General Air Testing Procedures:

1) The opposite end of the air channel will in all cases be pierced to assure that no blockages of the air channel have occurred.

2) Whenever possible, seams should be air-tested prior to completing butt seams to avoid having to cut into the geomembrane. All cuts through the geomembrane as a result of testing will be repaired by extrusion welding.

3) All needle holes in air channels remaining after testing shall be circled by testing crew and will be repaired with an extrusion bead.

e. Air Pressure Testing Documentation:

1) All information regarding air-pressure testing, (date, initial time and pressure, final time and pressure, pass/fail designation, and Technician's initials) shall be written at both ends of the seam, or portion of seam tested. All of this information shall be documented by the geomembrane installer. This documentation will be reviewed daily by the Engineer. The Installer shall include this information in the record document submittal for the geomembrane.

f. Vacuum Testing (ASTM D5641):

1) This test shall be used on extrusion welds, or when the geometry of a fusion weld makes air pressure testing impossible or impractical, or when attempting to locate the precise location of a defect believed to exist after air pressure testing.

g. Equipment for Vacuum Testing:

1) Vacuum box assembly consisting of a rigid housing with a soft neoprene gasket attached to the bottom, a transparent viewing window, port hole or valve assembly, and a vacuum gauge.

2) Vacuum pump assembly equipped with a pressure controller and pipe connection.

3) A rubber pressure/vacuum hose with fittings and connections.

4) A bucket and means to apply a soapy solution.

5) A soapy solution.

h. Procedure for Vacuum Testing:

1) Trim excess overlap from the seam, if any.

2) Turn on the vacuum pump to reduce the vacuum box to between 3 and 5 psi gauge.

3) Apply a generous amount of a strong solution of liquid detergent and water to the area to be tested.

4) Place the vacuum box over the area to be tested and apply sufficient downward pressure to "seat" the seal strip against the liner.

5) Close the bleed valve and open the vacuum valve.

6) Apply a minimum of 3 psi vacuum to the area as indicated by the gauge on the vacuum box.

7) Ensure that a leak tight seal is created.

8) For a period of approximately 10 to 15 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.

9) If no bubbles appear after 15 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum three inch (3") overlap, and repeat the process.

i. Procedure for Non-Complying Test:

1) Mark all areas where soap bubbles appear and repair the marked areas.

2) Retest repaired areas.

j. General Vacuum Testing Procedures:

1) Overlap shall be trimmed prior to vacuum testing all seams.

2) Special attention shall be exercised when vacuum testing "T" seams or patch intersections with seams.

k. Vacuum Testing Documentation:

1) Vacuum testing crew shall use permanent markers to write on liner indicating tester's initials, date, and pass/fail designation on all areas tested.

2) All of the above information plus location and test unit number shall be documented by the geomembrane installer. The documentation will be reviewed daily by the Engineer. The geomembrane installer shall include this information in the record document submittal for the geomembrane.

C. Quality-control technicians, employed by the geomembrane installer, shall inspect each seam. Any area showing a defect shall be marked and repaired.

D. No materials shall be placed over any area of installed geomembrane until the installed geomembrane has been accepted by the Engineer. In order to gain acceptance by the Engineer, installer shall submit all as-built documentation and test results required by this specification including, but not necessarily limited to, as-built geomembrane panel lay-out, all field installation logs, non-destructive test logs and results showing passing and failing tests, and repair reports. This information shall be reviewed and approved by the Engineer prior to acceptance of any areas of installed geomembrane and installation of cover materials above the geomembrane.

E. Upon the Engineer's acceptance of the geomembrane installation or portions thereof, the geomembrane shall be covered with proposed materials as soon as possible to prevent damage to the geomembrane that could be caused by weather conditions or construction activities. Any completed geomembrane that is left uncovered prior to acceptance by the Engineer shall be protected from potential wind damage through the use of sandbags and/or tires to prevent uplift, and protected from construction activities by preventing construction personnel and equipment from entering these areas. In no case shall geomembrane that has been accepted by the Engineer remain uncovered for longer than 14 calendar days.

F. The geomembrane installer shall prepare and maintain record drawings which detail and delineate all geomembrane panels, deficiencies, seams, repairs, penetrations, roll numbers, seam numbers, and other required information to fully and comprehensively document the as-built condition.

