

**CONTRACT DOCUMENTS AND SPECIFICATIONS  
FOR**

**ATHLETIC VILLAGE  
SAND VOLLEYBALL COURT CONSTRUCTION**

**STATE PROJECT #H27-Z081**

**FOR**

**UNIVERSITY OF SOUTH CAROLINA**

**URS CORPORATION PROJECT NO. 46422848**

**MAY 6, 2013**

**BID DOCUMENTS**

*THESE DOCUMENTS ARE FOR THE  
PURPOSE OF SOLICITATION OF BIDS AND  
ARE NOT FOR USE FOR CONSTRUCTION.*

CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CONTRACTOR'S LICENSE NUMBER: \_\_\_\_\_



URS Corporation  
101 Research Drive  
Columbia, SC 29203  
(803) 254-4400 FAX: (803) 771-6676



**ATHLETIC VILLAGE  
SAND VOLLEYBALL COURT CONSTRUCTION**

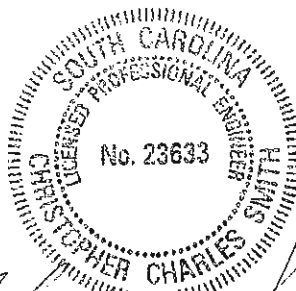
**STATE PROJECT #H27-Z081**

**FOR**

**UNIVERSITY OF SOUTH CAROLINA**

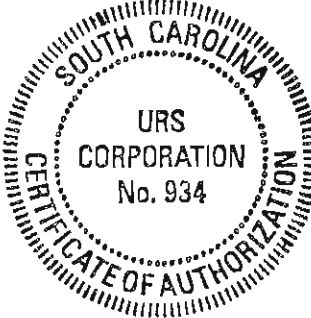
**URS CORPORATION PROJECT NO. 46422848**

**MAY 6, 2013**



*Christopher C. Smith*

A circular professional seal for Christopher Charles Smith, a Licensed Professional Engineer in South Carolina. The seal contains the text: "SOUTH CAROLINA", "LICENSED PROFESSIONAL ENGINEER", "No. 23633", and "CHRISTOPHER CHARLES SMITH". A handwritten signature, "Christopher C. Smith", is written across the bottom of the seal.



*5-6-13*

A circular seal for URS Corporation, South Carolina, Certificate of Authorization No. 934. The seal contains the text: "SOUTH CAROLINA", "URS CORPORATION", "No. 934", and "CERTIFICATE OF AUTHORIZATION". A handwritten date, "5-6-13", is written below the seal.





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**SE-310**  
**REQUEST FOR ADVERTISEMENT**

**PROJECT NAME:** Athletic Village Sand Volleyball Court Construction

**PROJECT NUMBER:** H27-Z081

**PROJECT LOCATION:** Athletics Village, Heyward Street

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:** \$675,000 - \$775,000

Construct 5 new sand volleyball courts and related amenities, re-grading of existing practice soccer fields, new electrical conduits to practice soccer field and volleyball courts.

**A/E NAME:** URS

**A/E CONTACT:** Mr. Chris Smith, P.E.

**A/E ADDRESS:** 101 Research Drive

City: Columbia

State: SC ZIP: 29203

**EMAIL:** chris.c.smith@urs.com

**TELEPHONE:** (803) 254-4400

**FAX:** (803) 771-6676

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

**BIDDING DOCUMENTS/PLANS MAY BE OBTAINED FROM:** "http://purchasing.sc.edu; Facilities/Construction Solicitations and Awards"

**PLAN DEPOSIT AMOUNT:** \$0 **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:** 5-21-13 **TIME:** 10:00 AM **PLACE:** USC, Facilities Management Center, Conference Room 53, 743 Greene Street, Columbia, SC 29208

**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:** 6-4-13 **TIME:** 1:00 PM **LOCATION:** USC, Facilities Management, Conference Room 53, 743 Greene Street, Columbia, SC 29208

**BID DELIVERY ADDRESSES:**

**HAND-DELIVERY:**

Attn: Juaquana Brookins  
USC Campus Planning & Construction  
743 Greene Street  
Columbia, SC 29208

**MAIL SERVICE:**

Attn: Juaquana Brookins  
USC Campus Planning & Construction  
743 Greene Street  
Columbia, SC 29208

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

**APPROVED BY** *(Office of State Engineer):* \_\_\_\_\_

**DATE:** \_\_\_\_\_





Section AIA A701-1997

Instruction to Bidders

Instruction to Bidders, AIA Document A701-1997 Edition, is incorporated into the Contract Documents by reference herein.

Copies of Instructions to Bidders, AIA Document A701-1997, may be obtained from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006, or from local AIA offices and reprographic offices.

Original AIA Document on file at the Office of the University of South Carolina Construction Services, 743 Greene Street, Columbia, SC 29208.

End of Section AIA A701-1997



# OSE FORM 00201

## STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

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**OWNER:** University of South Carolina

**PROJECT NUMBER:** H27-Z081

**PROJECT NAME:** Athletic Village Sand Volleyball Court Construction

**PROJECT LOCATION:** Athletics Village, Heyward Street, Columbia, SC

**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.

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

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

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

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

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

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.

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS****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](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 may 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.

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS****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.



**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

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-Authority 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-responsive

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."

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS****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](http://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

**OSE FORM 00201****STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

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:** Receptionist Area

**Building Where Posted:** Facilities Management Center

**Address of Building:** 743 Greene Street, Columbia, SC 29208

**WEB site address (if applicable):** [http://purchasing.sc.edu/Facilities/Construction Solicitations and Awards](http://purchasing.sc.edu/Facilities/Construction%20Solicitations%20and%20Awards)

**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](mailto: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.

**OSE FORM 00201**

**STANDARD SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

**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**

## Section AIA A310-2010

### Bid Bond

Bid Bond, AIA Document A310-2010 Edition, is incorporated into the Contract Documents by reference herein.

Copies of Bid Bond, AIA Document A310-2010, may be obtained from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006, or from local AIA offices and reprographic offices.

Original AIA Document on file at the Office of the University of South Carolina Construction Services, 743 Greene Street, Columbia, SC 29208.

End of Section AIA A301-2010



**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** Athletic Village Sand Volleyball Court Construction  
**PROJECT NUMBER** **H27-Z081**

**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):* Construct 5 new sand volleyball courts and related amenities, re-grading of existing practice soccer fields, new electrical conduits to practice soccer field and volleyball courts for a cost of

\_\_\_\_\_, 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): \_\_\_\_\_ Supply synthetic turf

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): Supply/install scoreboards (main and court) \_\_\_\_\_

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): Supply/install sod (area north of volleyball courts and on soccer field) \_\_\_\_\_

ADD TO or  DEDUCT FROM BASE BID: \_\_\_\_\_

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



**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:

<b>SUBCONTRACTOR            SPECIALTY</b> <b>By License Classification            and/or Subclassification</b> <b>(Completed by Owner)</b>	<b>SUBCONTRACTOR'S            PRIME CONTRACTOR'S            NAME</b> <b>(Must be completed by Bidder)</b> <b>BASE BID</b>	<b>SUBCONTRACTOR'S            PRIME CONTRACTOR'S            SC LICENSE NUMBER</b>
None required		
<b>ALTERNATE 1</b>		
None required		
<b>ALTERNATE 2</b>		
None required		
<b>ALTERNATE 3</b>		
None required		

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.