END OF SECTION

SAMPLE

SITE SPECIFIC HEALTH AND SAFETY PLAN

VAPOR MITAGATION SYSTEM IMPLEMENTATION
USC FOOTBALL OUTDOOR PRACTICE FACILITY
BLUFF ROAD, COLUMBIA, SC

Terracon Project No. 73137065
November 22, 2013

Terracon
521 Clemson Road
Columbia, SC

SAMPLE

Terracon

SITE SPECIFIC HEALTH AND SAFETY PLAN

VAPOR MITAGATION SYSTEM IMPLEMENTATION
USC FOOTBALL OUTDOOR PRACTICE FACILITY
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Terracon Project No. 73137065

1.0 INTRODUCTION

This Site Specific Health and Safety Plan (HASP) will govern the activities of all Terracon personnel conducting intrusive assessment and mitigation of solid waste landfill facilities. The purpose of this plan is to prevent adverse health effects from potential contaminants and safety hazards which may be present at this site.

Subcontractors engaged in project activity at this site will comply with applicable provisions of the Occupational Safety and Health Act of 1970, the safety and health requirements set forth in Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1910.120, where applicable, and any applicable state, city or local safety codes. Each subcontractor will be responsible for supplying a competent person to oversee the work they perform at this project site. The competent person for each subcontractor will bear primary responsibility for utilizing equipment and work practices necessary to protect the safety of the subcontractor's employees engaged in activities at this project site.

The subcontractor will maintain an orderly and safe work area around drilling/probe/excavation equipment to minimize the potential for accidents. In addition, the subcontractor will provide whatever safety barricades or warning devices are deemed necessary by USC/Terracon to prevent accidents or injury to field personnel and the general public.

Subcontractors engaged on this project site may utilize this site specific HASP as a guide for their employees, or each subcontractor may develop and utilize their own site Safety and Health Plan provided the provisions of the subcontractor's site Safety and Health Plan are at least as stringent as the requirements contained in this Plan. Decisions regarding equivalence of safety and health requirements will be made by the USC / Terracon Project Manager (or Corporate Safety and Health Manager). Adoption of this HASP by subcontract employers shall not relieve any site subcontractor for the responsibility of the health and safety of its employees.

2.0 SAFETY AND HEALTH ADMINISTRATION

The Project Manager is ultimately responsible for seeing that work on this project is performed in accordance with the safety and health provisions contained in this HASP. The designated Site Safety Officer (SSO) will monitor compliance with this Plan during field activities. All field team members engaged in project activities will be required to sign the "Acknowledgment of

Instruction" form included with this Plan. The SSO will maintain a copy of this Plan on site for the duration of project activities.

Terracon and subcontractor task leaders will be responsible for:

- Providing subordinate personnel a copy of this Plan, and briefing them on its content.
- Enforcing the applicable provisions of this Plan.
- Inspecting and maintaining equipment in compliance with applicable federal, state or local safety regulations.
- Enforcement of corrective actions.
- Investigation of accidents or injuries.

The following individuals will be responsible for implementation and enforcement of the Plan:

TITLE	NAME	PHONE
Project Manager:	Mike Hudgins, PG	803-603-1313
Terracon Safety and Health Manager:	Gary K. Bradley, CSP, CHMM	913-599-6886
Site Safety and Health Officer:	_____	_____
Terracon Task Leader(s):	_____	_____
	_____	_____
Subcontractor Task Leader:	_____	_____

If hazardous conditions develop during the course of project activity, the SSO will consult the Corporate Safety and Health Manager and coordinate actions required to safeguard site personnel and members of the general public. Additional safety measures will be verbally communicated to all project personnel, recorded in writing and appended to this Plan.

3.0 MEDICAL SURVEILLANCE REQUIREMENTS

Subsurface contamination may be encountered during the course of this investigation. All Terracon personnel participating in this project shall be enrolled in a health monitoring program in accordance with the provisions of OSHA 29 CFR 1910.120 and 1910.134. Each project participant shall be certified by a Doctor of Medicine as fit for respirator and semi-permeable/impermeable protective equipment use. All personnel shall have received an environmental physical examination within one year prior to the start of project activities. The content of acceptable physical examinations will be determined by a consulting physician. Follow-up medical examinations will also be provided in the event of job site injury or unprotected exposure to contaminants in excess of eight-hour time weighted average permissible exposure limits. Certificates of medical examination will be maintained by the Corporate Safety and Health Manager.

4.0 EMPLOYEE TRAINING REQUIREMENTS

All Terracon personnel participating in this project must have completed 40 hour Hazardous Waste Operations Training and at least three days of supervised field activity per requirements of OSHA 29 CFR 1910.120. In addition, a current 8-hour annual refresher training certificate will be required for all personnel. Training certificates for all project personnel will be maintained by the Corporate Safety and Health Manager and/or the SSO at the project command center. The SSO and at least one other Terracon site participant shall maintain a current certification in basic First Aid training as provided by the American Red Cross.