## **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 90 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 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:** \_\_\_\_\_





**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:** \_\_\_\_\_

**ADDRESS:** \_\_\_\_\_  
\_\_\_\_\_

**BY:** \_\_\_\_\_  
*(Signature)*

**DATE:** \_\_\_\_\_

**TITLE:** \_\_\_\_\_

**TELEPHONE:** \_\_\_\_\_

**EMAIL:** \_\_\_\_\_



Section AIA A101-1997

Standard Form of Agreement Between Owner and Contractor

The Standard Form of Agreement Between Owner and Contractor, AIA Document A101-1997 Edition shall be the form of agreement and is incorporated into the Contract Documents by reference herein.

Copies of Standard form of Agreement Between Owner and Contractor, AIA Document A101-1997, may be obtained from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006, or from local AIA offices and reprographic offices.

Original AIA Document on file at the Office of the University of South Carolina Construction Services, 743 Greene Street, Columbia, SC 29208.

End of Section AIA A101-1997



**OSE FORM 00501**  
**STANDARD MODIFICATIONS TO AGREEMENT BETWEEN**  
**OWNER AND CONTRACTOR**

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**OWNER:** University of South Carolina

**PROJECT NUMBER:** H27-Z081

**PROJECT NAME:** Athletic Village Sand Volleyball Court 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%)."*

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**STANDARD MODIFICATIONS TO AGREEMENT BETWEEN**  
**OWNER AND CONTRACTOR**

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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: Mr. Tom Opal

Title: Senior Project Manager

Address: 743 Greene Street, 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: Ms. Ann Derrick

Title: Project Manager

Address: 743 Greene Street, 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: \_\_\_\_\_

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**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: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
Telephone: \_\_\_\_\_ FAX: \_\_\_\_\_  
Email: \_\_\_\_\_

2.14. *Add the following Section 8.6.1:*

**8.6.1** The Architect's representative:

Name: Mr. Chris Smith, P.E.  
Title: Senior Project Manager  
Address: 101 Research Drive, Columbia, SC 29203  
Telephone: (803) 254-4400 FAX: (803) 771-6676  
Email: chris.c.smith@urs.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**





## Section AIA A201-1997

### General Conditions of the Contract

The General Conditions of the Contract for Construction, AIA Document A201-1997 Edition, shall be the form of General Conditions, and is incorporated into the Contract Documents by reference.

Copies of the General Conditions, AIA Document A201, 1997 Edition, may be obtained from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, DC 20006, or from local AIA offices and reprographic offices.

Original AIA Document on file at the Office of the University of South Carolina Construction Services, 743 Greene Street, Columbia, SC 29208.

End of Section AIA A201-1997



**OSE FORM 00811****STANDARD SUPPLEMENTARY CONDITIONS**

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**OWNER:** University of South Carolina**PROJECT NUMBER:** H27-Z081**PROJECT NAME:** Athletic Village Sand Volleyball Court 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.

**OSE FORM 00811****STANDARD SUPPLEMENTARY CONDITIONS****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.

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**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

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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 construction 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 Contractor 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 opening words "The Contractors shall."*

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**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.

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### 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



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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;

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**STANDARD SUPPLEMENTARY CONDITIONS**

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- .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:

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- .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.

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**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.

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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

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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.

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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.”

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**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



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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.

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**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 be 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.

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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.

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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 Carolina 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.

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**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](http://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

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- .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;

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- .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.

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**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 waived 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)



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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.

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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: The University of South Carolina will procure required inspection directly.

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**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)*

Refer to 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)*

Refer to 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.



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. Fraternalization 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.

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 IDC's, 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 2 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.

Updated: July 15, 2011

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**  
**Performance Bond**

2011 Edition

**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: Athletic Village Sand Volleyball Court Construction  
State Project Number: H27- Z081

Brief Description of Awarded Work, as found on the SE-330, Bid Form: \_\_\_\_\_

Construct 5 new sand volleyball courts and related amenities, re-grading of existing practice soccer fields, new electrical conduits to practice soccer field and volleyball courts.

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

Name: URS  
Address: 101 Research Drive  
Columbia, SC 29203

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****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: Athletic Village Sand Volleyball Court Construction  
Project Number: H27- Z081  
Brief Description of Awarded Work, as found on the SE-330, Bid Form: Construct 5 new sand volleyball courts and related amenities, re-grading of existing practice soccer fields, new electrical conduits to practice soccer field and volleyball courts.

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

Name: URS  
Address: 101 Research Drive  
Columbia, SC 29203

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)*

**SE-357**

**Labor and Material Payment 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 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 one 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.

# CONSTRUCTION CHANGE ORDER

Change Order No.:

Agency: University of South Carolina

Project Number: H27-Z081

Project Name: Athletic Village Sand Volleyball Court 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: Christopher C. Smith, P.E.

### Agency Acceptance and Certification

BY: \_\_\_\_\_ Date: \_\_\_\_\_  
*(Signature of Representative)*  
 Print Name: Ann Derrick

- 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: \_\_\_\_\_



Athletic Village Sand Volleyball Court Construction

State Project Number H27-Z081

**CONTRACTOR'S ONE YEAR GUARANTEE**

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

WE \_\_\_\_\_

as General Contractor on the above-named project, do hereby guarantee that all work executed under the requirements of the Contract Documents shall be free from defects due to faulty materials and /or workmanship for a period of one (1) year from date of acceptance of the work by the Owner and/or Architect/Engineer; and hereby agree to remedy defects due to faulty materials and/or workmanship, and pay for any damage resulting wherefrom, at no cost to the Owner, provided; however, that the following are excluded from this guarantee;

Defects or failures resulting from abuse by Owner.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

\_\_\_\_\_  
[Name of Contracting Firm]

\*By \_\_\_\_\_

Title \_\_\_\_\_

\*Must be executed by an office of the Contracting Firm.