Prior to the start of site activities, all Terracon project personnel will participate in a pre-project safety and health briefing outlining the contents of this Plan. The personnel responsible for project safety and health will be addressed, as will site history, scope of work, site control measures, emergency procedures and site communications. Daily "tailgate" safety and health briefings will be presented by the SSO at the start of each work day. Records of safety and health briefings will be maintained for the duration of this project.

South Carolina OSHA generally follows federal OSHA requirements. According to 29 CFR 1910.120(e), site workers that could be potentially exposed to hazardous substances, health hazards, or safety hazards and their supervisors and management responsible for the site work shall receive either 24 or 40-hour HAZWOPER training under a qualified vendor. Workers engaged in subsurface trench work or other activities within the EMA, and which may be potentially exposed to the contaminants of concern and health hazards, shall receive a minimum of 40 hours of HAZWOPER instruction. Workers who work in the EMA only occasionally for a specific task such as surveying, etc., and who are unlikely to be exposed over permissible exposure limits shall receive a minimum of 24 hours of instruction.

All Contractors working as defined within the EMA shall at all times comply with all applicable environmental laws. Management and handling of contaminated media shall be conducted in accordance with the South Carolina Solid Waste Management Regulation (R. 61-107), SC Hazardous Waste Management Regulation (R. 61-79), and the SC Pollution Control Act

Subcontracting of work does not relieve the Contractor of any of its obligations, including obligation to comply with all applicable environmental laws.

5.0 SITE HISTORY/SCOPE OF SERVICES

The project site is a former farmer's market facility, located at Bluff Road in Columbia SC, that previously contained an unregulated solid waste landfill which served the City of Columbia (see Exhibit 1). The site is currently used for game day parking for the football stadium. The proposed site redevelopment includes two outdoor and one indoor practice facilities for the USC football program. Terrain surrounding the site is fairly flat to gently sloping to the west-southwest. Site

access will be via existing, active roadways. The former landfill (dump) has been closed for over 30 years, and known trash or debris has been covered with approximately 15 to 20 feet of fill.

Concentrations of methane have been detected at potentially combustible levels in the subsurface across the site. The source of the methane is suspected to be an abandoned, unpermitted landfill located at the western boundary of the site. Lithologic data collected during installation of site wells indicates a low permeability unit is present at a depths ranging from 6 to 13 feet, allowing methane to accumulate to combustible levels. It has been shown that methane can accumulate beneath lower permeability soils encountered at this site; however, once released, methane levels dissipate fairly rapidly within the breathing zone.

Terracon personnel and USC contractors will mobilize to the former (landfill) site to conduct the following services:

- Installation of a Methane Vapor Mitigation System (VMS) to include a liner and active or passive methane vent system under the outdoor practice facility.

Anticipated site activities governed by this Plan will require approximately 20 days for completion.

6.0 HAZARD ASSESSMENT

The former landfill site was utilized for an unknown period of time. Records of wastes buried at this landfill are not available. Although it is not believed that drummed chemical wastes or industrial wastes have been deposited in the landfill, their presence cannot be ruled out. Buried solid wastes such as household wastes, cellulosic waste, inert materials, glass, steel, tires, and discarded batteries, etc. may be encountered during soil boring or deep excavation activities. Drilling or excavation personnel will remain alert to staining of drill tools, the presence of granular materials, chemical odors or other signs of subsurface encounters with potentially hazardous materials. Impermeable gloves will be donned prior to handling drilling tools which are suspected to have encountered subsurface contaminants.

Site personnel performing soil borings at this project site may be exposed to biological, as well as slip, trip and fall hazards as outlined below. Air monitoring as outlined below will only be required during site excavation work below 3 feet. All Terracon personnel who mobilize to the project site will wear Level D personal protective equipment consisting of a standard work uniform, abrasion resistant gloves (leather, heavy PVC), safety footwear (ANSI-Z41) and hard hat. Additional requirements for air monitoring and personal protective requirements for personnel engaged in intrusive operations are outlined below.

6.1 Physical Hazards

Activities to be performed on site will involve powered drilling, excavation, and grading equipment. Personnel must remain aware that as personal protective equipment increases,

dexterity and visibility may be impacted and performing some tasks may be more difficult. Tape all loose protective clothing to avoid entanglement in drilling/probing equipment. Before drilling or excavation proceeds, underground utilities must be located and marked. Other drilling/probing safety precautions to be observed include the following:

- All personnel working around drill rigs will be familiarized with emergency shut-down procedures and the position of "kill" switches.
- No loose fitting clothing, jewelry or unsecured long hair is permitted near the rig.
- Keep hands and feet away from all moving parts while drilling is in progress. Shovel auger cuttings with long handled shovel DO NOT use hands or feet.
- Daily inspection of all ropes, cables and moving parts is mandatory.
- A first aid kit and fire extinguisher will be immediately available at all times.
- All drill crews shall consist of at least two persons.
- No drilling is permitted during impeding electrical storms, tornadoes or when rain creates a hazardous work environment.
- Keep drill rig at least 10 feet from all overhead power lines; use spotters to help rig operator maneuver vehicle.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of site materials is prohibited in the exclusion zone.
- Before raising the drill mast, walk completely around the rig and ensure that minimum clearance distance of 10 feet is maintained from the nearest power line.
- Drill rigs will not be moved with the mast in the upright position.
- If drilling must be performed less than 10 feet from overhead power lines, the local utility must be contacted.