SWORN TO before me this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_ (seal)

\_\_\_\_\_ State

My commission expires \_\_\_\_\_





## SECTION 000604

### EMPLOYMENT ELIGIBILITY VERIFICATION REQUIREMENTS

- A. Contractor is required to comply with all applicable State and Federal employment eligibility verification requirements including but not limited to the following:
1. By signing its bid or proposal, Contractor certifies that it will comply with the applicable requirements of Title 41, Chapter 8 of the South Carolina Code of Laws and agrees to provide to University of South Carolina upon request any documentation required to establish either: (a) that Title 41, Chapter 8 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 41, Chapter 8. Pursuant to Section 41-8-70, "In addition to other penalties provided by law, 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 41, Chapter 8, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 41, Chapter 8.
- B. Contractor is required to complete and submit the attached affidavit along with the executed contract documents.
- C. E-Verify.
1. In addition to completing and maintaining the federal employment eligibility verification form (Form I-9), Contractor must, within three business days after employing a new employee, verify the employee's work authorization through the E-Verify federal work authorization program administered by the U.S. Department of Homeland Security. Employers may no longer confirm a new employee's employment authorization with a driver's license or state identification card.
  2. Contractor shall enroll in E-Verify at [www.dhs.gov/e-verify](http://www.dhs.gov/e-verify).

END OF SECTION

Attachment



**CONTRACTOR AFFIDAVIT**  
**SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT (Amended)**

In accordance with the requirements of the South Carolina Illegal Immigration Reform Act, \_\_\_\_\_ (Contractor) hereby certifies that it is currently in compliance with the requirements of Title 41, Chapter 8 of the S. C. Code Annotated and will remain in compliance with such requirements throughout the term of its contract with the University of South Carolina .

The Contractor hereby acknowledges that in order to comply with requirements of S. C. Code Annotated Section 41-8-20:

- (A) All private employers in South Carolina shall be imputed a South Carolina employment license, which permits a private employer to employ a person in this State. A private employer may not employ a person unless the private employer's South Carolina employment license and any other applicable licenses as defined in Section 41-8-10 are in effect and are not suspended or revoked. A private employer's employment license shall remain in effect provided the private employer complies with the provisions of this chapter.
- (B) All private employers who are required by federal law to complete and maintain federal employment eligibility verification forms or documents must register and participate in the E-Verify federal work authorization program, or its successor, to verify the work authorization of every new employee within three business days after employing a new employee. A private employer who does not comply with the requirements of this subsection violates the private employer's licenses.
- (C) The South Carolina Department of Employment and Workforce shall provide private employers with technical advice and electronic access to the E-Verify federal work authorization program's website for the sole purpose of registering and participating in the program.
- (D) Private employers shall employ provisionally a new employee until the new employee's work authorization has been verified pursuant to this section. A private employer shall submit a new employee's name and information for verification even if the new employee's employment is terminated less than three business days after becoming employed. If a new employee's work authorization is not verified by the federal work authorization program, a private employer must not employ, continue to employ, or reemploy the new employee.
- (E) To assist private employers in understanding the requirements of this chapter, the director shall send written notice of the requirements of this section to all South Carolina employers, and shall publish the information contained in the notice on its website. Nothing in this section shall create a legal requirement that any private employer receive actual notice of the requirements of this chapter through written notice from the director, nor create any legal defense for failure to receive notice.

- (F) If a private employer is a contractor, the private employer shall maintain the contact phone numbers of all subcontractors and sub-subcontractors performing services for the private employer. The private employer shall provide the contact phone numbers or a contact phone number, as applicable, to the director pursuant to an audit or investigation within seventy-two hours of the director's request.

The Contractor agrees to provide to the University of South Carolina upon request any documentation required to establish the applicability of the South Carolina Illegal Immigration Reform Act (Amended) to the contractor, subcontractor or sub-subcontractor. The Contractor further agrees that it will upon request provide the University of South Carolina with any documentation required to establish that the contractor and any subcontractors or sub-subcontractors are in compliance with the requirements of Title 41, Chapter 8 of the S. C. Code Annotated.

Date: \_\_\_\_\_

By: \_\_\_\_\_

Contractor

Title: \_\_\_\_\_

SECTION 000851

DRAWINGS INDEX

All Drawings are dated May 6, 2013

<u>TITLE</u>	<u>SHEET NO.</u>	<u>RESPONSIBLE FIRM</u>
Cover Sheet		URS
General Notes and Legend	C1	URS
Existing Conditions and Demolition Plan	C2	URS
Overall Site Plan	C3	URS
Grading Plan and Storm Drainage Plan	C4	URS
Storm Water Pollution Prevention Plan	C5	URS
Site Details	C6	URS
<b><u>VOLLEYBALL COURT PLANS:</u></b>		
Existing Conditions Plan – Volleyball	A1	CHA
Site Removals Plan – Volleyball	A2	CHA
Site Layout Plan – Volleyball	A3	CHA
Site Grading Plan – Volleyball	A4	CHA
Site Utility Plan – Volleyball	A5	CHA
Site Details – Volleyball	A6	CHA
Site Details – Volleyball	A7	CHA
Electrical Legend, Symbols and Abbreviations - Volleyball	A8	CHA
Electrical Site Plan – Volleyball	A9	CHA
Electrical One Line Diagram, Schedules and Details - Volleyball	A10	CHA
Electrical Details – Volleyball	A11	CHA
<b><u>SITE ELECTRICAL PLANS:</u></b>		
Site Electrical Plan	E-1	RMF
Electrical Details & Schedules	E-2	RMF
Electrical Single Line Diagram	E-3	RMF
<b><u>IRRIGATION PLANS:</u></b>		
Irrigation Plan	I-1	GC



## SECTION 013323

### SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Make submittals required by the Contract Documents and revise and resubmit as necessary to establish compliance with the specified requirements.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
  - 2. Individual requirements for submittals also may be described in pertinent sections of these specifications.
- C. Work not included:
  - 1. Unrequired submittals will not be reviewed by the Engineer.
  - 2. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the work, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Engineer.

##### 1.2 QUALITY ASSURANCE

- A. Coordination of submittals:
  - 1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
  - 2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
  - 3. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.
  - 4. Review and coordinate each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.
  - 4. All submittals will have their appropriate Specification Section as noted. Any submittals not accompanied with their Section numbers will be returned to the Contractor.
- B. Completeness of submittal:
  - 1. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes.
  - 2. Determine and verify all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

- C. "Or equal":
  - 1. Where the phrase "or equal" occurs in the Contract Documents, do not assume that the materials, equipment or methods will be considered as equal unless the item has been specifically so approved for this Work by the Engineer.
  - 2. The decision of the Engineer shall be final.
- D. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless the Contractor advises the Engineer otherwise in writing.

### 1.3 SUBMITTALS

- A. Within fifteen (15) calendar days after the Contractor has received the Owner's notice to proceed, submit:
  - 1. Schedule for submittals including specification section, type of submittal and submittal date.
  - 2. Construction schedule.
  - 3. Schedule of partial payment requests.
- B. Make submittals of shop drawings, samples, substitution requests and other items in accordance with the provisions of this Section.
- C. All submittals will have all applicable specification sections referenced clearly or they will be returned to the contractor for clarification.

## PART 2 - PRODUCTS

### 2.1 SHOP DRAWINGS

- A. Scale and measurements: Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.
- B. Large prints (11" x 17" or larger):
  - 1. Submit shop drawings in the form of white copies.
  - 2. Blueprints will not be acceptable.
- C. Manufacturer's literature:
  - 1. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.
  - 2. Submit the number of copies which are required to be returned, plus four copies of electrical and three copies of all other submittals which will be retained by the Engineer.
- D. Number of copies:
  - 1. Submit the number of copies which are required to be returned, plus three copies which will be retained by the Engineer.
  - 2. Electrical shop drawings: submit the number of copies which are required to be returned, plus four copies which will be retained by the Engineer.



- E. Do not begin fabrication of equipment or materials prior to Engineer's approval of shop drawings.

## 2.2 VARIATIONS

- A. With each submittal, provide specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.
- B. Provide an explanation of why the item(s) submitted are considered to be equal to the item(s) specified.
- C. Failure to submit a written notice will result in rejection of the submittal.

## 2.3 SAMPLES

- A. Provide sample or samples identical to the precise article proposed to be provided. Identify as described under "Identification of submittals" below.
- B. Number of samples required:
  - 1. Unless otherwise specified, submit samples in the quantity which is required to be returned, plus one which will be retained by the Engineer.
  - 2. By prearrangement in specific cases, a single sample may be submitted for review and, when approved, be installed in the work at a location agreed upon by the Engineer.

## 2.4 COLORS AND PATTERNS

- A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Engineer for selection.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW OF SUBMITTALS

- A. Before submitting a shop drawing or any related material, Contractor shall:
  - 1. Determine and verify all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.
  - 2. Determine and verify the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work
  - 3. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor.
  - 4. Approve each such submission before submitting it.
  - 5. Stamp and sign each such submission before submitting it.
- B. Shop drawings and related materials shall be returned with comments provided that each submission has been specified and is stamped by the Contractor.

- C. Shop drawings or material not specified or which have not been approved by the Contractor shall be returned without comment.
- D. Contractor is to utilize the following stamp on all shop drawing submittals:

<p>This shop drawing has been reviewed by <b>[NAME OF CONTRACTOR]</b> and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. <b>[NAME OF CONTRACTOR]</b> also warrants that this shop drawing complies with contract documents and comprises no variations thereto.</p> <p>By: _____</p> <p>Date: _____</p>
--

- E. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of the General Conditions and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of the General Conditions.

### 3.2 IDENTIFICATION OF SUBMITTALS

- A. Consecutively number all submittals.
  - 1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
  - 2. On resubmittals, cite the original submittal number for reference.
- B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.
- C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
- D. Maintain an accurate submittal log for the duration of the work, showing current status of all submittals at all times. Make the submittal log available to the Engineer for his review upon request.

### 3.3 GROUPING OF SUBMITTALS

- A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
  - 1. Partial submittals may be rejected as not complying with the provisions of the Contract.
  - 2. The Contractor may be held liable for delays so occasioned.

### 3.4 TIMING OF SUBMITTALS

- A. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

- B. In scheduling, allow at least twenty-five working days for review by the Engineer following his receipt of the submittal.

### 3.5 RESUBMITTAL SCHEDULE

- A. For submittals marked "Furnish as Corrected" by the Engineer, resubmittal shall be within fourteen (14) days of the review date shown on the Engineer's shop drawing review stamp.
- B. For submittals marked "Revise and Resubmit", "Submit Specified Item", or "Rejected", resubmittal shall be within seven (7) days of the review date shown on the Engineer's shop drawing review stamp.

### 3.6 ENGINEER'S REVIEW

- A. Review by the Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.
- B. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer.
- C. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
- D. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.
- E. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
- F. Revisions:
  - 1. Make revisions required by the Engineer.
  - 2. If the Contractor considers any required revision to be a change, he shall so notify the Engineer as provided for in the General Conditions.
  - 3. Make only those revisions directed or approved by the Engineer.
  - 4. Submittals which have been reviewed and returned to the Contractor marked "Revise and Resubmit" or "Rejected" and which are resubmitted and not in an approvable state, will not be reviewed a third time unless payment for the third and any subsequent review is by the Contractor. The engineering costs for review shall be equal to the Engineer's charges to the Owner under the terms of the Engineering Agreement with the Owner.

END OF SECTION



## SECTION 014100

### REGULATORY REQUIREMENTS

- A. The following requirements of Regulatory Agencies having an interest in this project are hereby made a part of this Contract.
- B. The construction of the project, including the letting of contracts in connection therewith, shall conform to the applicable requirements of State, territorial, and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.
- C. South Carolina Sales Tax: All applicable South Carolina sales tax shall be to the account of the Contractor.
- D. Use of chemicals: All chemicals used during the project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.
- E. Safety and Health Regulations: The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54).
- F. The Contractor shall comply with the Manual on Uniform Traffic Control Devices for Streets and Highways.
- G. Inspection by Agencies: The representatives of the South Carolina Department of Health and Environmental Control, City of Columbia, SCDOT, and the South Carolina Office of State Engineer (OSE) shall have access to the work wherever it is, in preparation or in progress, and the Contractor shall provide proper facilities for such access and inspection.
- H. Withholding for non-residents shall comply with the following:
  - 1. Attention of non-resident Contractors is invited to Code Sections 12-8-540 and 12-8-550 as amended effective July 1, 1994, Section 49, Appropriations Bill, Part II.
  - 2. If a non-resident Contractor is the successful bidder on this project, he shall be required to provide the Owner with an Affidavit (Form I-312, Nonresident Taxpayer Registration Affidavit Income Tax Withholding) affirming registration with the South Carolina Department of Revenue or the South Carolina Secretary of State's office. (See attached form).
  - 3. Forms to register for all taxes administered by the South Carolina Department of Revenue may be obtained by calling the License and Registration Section at (803) 737-4872 or writing to South Carolina Department of Revenue, Registration Unit, Columbia, South Carolina 29214-0140.
  - 4. In the absence of an Affidavit being provided, withholding in the amount of two (2) percent of the contract price will be made by the Owner.

END OF SECTION

Attachment





STATE OF SOUTH CAROLINA  
DEPARTMENT OF REVENUE  
**NONRESIDENT TAXPAYER REGISTRATION  
AFFIDAVIT INCOME TAX WITHHOLDING**

**Mail to: The company or individual you are contracting with.**

The undersigned nonresident taxpayer on oath, being first duly sworn, hereby certifies as follows:

1. Name of Nonresident Taxpayer: \_\_\_\_\_

2. Trade Name, if applicable (Doing Business As):  
\_\_\_\_\_

3. Mailing Address: \_\_\_\_\_

4. Federal Employer Identification Number (FEI): \_\_\_\_\_

5. \_\_\_\_\_ Hiring or Contracting with:  
Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_ Receiving Rentals or Royalties From:  
Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_ Beneficiary of Trusts and Estates:  
Name: \_\_\_\_\_

Address: \_\_\_\_\_

6. I hereby certify that the above named nonresident taxpayer is currently registered with (check the appropriate box):

- The South Carolina Secretary of State or
- The South Carolina Department of Revenue

Date of Registration: \_\_\_\_\_

7. I understand that by this registration, the above named nonresident taxpayer has agreed to be subject to the jurisdiction of the South Carolina Department of Revenue and the courts of South Carolina to determine its South Carolina tax liability, including estimated taxes, together with any related interest and penalties.