Other physical hazards which may be present on this project site include:

- Back injuries due to improper lifting - Use proper lifting techniques. Lift with the legs, not the back. Keep loads close to the body and avoid twisting. Loads heavier than 50 pounds (lbs) require a second person or mechanical device for lifting. Use mechanical devices such as drum dollies, hand trucks, and tool hoists (for lifting augers) to lift or move heavy loads whenever possible.
- Ergonomic Stress - Lift carefully with load close to body with the legs taking most of the weight. Get help with lifts greater than 40 lbs. When working with a heavy tool or object, keep legs under the load and do not overreach or twist to the side. Reposition body to be more square to the load and work. Push loads, rather than pull, whenever feasible. Do not persist with lifting when the load is too heavy. Use a mechanical lifting

aid or have a coworker assist with the lift. Rotate repetitive tasks to avoid soft-tissue fatigue.

- Falls From Elevated Surfaces - Protect employees from falling off surfaces that have a side or an edge that is 6 ft or more above a lower level. Provide a safety harness and shock-absorbing lifeline or adequate fall protection where applicable. Employees must wear them when working 6 ft or higher above the platform or main work deck. Install either a guardrail system or fall arrest system that conforms to 29 CFR 1926.502 (d) and is approved by the American National Standards Institute.

- Fire and Explosion - Make ABC fire extinguishers accessible in the work area. Store flammables in Underwriter's Laboratory and Occupational Safety and Health Administration (OSHA) approved metal safety cans equipped with spark arrestors. Store flammable containers more than 50 ft from possible ignition sources. Keep exhaust equipment powered by internal combustion engines well away from flammables and combustibles. Secure hot work permits/approvals before welding or cutting. Store and use compressed gases in a safe manner. Never refuel equipment (e.g., generators) while it is in operation or hot enough to ignite fuel vapors. Conspicuously mark operations that pose fire hazards "No Smoking" or "Open Flames." Remove trash, weeds, and unnecessary combustibles from the Exclusion Zone (EZ). Transfer of potentially flammable liquids will be conducted with intrinsically safe pumping equipment. Drums will be bonded and grounded prior to transfer of potentially flammable liquids.

- Vehicles - Obey all site traffic signs and speed limits. Seat belts must be functional and in use during operation of any site vehicles (including rentals). Operator shall regularly inspect the vehicle for defective parts, such as brakes, controls, motor, chassis and drives. Always be aware and stay alert to traffic around the work area.

- Inclement Weather – The project may be shutdown by the SSO during the following inclement weather conditions: poor visibility; precipitation severe enough to impair safe movement or travel; lightning in the immediate area; steady winds in excess of 40 mph; or, other conditions as determined by the SSO or Corporate Safety and Health Manager. Work will resume when the conditions are deemed safe by the SSO.

- Noise - Wear hearing protection when speech becomes difficult to understand at a distance of 10 ft and while standing within 20 to 25 ft from heavy equipment, pneumatic power tools, steam cleaners, and other equipment in operation that can generate more than 85 decibels (A-weighted scale) (dBA).

- Slips, Trips, and Falls - Clear work area of obstructions and debris before setting up. Alter work areas as necessary to provide a safe, reasonably level area. All walking and working surfaces shall continually be inspected and maintained to be free of slip, trip, and fall hazards. Keep platforms, stairs, and immediate work areas clear. Do not allow oil, grease, or excessive mud to accumulate in these areas. Eliminate slip, trip, and fall hazards or identify them clearly with caution tape, barricades, or equivalent means. Store loose or light material and debris in designated areas or containers. Secure tools, materials, and equipment subject to displacement or falling.

- Traffic Control - If site activities interrupt the normal flow of pedestrian or vehicular traffic, barricades and warning signs which comply with the Manual on Uniform Traffic

Control Devices and/or State or local ordinances will be erected around affected equipment. Safety orange work vests will be worn by personnel working within 10 feet of any active roadway. All borings or partially completed groundwater monitoring wells will be adequately covered and/or barricaded if left unattended for any period of time.

6.2 Biological Hazards

In addition to the methane gas identified in site wells and gas probes, disease-causing microorganisms (bacteria, fungus, viruses, molds) may exist in decaying organic materials which may be present in fill materials. Illness may result from inadvertent ingestion of these microorganisms. Partially buried sharp or jagged debris, broken glass and rusty metal pose trip, puncture and potential laceration hazards. Safety footwear is MANDATORY for this project. Decaying organic material in fill areas will potentially yield flammable methane gas. Off-gassing of methane generated in sub-surface fill areas can also bring organic vapors from buried chemical substances to the surface. Due to the potential presence of methane being liberated to the surface during drilling and excavation in fill areas, smoking is banned while within 50 feet of excavation areas on the site.

6.3 Methane

Methane is a non-toxic, colorless, odorless and tasteless gas. Methane is lighter than air. Methane is produced by the anaerobic decomposition of organic matter. Methane is considered a simple asphyxiant (i.e., is toxic only in its ability to displace normal oxygen). Methane is extremely flammable; the explosive range is indicated below.

- **Lower Flammable Limit--5% (concentration in air)**
- **Upper Flammable Limit--15% (concentration in air)**

Activities to be performed on site will involve drilling, excavation, and grading. Personnel should be aware that as personal protective equipment increases, dexterity and visibility may be impacted and performing some tasks may be more difficult. Personnel must remain outside the swing radius of backhoes at all times. Operators will ascertain the direction of prevailing winds at each boring location. Stationary equipment will be positioned to the upwind side of each proposed work area.

7.0 Air Monitoring Requirements

The designated Site Safety Officer will ensure that both a photoionization detector (PID) and a combustible gas indicator are mobilized to the project site on each day of boring activity.

The combustible gas indicator (CGI) and photoionization detector will be calibrated in accordance with manufacturers' instructions daily prior to use. The CGI will be calibrated to 50% LEL methane calibration gas. Photoionization detectors will be calibrated with isobutylene calibration gas (100--250 ppm). A response factor of 1.0 will be used during calibration and

field operation of photoionization detectors used on this project site. Operators' manuals will accompany each instrument to the project site.

7.1 Organic Vapors

Frequent photoionization detector readings will be taken in the breathing zone of site personnel during soil moving activities. If sustained (> 5 minutes continuous) breathing zone OVA readings exceed **5 ppm** above background or if any unusual chemical odors are noted, personnel will don full face air purifying respirators as described below.

Respirators will be equipped with combination organic vapor/HEPA cartridges. If sustained breathing zone readings photoionization detector readings exceed **25 ppm**, personnel will move to the upwind side of the project site and contact the Safety and Health Manager to report conditions and to discuss enhanced monitoring and personal protective equipment.

7.2 Methane Monitoring

CGI readings will be taken in the work zone during site drilling and excavation activities. **If CGI readings in the breathing zone exceed 20% of the Lower Explosive Limit (LEL), discontinue drilling and allow the boring or trench to vent.** Eliminate any possible ignition sources in the vicinity. After approximately 5 minutes, repeat CGI reading. If CGI readings have fallen below 20% LEL, soil work may proceed with caution and continuous combustible gas monitoring. If CGI readings fail to move below 20% LEL after venting for 10-15 minutes, establish fans to blow vapors away from the impacted area, and continue soil work with continuous combustible gas monitoring at the borehole or trench.

7.3 Engineering Control Measures

In an effort to reduce the concentration of organic vapors and/or methane in the work zone, high volume fans (>2,000 CFM) will be utilized at each location where sustained photoionization detector or combustible gas indicator readings in the breathing zone exceed the action levels specified above. The SSO will determine the direction of the prevailing wind at the proposed boring or trench location. The equipment will be positioned perpendicular to the prevailing wind and the high volume fan will be established approximately 4 feet to the upwind of the bore hole or trench. Caution must be taken to maintain the fan at a distance adequate to prevent inadvertent contact by site personnel. The fan must be positioned such that vapors/landfill gases liberated during soil work are directed DOWNWIND, and away from the operator and operator controls. Periodic photoionization detector monitoring of the breathing zone atmosphere will then be conducted to determine the adequacy of engineering control efforts and potential need for respiratory protection.