8. I understand the South Carolina Department of Revenue may revoke the withholding exemption granted under Code Sections 12-8-540 (rentals), 12-8-550 (temporarily doing business or professional services in South Carolina), and 12-8-570 (distributions to nonresident beneficiary by trusts or estates) at any time it determines that the above named nonresident taxpayer is not cooperating with the Department in the determination of its correct South Carolina tax liability.

The undersigned understands that any false statement contained herein could be punished by fine, imprisonment or both.

Recognizing that I am subject to the criminal penalties under Code Section 12-54-44 (B) (6) (a) (i), I declare that I have examined this affidavit and to the best of my knowledge and belief, it is true, correct and complete.

\_\_\_\_\_  
Signature of Nonresident Taxpayer (Owner, Partner or Corporate Officer, when relevant) (Seal) \_\_\_\_\_ Date

If Corporate officer, state title: \_\_\_\_\_

\_\_\_\_\_  
(Name - Please Print)

**INFORMATION**  
**NONRESIDENT TAXPAYER REGISTRATION AFFIDAVIT**

Submit this form to the company or individual you are contracting with.

Do not submit this form to South Carolina Department of Revenue.

**PURPOSE OF AFFIDAVIT**

A person is not required to withhold taxes for a nonresident taxpayer who submits an affidavit certifying that they are registered with either the South Carolina Secretary of State or the South Carolina Department of Revenue.

**REQUIREMENTS TO MAKE WITHHOLDING PAYMENTS**

Code Section 12-8-550 requires persons hiring or contracting with a nonresident taxpayer to withhold 2% of each payment made to the nonresident where the payments under the contract exceed \$10,000. However, this section does not apply to payments on purchase orders for tangible personal property when those payments are not accompanied by services to be performed in this state.

Code Section 12-8-540 requires persons making payment to a nonresident taxpayer of rentals or royalties at a rate of \$1,200 or more a year for the use of or for the privilege of using property in South Carolina to withhold 7% of the total of each payment made to a nonresident taxpayer who is not a corporation and 5% if the payment is made to a corporation.

Code Section 12-8-570 requires trusts or estates making distribution of South Carolina taxable income to a nonresident beneficiary to withhold 7% of the beneficiary's distribution which is attributable to South Carolina taxable income.

Our Internet address is: [www.sctax.org](http://www.sctax.org)



SECTION 014101  
PERMITS AND RIGHTS-OF-WAY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: This section establishes requirements pertaining to the securement and payment for licenses, building permits, rights-of-way, etc., necessary for the construction of the project.
- B. Work not included: The Owner will obtain and provide to the Contractor, as required, copies of:
  - 1. Encroachment permits, South Carolina Department of Transportation.
  - 2. South Carolina Department of Health and Environmental Control, Permit to Construct.
- C. Related work: Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.

1.2 SUBMITTALS

- A. Submit to the Engineer satisfactory evidence that all necessary licenses, building permits, etc., have been secured prior to commencing the work.

PART 2 - PRODUCTS

No products are required for this work.

PART 3 - EXECUTION

3.1 BUSINESS LICENSE

- A. Determine licenses necessary to perform the work at project location.
- B. Obtain all necessary licenses at no additional cost to the Owner.

3.2 RIGHTS-OF-WAY, UTILITY LINES

- A. Owner will provide necessary rights-of-way or easements for construction of utility lines, whether on privately or publicly owned property.
- B. The Contractor shall confine his activities to a 30-foot construction easement. The 30-foot easement is not in all cases equidistant, 15 feet each side of the centerline of the utility.
  - 1. Contact the City of Columbia for rights-of-way as actually obtained.
- C. The Owner will provide no right-of-way over other property.

3.3 LAND

- A. The necessary land for construction of the project will be provided by the Owner.

END OF SECTION

SECTION 014102  
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Throughout the Project Documents, reference is made to specifications and standards issued by nationally recognized professional and/or trade organizations.
1. These referenced standards are generally identified by abbreviating the name of the organization following with the specification/standard number.
  2. Unless specifically indicated otherwise, all references to standards refer to the latest edition available at the time of the bidding.

1.2 ABBREVIATIONS

- A. Wherever the following abbreviations are used in these Project Documents, they are to be construed the same as the respective expressions represented:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ALS	American Lumber Standards
ANSI	American National Standards Institute, Inc.
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWPA	American Wood Preservers Association
AWS	American Welding Society
FSS	Federal Specifications and Standards, General Services Administration
IBC	International Building Code
NACE	National Association of Corrosion Engineers
NFPA	National Fire Protection Association
NSF	Formerly: National Sanitary Foundation
OSHA	Occupational Safety and Health Administration
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION



## SECTION 014103

### PRECONSTRUCTION CONFERENCE

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: To help clarify construction contract administration procedures, the Engineer will conduct a Preconstruction Conference prior to start of the Work. Provide attendance by the designated personnel.
- B. Related work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.2 QUALITY ASSURANCE

- A. For those persons designated by the Contractor, his subcontractors, and suppliers to attend the Preconstruction Conference, provide required authority to commit the entities they represent to solutions agreed upon in the Conference.

##### 1.3 SUBMITTALS

- A. To the maximum extent practicable, advise the Engineer at least 24 hours in advance of the Conference as to items to be added to the agenda.
- B. The Engineer will compile minutes of the Conference, and will furnish three copies of the minutes to the Contractor and required copies to the Owner. The Contractor may make and distribute such other copies as he wishes.

##### 1.4 PRECONSTRUCTION CONFERENCE

- A. The Conference will be scheduled to be held within 30 working days after the Owner has determined the low bidder and may be held prior to issuance of the Notice to Proceed when required by regulatory agencies having jurisdiction. In any event, the Conference will be held prior to actual start of the work.
- B. Attendance:
  - 1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
  - 2. The Engineer will advise other interested parties, including the Owner, and request their attendance.
- C. Minimum agenda: Data will be distributed and discussed on:
  - 1. Organizational arrangement of Contractor's forces and personnel and those of subcontractors, materials suppliers, and the Engineer.
  - 2. Channels and procedures for communication.
  - 3. Construction schedule, including sequence of critical work.
  - 4. Contract Documents, including distribution of required copies of Drawings and revisions.
  - 5. Processing of Shop Drawings and other data submitted to the Engineer for review.
  - 6. Processing of field decisions and Change Orders.
  - 7. Rules and regulations governing performance of the Work.
  - 8. Procedures for security, quality control, housekeeping, and related matters.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 014104  
PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: To enable orderly review during progress of the Project, and to provide for systematic discussion of problems, the Engineer will conduct project meetings throughout the construction period.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.2 QUALITY ASSURANCE

- A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.3 SUBMITTALS

- A. Agenda items: To the maximum extent practicable, advise the Engineer at least 48 hours in advance of project meetings regarding items to be added to the agenda.
- B. Minutes:
  - 1. The Engineer will compile Minutes of each project meeting, and will furnish three copies to the Contractor and required copies to Owner.
  - 2. Recipients of copies may make and distribute such other copies as they wish.