8.0 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Intrusive site activities may begin in **LEVEL D** personal protective equipment to include:

- **Standard Work Uniform**
- **Hard Hat**
- **Rubberized Safety Foot Wear (Steel Toe/Shank per ANSI Z-41)**
- **Impermeable Gloves (PVC, Neoprene or Nitrile)**
- **Safety Eye Wear (ANSI Z-87 approved)**

If organic vapor (PID) readings during intrusive site activities exceed the action level of 5 ppm specified above, site personnel will upgrade to **LEVEL C** personal protective equipment to include:

- **Full Face Air Purifying Respirators equipped with**
- **Combination Organic Vapor/Acid Gas/HEPA cartridges**

9.0 SITE CONTROL IN ENVIRONMENTAL MANAGEMENT AREA

For the purposes of this HASP, the Environmental Management Area (EMA) is considered to be the area where boring, trench or excavation workers may potentially encounter methane and other landfill gases in subsurface soils. Based on the extent of impacts detected during previous investigations at the site, the proposed EMA is considered to be the entire extent of the two outdoor practice fields, within the proposed fenced areas, as illustrated on the project plans.

Anyone entering this area must wear the appropriate personal protective equipment as described in this plan or any addendum to this plan. Personnel entering the EMA must have the authorization of the USC or Terracon SSO. All personnel allowed within the contaminant zone must meet the training and medical surveillance requirements of OSHA 29 CFR 1910.120 (see Section 3.0 and Section 4.0 of this Plan).

Safety cones, barrier fencing or barrier tape will be established at the site perimeter if the use of such barricade could reasonably prevent unauthorized access of, and potential injury to, non-authorized personnel. No eating, drinking or smoking will be permitted in the EMA.

10.0 SOIL MANAGEMENT IN ENVIRONMENTAL MANAGEMENT AREA

When removal of contaminated media occurs from the EMA, the CONTRACTOR shall perform the following:

1. Conduct work in accordance with their HASP(s).
2. Identify SCDHEC approved disposal facilities, and obtain pre-approval for disposal of contaminated soil and groundwater generated during subsurface activities.
3. Select a location for temporary storage of removed soil/groundwater.
4. Excavate contaminated soil in a manner that prevents commingling with non-contaminated materials with the assistance of SSO. Contractor shall minimize dust during excavation. Separate impacted groundwater from soil to the extent possible and contain in DOT-approved containers.
5. Place contaminated soil in portable drop boxes or other suitable receptacles with lids (supplied by Contractor), or directly into trucks for transport to the pre-approved disposal facility, or place soil on top of an impervious surface (i.e.,6-mil thick plastic sheeting, concrete pavement, etc.) and cover with a minimum of 6-mil thick plastic sheeting (supplied by Contractor). Contain impacted groundwater directly into DOT-approved containers or Baker tank if necessary. Note: There is the potential to reuse disturbed and/or impacted soil onsite provided that the concentrations of contaminants are below applicable screening levels and OWNER / SCDHEC approval has been granted. Additionally, the soils would need to be geotechnically suitable based on intended use. If requirements are met and

SCDHEC approves, impacted soil may be reused onsite. If contaminated soil is relocated within the site boundaries, the SSO will identify the location on a scaled site plat.

6. Typical construction practices for security and fencing should be followed. Additionally, contaminated groundwater and/or soil being stored prior to final determination or disposal should be properly secured and/or fenced to prevent unauthorized access or contact. For example, temporary stockpiles of impacted soil should be placed on and completely covered with plastic sheeting. Appropriate signage to discourage trespassing should be posted.
7. Arrange for backfilling of soil excavation with certified clean fill under specifications for the intended surface use and mechanical soil loads.
8. If discharge of contaminated groundwater to sewer system is possible, Contractor will provide equipment to discharge from container(s) to sewer access under city permit.
9. If contaminated groundwater is minimal (less than 2,000 gallons), a vacuum truck contractor may be utilized to remove and dispose of the contaminated groundwater. If a larger volume of groundwater is anticipated, the construction contractor and owner's representative will select an onsite location for temporary storage of pumped excavation water prior to disposal.
10. Contractor shall decontaminate equipment that has come into contact with contaminated soil by scraping soil off of equipment with a shovel, if possible, or by scrub washing or high temperature pressure wash (supplied by construction contractor). Rinsate generated during decontamination should be collected and disposed of properly, as determined by the SSO.
11. Contractor shall transport the contaminated soil and/or groundwater (or unsuitable and/or unusable soil if a Solid Waste Permit Authorization is granted) to pre-approved disposal facilities (i.e. a Subtitle D Landfill) in accordance with applicable environmental laws.
12. Contractor will provide SSO with a copy of the contaminated soil/groundwater disposal receipts for all contaminated soil/groundwater transported for disposal.

Transport and disposal of contaminated media shall comply with all applicable federal, state, or local laws, codes, and ordinances that govern or regulate contaminated substance transportation and disposal. Additional transport recommendations may be recommended or required. A manifest or bill of lading will be included for each load of contaminated media transported offsite for disposal or treatment.

Contaminated media shall be loaded into transport vehicles in a manner that prevents the spilling or tracking of contaminated media into on-site and off-site uncontaminated areas. Contaminated media that spills or falls onto the ground shall be immediately placed back into the truck or in its original container/stockpile, and the affected area shall be immediately cleaned up. If loading areas are unpaved, the surface soil, at the direction of the EC, may be sampled at the conclusion of the loading activities to confirm that impacted media are not present. If loading areas are paved, any loose media shall be cleaned from the pavement at the conclusion of the loading activities.

Specific transportation routes shall be established before beginning off-site contaminated media

transport. Offsite transportation routes shall be established to reduce the risk of releases of contaminated media and impact on local traffic. All loaded truck weights will be within acceptable limits. All trucks shall be covered before they leave the loading area.

All drivers of transport vehicles must follow Oregon Department of Transportation codes, regulation and requirements and be informed of the nature of the transported materials. Trucks used for the transportation of contaminated media offsite shall be water tight, substance compatible, licensed, insured, and permitted pursuant to federal, state, and local statutes, rules, regulations, and ordinances.

11.0 DECONTAMINATION

11.1 Personnel Decontamination

Personnel decontamination is necessary on all potentially contaminated intrusive projects. Personnel decontamination for this project will consist of washing off safety footwear, proper cleaning or disposal of work gloves and thorough washing of face, arms and hands. Expendable personal protective equipment will be placed in plastic trash bags, sealed and disposed of per client agreement. Decontamination solutions will be containerized or disposed of as arranged by Project Manager.

11.2 Equipment Decontamination

Decontamination of equipment will be performed to limit the migration of contaminants off-site. All equipment will be cleaned prior to site entry to remove grease, oil and encrusted soil. Decontamination of large equipment will consist of physically removing gross contamination with shovels, brushes etc. followed by detergent and water high pressure wash with a clean water rinse if impacted media is encountered. Cuttings and decontamination fluids will be handled as outlined in the project work plan.

12.0 SITE COMMUNICATIONS

Communication between personnel within the EMA will be via verbal communication or hand signals. Visual contact between members of task teams should be possible throughout the course of project activities. Contact with the SSO will be through direct verbal communication. The hand signals listed below will be used by personnel wherever respiratory protection and/or equipment noise limit verbal communication.

Signal	Meaning
Thumbs Up	OK, all is well
Grab throat with both hands	Can't breathe
Shake head, thumbs down	NO, negative
Point right (When facing equipment operator)	Move/steer left
Point left (When facing equipment operator)	Move/steer right
Grab partner's wrist	Leave area immediately

SAMPLE

13.0 EMERGENCY RESPONSE PROCEDURES

13.1 Emergency Notification

The Project Manager is responsible for obtaining and recording the following emergency information prior to site mobilization:

Location of Nearest Telephone: _____

Nearest Hospital/Clinic: _____ Phone: _____

Estimated Drive Time: _____

Directions From Site to Hospital: (ATTACH SITE DIAGRAM)

_____

_____

EMERGENCY TELEPHONE CONTACTS

Ambulance:	_____
Fire Department:	_____
Police:	_____
Project Manager:	_____
Safety and Health Manager:	**(913) 599-6886**

13.2 Emergency Equipment

The Site Safety Officer will ensure that at least one 10# B/C-rated fire extinguisher is mobilized to the project site during intrusive activity. In addition, a 10-unit (minimum) first aid kit and a supply of clean water will be immediately available at the project site at all times.

13.3 Personal Injury

For minor injuries, such as cuts, burns, exhaustion, heat cramps, insect stings, etc., the affected employee will be removed to an uncontaminated area. The SSO or other designated employee will administer appropriate first aid. All lacerations, abrasions or punctures incurred on landfill project sites must be cleaned, disinfected and bandaged as soon as possible. If the injury warrants additional medical attention (lacerations requiring sutures, direct puncture wounds, etc.), the wounds will be disinfected and bandaged and the employee will be transported to the nearest hospital or emergency medical facility.

For injuries which may involve spinal injuries, the Site Safety Officer or designee will summon an ambulance to the project site. No attempt will be made by Terracon personnel to move the

victim without the aid and/or instructions of qualified medical personnel. In the absence of toxic gases or vapors, the ambulance will be directed to the affected employee. If site conditions warrant and as time permits, the wheels of the ambulance will be decontaminated with high pressure wash.

The SSO or designee will accompany the ambulance to the medical facility, and provide guidance concerning additional decontamination which may be required for the injured employee, ambulance or attendants. If rescuer(s) assess that the victim cannot be removed without a stretcher or other specialized equipment, the victim will be removed at the earliest possible moment by appropriately attired Terracon personnel with the direction and/or assistance of qualified medical response personnel. The injured employee will be immediately decontaminated and transported to the nearest medical facility. A crew member designated by the SSO will inform the ambulance crew of known site contaminants and will provide assistance with decontamination if required.