PART 2 - PRODUCTS

(No products are required in this Section)

PART 3 - EXECUTION

3.1 MEETING SCHEDULE

- A. Project meetings will be held weekly at the job site.
- B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

- A. The Engineer will establish meeting location. To the maximum extent practicable, meetings will be held at the project site.

### 3.3 PROJECT MEETINGS

#### A. Attendance:

1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.
2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

#### B. Minimum agenda:

1. Review, revise as necessary, and approve Minutes of previous meetings.
2. Review progress of the Work since last meeting, including status of submittals for approval.
3. Identify problems that impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.
5. Complete other current business.

#### C. Revisions to Minutes:

1. Unless published Minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published Minutes shall reproduce and distribute copies of the challenge to all Minutes.
3. Challenge to Minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

END OF SECTION



SECTION 014105  
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Owner in appraising the reasonableness of the proposed schedule and in evaluating progress of the Work, prepare and maintain the schedules and reports described in this Section.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Requirements for progress schedule: General Conditions.
  - 3. Construction period: Form of Agreement.
- C. Definitions: "Day", as used throughout the Contract unless otherwise stated, means calendar day.

1.2 QUALITY ASSURANCE

- A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, and in preparing and issuing periodic reports as required below.
- B. Perform data preparation, analysis, charting, and updating in accordance with standards approved by the Owner.
- C. Reliance upon the approved schedule:
  - 1. The construction schedule as approved by the Owner will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.
  - 2. Should any activity not be completed within 15 days after the stated scheduled date, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.
  - 3. Should any activity be 30 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.
  - 4. Costs incurred by the Owner and by the Engineer in connection with expediting construction activity shall be reimbursed by the Contractor.
  - 5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

### 1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Preliminary analysis: Within 10 calendar days after the Contractor has received the Notice to Proceed, submit one reproducible copy and four prints of a preliminary construction schedule prepared in accordance with Part 3 of this Section.
- C. Construction schedule: Within 10 calendar days after the Contractor has received the Owner's approval to revisions of a preliminary construction schedule, submit one reproducible copy and four prints of a construction schedule prepared in accordance with Part 3 of this Section.
- D. Periodic reports: On the first working day of each month following the submittal described in Paragraph 1.3.C above, submit four prints of the construction schedule updated as described in Part 3 of this Section.

## PART 2 - PRODUCTS

### 2.1 CONSTRUCTION ANALYSIS

- A. Graphically show by bar chart the order and interdependence of all activities necessary to complete the work, and the sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram.
  - 1. Provide two line bar chart; one for planned activity, and one for actual completion.
- B. Include, but do not necessarily limit indicated activities to:
  - 1. Project mobilization.
  - 2. Submittal and approval of shop drawings and samples.
  - 3. Procurement of equipment and critical materials.
  - 4. Fabrication of special material and equipment, and its installation and testing.
  - 5. Final cleanup.
  - 6. Final inspecting and testing.
  - 7. All activities by the Engineer that affect progress, required dates for completion, or both, for all and each part of the Work.

## PART 3 - EXECUTION

### 3.1 PRELIMINARY ANALYSIS

- A. Contents:
  - 1. Show all activities of the Contractor under this Work for the period between receipt of Notice to Proceed and submittal of construction schedule.
  - 2. Show the Contractor's general approach to remainder of the Work.
  - 3. Show cost of all activities scheduled for performance before submittal and approval of the construction schedule.

### 3.2 CONSTRUCTION SCHEDULE

- A. Provide a construction schedule incorporating all revisions from review of the preliminary analysis.

### 3.3 PERIODIC REPORTS

- A. Provide monthly updates of the approved construction schedule.
  - 1. Indicate "actual" progress for each activity on the bar chart.
  - 2. Provide written narrative summary of revisions causing delay in the program, and an explanation of corrective actions taken or proposed.

### 3.4 REVISIONS

- A. Make periodic revisions to the schedule to incorporate delays, early completion, etc.
- B. Make only those revisions to approved construction schedule as are approved in advance by the Owner.

END OF SECTION



SECTION 014106  
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included:

1. Cooperate with the Owner's selected testing agency and all others responsible for testing and inspecting the work.
2. Provide such other testing and inspecting as are specified to be furnished by the Contractor in this Section and/or elsewhere in the Contract Documents.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
2. Requirements for testing may be described in various Sections of these specifications.
3. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.

C. Work not included:

1. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.
2. Payment for initial testing: The Owner will pay for all initial services of the testing laboratory as further described in Article 2.1 of this Section.
3. Tests at point of manufacture as specified in other Sections of these documents are to be made with all costs borne by the Contractor.

1.2 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E 329.

B. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

B. Promptly process and distribute required copies of test reports and related instructions to assure necessary retesting and replacement of materials with the least possible delay in progress of the work.

## PART 2 - PRODUCTS

### 2.1 PAYMENT FOR TESTING

#### A. Initial services:

1. The Owner will pay for initial testing services requested by the Owner.
2. When initial tests indicate non-compliance with the Contract Documents, the costs of initial tests associated with that non-compliance will be deducted by the Owner from the Contract Sum.
3. Retesting: When initial tests indicate non-compliance with the Contract Documents, subsequent re-testing occasioned by the non-compliance shall be performed by the same testing agency and all costs there from will be deducted by the Owner from the contract sum.

### 2.2 CODE COMPLIANCE TESTING

- #### A.
- Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

### 2.3 CONTRACTOR'S CONVENIENCE TESTING

- #### A.
- Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

## PART 3 - EXECUTION

### 3.1 COOPERATION WITH TESTING LABORATORY

- #### A.
- Representatives of the testing laboratory shall have access to the work at all times and at all locations where the work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

### 3.2 TAKING SPECIMENS

- #### A.
- All specimens and samples for testing, and deliveries to laboratory, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

### 3.3 SCHEDULES FOR TESTING

#### A. Establishing schedule:

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
2. Provide all required time within the construction schedule.

- B. Revising schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.
- C. Adherence to schedule: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra charges for testing attributable to the delay may be back-charged to the Contractor and shall not be borne by the Owner.

END OF SECTION





SECTION 015000  
TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide temporary facilities needed for the work including, but not necessarily limited to:
  - 1. Job box for the Contractor's and Engineer's personnel.
  - 2. Sanitary facilities.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.

1.2 PRODUCT HANDLING

- A. Maintain temporary facilities in proper and safe condition throughout progress of the work.