14.0 SITE SAFETY PROCEDURES

All personnel working in proximity to a drill rig or other heavy equipment will be familiarized with the location and operation of emergency kill switches prior to equipment start-up.

Because heavy equipment can create major hazards at the job site, the following procedures shall be followed during soil moving activities: Personnel are advised that as the level of personal protection increases, mobility, visibility and communication may become impaired.

- Prior to mobilization to the project site, all underground utilities will be located and properly marked.
- No loose fitting clothing, jewelry or unsecured long hair is permitted near the equipment.
- Keep hands and feet AWAY from all moving parts while drilling is in progress. Persons shall not pass under or over a moving stem or auger.
- Daily inspection of all ropes, cables and moving parts is mandatory.
- A first aid kit and fire extinguisher (10 # class B/C, minimum) will be available at all times.
- All crews shall consist of at least two persons.
- No site activity is permitted during impeding electrical storms, tornadoes or when rain or icing creates a hazardous work environment.
- Keep equipment at least 10 feet from all overhead power lines; use spotters to assist driver in positioning rigs when overhead powerlines or other obstructions are near.
- Personnel are not allowed on a drill mast while the auger is in operation.
- When a drill rig is moved from one location to another, drill steel, tools and other equipment shall be secured and the mast placed in a safe position.

- Bore holes large enough to constitute a hazard shall be plugged, covered or barricaded to prevent injury.

Contractors shall at all times properly handle, store, use, and dispose of any hazardous materials brought on to the work site in accordance with all applicable environmental laws. In the event of a spill or release of any hazardous material brought on to the work site, the procedures as set forth in the contractors Health and Safety Plan (HASP) or other management plan concerning hazardous materials encountered during construction shall be followed.

15.0 RECORD KEEPING

The SSO will keep daily records of site safety briefings regarding work in the EMA and prepare daily reports to document management of contaminated media. SSO shall use a manifest or bill of lading for each off-site shipment of contaminated media. The manifest or bill of lading shall include among other information, the date and time of shipment, the name of the transportation company, the name of the truck driver, the disposal site, and a brief description of the contaminated media (e.g., soil, groundwater).

16.0 STANDARD OF CARE

Terracon's preparation of this Site Specific HASP was performed in accordance with generally accepted practices of this profession, undertaken in similar studies at the same time and in the same geographical area.

Findings, conclusions and recommendations resulting from these services are based upon previous reports prepared by others, on-site activities, and review of certain public records performed under this scope of work; such information is subject to change over time. Please note that Terracon does not warrant the work of laboratories or other third parties supplying information used in the preparation of this Site Specific HASP. In conducting the limited scope of services described herein, certain sources of information and public records were not reviewed. It should be recognized that environmental concerns may be documented in public records that were not reviewed. Performance of this practice is intended to reduce, but not eliminate, uncertainty regarding the potential for environmental conditions at the site. No warranties, express or implied, are intended or made. Additionally, certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, nondetectable or not present during these services, and we cannot represent that the site does not contain hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified in this Site Specific HASP. The data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services. The limitations herein must be considered when the user of this report formulates opinions as to risks associated with the site or otherwise uses the report for any other purpose.

17.0 RELIANCE

This Site Specific HASP has been prepared for the exclusive use and reliance of The University of South Carolina. Use or reliance by any other party (except a government entity having jurisdiction over the site) is prohibited without the written authorization of the client.

SAMPLE

ACKNOWLEDGMENT OF INSTRUCTION

The following must be completed prior to performing site activities. The following acknowledgment must be completed as accurately as possible. It is not a waiver. It is the only method used to compile your environmental on-the-job training and experience records. By written request you may obtain a copy of your environmental work record from the Safety and Health Manager.

PROJECT NAME: USC FOOTBALL OUTDOOR PRACTICE FACILITY

PROJECT NO.: 73137065

I understand that this project involves drilling at a former landfill site. Methane gas and/or organic vapors may be encountered during the course of project activities. If organic vapors or methane are detected, I will refer to and abide by the personal protective equipment requirements contained in this plan. Potential for health risk from exposure to the site is expected to be low.

I have read this Site Specific Health and Safety Plan and have received instructions for procedures to be followed.

Name: (Please Print)	**Signature**:	**Date**:

Safety Briefing Performed by:_____

Date:_____

Personal Protective Equipment:

LEVEL D/D Mod _X_ **LEVEL C _X_ (Stand-by)**