1.3 QUALITY CONTROL

- A. Provide a temporary job box for paperwork to be kept on site. The Engineer will approve of the box and its installed location.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed under this Section.
  - 2. Proposed location of job box.

PART 2 - PRODUCTS

2.1 FACILITIES

- A. Sanitary facilities:
  - 1. Provide temporary sanitary facilities in the quantity required for use by all personnel.
  - 2. Maintain in a sanitary condition at all times.
  - 3. Strictly enforce their use.

## 2.2 TEMPORARY FENCING

- A. Contractor shall provide temporary fencing around entire site construction area as directed by the Owner. Contractor will directly coordinate with Owner.
- B. Fencing shall be minimum 6' high chain link, seamlessly connected and adequately anchored to the ground so that unauthorized persons cannot pass through.
- C. Maintain a secure perimeter around all active work areas.
- D. Make repairs as necessary to maintain secure perimeter, to satisfaction of Owner and Engineer at no additional cost to project.

## 2.3 TEMPORARY CONSTRUCTION ACCESS

- A. Contractor shall use temporary construction access for the site as exists on site. No new access points will be granted.

## PART 3 - EXECUTION

### 3.1 MAINTENANCE AND REMOVAL

- A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.
- B. Remove such temporary facilities and controls as rapidly as progress of the work will permit, or as directed by the Engineer.

END OF SECTION

SECTION 016500  
PRODUCT HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.

1.2 QUALITY ASSURANCE

- A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

- A. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage and protection.

1.4 PACKAGING

- A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
  - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
  - 2. Promptly remove damaged material and unsuitable items from the job site and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- B. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality and other pertinent information.

1.5 PROTECTION OF MATERIAL AND WORK

- A. General:
  - 1. Carefully and properly protect all materials of every description, both before and after being used in the Work in accordance with manufacturer's recommendations.
  - 2. Provide any enclosing or special protection from weather deemed necessary by the Engineer at no additional cost to the Owner.

- B. Partial payments under the Contract will not relieve the Contractor from responsibility.
  - 1. When materials and work at the site that have been partially paid for are not adequately protected by the Contractor, such materials will be protected by the Owner at the expense of the Contractor and no further partial payment thereon will be made.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

#### 1.6 STORAGE

- A. Store all items of equipment, component parts, etc., in accordance with the manufacturers' recommendations or as may otherwise be necessary to prevent damage or deterioration of any sort.
- B. Electrical and control equipment:
  - 1. Store in a dry area protected from dust and humidity.
  - 2. Equipment can be protected by a weatherproof cover if shipped to the site no more than two (2) weeks prior to installation and energization.

#### 1.7 REPAIRS AND REPLACEMENTS

- A. In the event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the contract time of completion.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 017000  
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included shall be providing compliance with the requirements of the General Conditions of these Specifications for administrative procedures in closing out the project work.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Other requirements for technical services are stated in other sections of these Specifications.
  - 3. Section 01720 - Project Record Documents.

1.2 SUBSTANTIAL COMPLETION

- A. The Contractor shall notify the Engineer that, in his opinion, the project is substantially complete. A written statement listing items complete shall be submitted.
- B. Upon receipt of the Contractor's notice, the Engineer shall make an observation to determine if substantial completion is provided.
- C. If, in the Engineer's opinion, the project is not substantially complete, a written notice to the Contractor shall follow outlining reasons and deficiencies in work that comprised the Engineer's decision. The Engineer's decision shall be final.

1.3 FINAL OBSERVATION

- A. The Engineer will make a final observation for the Contractor after all items noted in the substantial completion observation have been corrected. The Contractor shall notify the Engineer in writing when a final observation is needed. Incomplete and/or defective work shall be given to the Contractor by written notice.

1.4 REOBSERVATION

- A. Re-observation required due to failure by the Contractor to make previously noted corrections will be performed by the Engineer.
- B. Cost for such observations will be due to and payable by the Contractor at a rate equal to charges to the Owner for similar work.
- C. Re-observations will continue until the work is acceptable to the Engineer.

## 1.5 COMPLETION BY CONTRACTOR

- A. When the Engineer finds the Contractor's work acceptable, the Contractor shall be given such notice and should proceed with closeout submittals.
- B. Closeout submittals shall contain at least the following:
  - 1. Project record documents.
  - 2. Equipment operation and maintenance manuals and copies of start-up reports.
  - 3. Warranties and bonds.
  - 4. Keys and keying schedule.
  - 5. Spare parts and manuals.
  - 6. Evidence of payment and release to liens per General Conditions.
  - 7. Section 00690 - Contractor's Affidavit.

## 1.6 FINAL PAYMENT

- A. Final payment to the Contractor will be made upon completion of the previous items and others required by these specifications. A final statement shall be forwarded to the Engineer. The statement shall address:
  - 1. Previous change orders.
  - 2. Unit prices.
  - 3. Deductions for uncorrected work.
  - 4. Deductions for liquidated damages.
  - 5. Deductions for re-testing work.
  - 6. Deductions for re-observation.
  - 7. Deductions for shop drawing review.
  - 8. Adjusted contract sum.
  - 9. Previous payments.
  - 10. Amount due.
- B. When required, the Engineer will prepare a contract change order for adjustments not previously made.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 017123  
FIELD ENGINEERING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
1. Provide all staking required to construct the facility from coordinates established by the Engineer.
  2. Establish proper line and levels for installation of utilities.
- B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  2. Additional requirements for field engineering also may be described in other Sections of these Specifications.
  3. Section 02210 - Site Grading.
  4. Section 02220 - Excavation, Backfilling for Structures
  5. Section 02221 - Trenching, Backfilling for Utilities
  5. Section 02510 - Stone Base Course.
  6. Section 02721- Sewers: Storm Drainage
- C. Work by others:
1. The Engineer will establish reference control points for horizontal location of new construction.
  2. Not less than two benchmark elevations will be provided.

1.2 QUALITY ASSURANCE

- A. Provide a competent survey party and surveying instruments for staking the work.
- B. Exercise proper precautions to verify the figures shown on the Drawings prior to laying out any part of the Work.
1. The Contractor will be held responsible for any errors therein that otherwise might have been avoided.
  2. Promptly inform the Engineer of any error or discrepancies discovered in the Drawings or Specifications in order that proper corrections may be made.

1.3 PROCEDURES

- A. Locate and protect control points before starting work on the site.
- B. Preserve permanent reference points during progress of the Work.
- C. Do not change or relocate reference points or items of the Work without specific approval from the Engineer.
- D. Promptly advise the Engineer when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.

END OF SECTION

FIELD ENGINEERING  
017123-1





SECTION 017200  
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included:
  - 1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below.
  - 2. Upon completion of the Work, deliver the recorded changes to the Engineer.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
  - 2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these specifications.

1.2 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.
- B. Accuracy of records shall be such that future search for items shown on the Project Record Documents may rely reasonably on the information provided under this Section of the Work.

1.3 SUBMITTALS

- A. The Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.
- B. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.
- C. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer and secure his approval.

1.4 PRODUCT HANDLING

- A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer to the Engineer.
- B. In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.
  - 1. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealing materials.
  - 2. In such case, provide replacements to the standards originally required by the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 JOB SET DOCUMENTS

- A. Promptly following receipt of the Owner's Notice to Proceed, secure from the Engineer, at no charge to the Contractor, one complete set of all Documents comprising the Contract.

## PART 3 - EXECUTION

### 3.1 MAINTENANCE OF JOB SET

- A. Immediately upon receipt of the job set described in above paragraph titled "JOB SET DOCUMENTS", identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET".
- B. Preservation:
  - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Engineer.
  - 2. Do not use the job set for any purpose except entry of new data and for review by the Engineer.
  - 3. Maintain the job set at the site of Work as that site is designated by the Engineer.
- C. Field work and making entries on Job Set Drawings:
  - 1. Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.
  - 2. Show by station number location of all fittings, manholes, valves, wye locations, etc.
  - 3. Reference all fittings and valves at least to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.
  - 4. Reference all pipelines from the center of the parallel roadway at least every 100 feet or where changes occur in the direction of the pipeline.
  - 5. Reference all bores from the center of the roadway to the beginning and end of the casing and ductile iron pipe. Depths of bury must also be provided.
  - 6. Reference all stream crossings and their distance from the center of the parallel roadway and the bridge or other obstruction. A profile of the stream crossing shall also be provided to show the depth of the pipeline under the stream.
  - 7. Field measure and reference all fittings and valves to two aboveground items reasonably safe from being relocated and indicate such references on the drawings.
  - 8. Show location of electrical conduit, pull boxes, etc.
  - 9. Gravity sewers and storm sewers
    - a. Provide survey grade state plane Geographic Information System (G.I.S.) electronic data horizontal coordinates for each manhole location.
    - b. Provide ground elevation, top elevation and invert elevations for each manhole.
    - c. Comply with Section 01050.1

D. Submittal:

1. Submit "marked-up" set of drawings to the Engineer.
2. Make any necessary additions as required by the Engineer.

END OF SECTION



SECTION 023200  
GEOTECHNICAL INVESTIGATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Soils investigation report:
  - 1. A soils investigation reports has not been prepared for the site.
- B. Use of data:
  - 1. It is the responsibility of the Bidders to visit the site and acquaint themselves with existing conditions.
  - 2. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Engineer.

1.2 QUALITY ASSURANCE

- A. A soil engineer will be retained by the Owner to observe performance of work in connection with excavating, trenching, filling, backfilling and grading, and to perform compaction tests.
- B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written approval from the Engineer.

END OF SECTION



## SECTION 033055

### CAST-IN-PLACE CONCRETE FOR SITEWORK

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Provide cast-in-place concrete, including formwork and reinforcement, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Reference standards: Comply with the following codes, specifications and standards, except as otherwise shown or specified:
  - 1. American Concrete Institute (ACI) Publications:
    - ACI 301 Specification for Structural Concrete for Buildings
    - ACI 305 Recommended Practice for Hot Weather Concreting
    - ACI 306 Recommended Practice for Cold Weather Concreting
    - ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures
    - ACI 318 Building Code Requirements for Reinforced Concrete
    - ACI 347 Recommended Practice for Concrete Framework
  - 2. American Society for Testing and Materials (ASTM) Publications:
    - A185 Welded Steel Wire Fabric for Concrete Reinforcement
    - A615 Deformed and Plain Billet Steel Bars for Concrete Reinforcement
    - C31 Making and Curing Concrete Test Specimens in the Field
    - C33 Concrete Aggregates
    - C39-72 Compressive Strength of Cylindrical Concrete Specimens
    - C94 Ready-Mixed Concrete
    - C150 Portland Cement
    - C260 Air-Entraining Admixtures for Concrete
  - 3. Concrete Reinforcing Steel Institute (CRSI):
    - "Manual of Standard Practice"
  - 4. American Welding Society (AWS) Publication:
    - D12.1-61 Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete
- C. Testing agency: A testing laboratory will be retained by the Owner to perform material evaluation tests required by these specifications.

- D. Qualifications of contractors performing concrete work: Minimum of two (2) years experience on comparable concrete projects.
- E. Plant qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C94.

### 1.3 SUBMITTALS

- A. Comply with the pertinent provisions of Section 01340.
- B. Within 15 calendar days after receiving the Owner's Notice to Proceed, submit proposed mix designs for approval.
  - 1. Proportions shall be determined by means of laboratory tests of concrete made with the cement and aggregate proposed for use.
  - 2. Provide report in detail from an approved testing laboratory showing 7-day and 28-day strengths obtained using materials proposed.
  - 3. Required average strength above specified strength:
    - a. Determinations of required average strength above specified strength ( $f'c$ ) shall be in accordance with ACI 318 and ACI 301.
    - b. Establish the required average strength of the design mix using the materials proposed to be employed. Standard deviations shall be determined by thirty tests. Average strength used for selecting proportions shall exceed specified strength ( $f'c$ ) by at least:
 

400 psi	Standard deviation is less than 300
550 psi	Standard deviation is 300 to 400
700 psi	Standard deviation is 400 to 500
900 psi	Standard deviation is 500 to 600
1200 psi	Standard deviation is above 600 or unknown
    - c. When the ready-mix producer does not have a record of past performance, the combination of materials and the proportions selected shall be selected from trial mixes having proportions and consistencies suitable for the work using at least three (3) different water/cement ratios which will produce a range of strengths encompassing those required. Average strength required shall be 1200 psi above specified strength.
  - 4. Cost of this work shall be borne by the Contractor.
- C. Manufacturer's data: Submit manufacturer's specification with application instructions for proprietary materials and items, including curing compound, form release agents, admixtures, patching compounds, and others as required by the Engineer.
- D. Shop drawings: Submit the following shop drawings to the Engineer for approval before work is started:
  - 1. Reinforcing steel drawings: Prepare in accordance with ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, dimensions and details of bar reinforcing and accessories.
  - 2. Cementitious coating.

### 1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.



- B. Store reinforcement in a manner that will avoid excessive rusting or coating by grease, oil, dirt and other objectionable materials.
- C. Keep reinforcement in separate piles or racks so as to avoid loss of identification after bundles are broken.

## PART 2 - PRODUCTS

### 2.1 FORMS

- A. Use form materials conforming to ACI 347.
- B. Form lumber: Use lumber of sufficient quality and grade, size and stiffness to adequately support the work and ensure dimensional accuracy.
- C. Form ties: Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole.
  - 1. Use ties with cones that allow a 1" break back and facilitate patching.
  - 2. On structures containing water or other liquid or below grade structures, use embedded rod ties with integral waterstops in addition to cones.
  - 3. Through-bolts that utilize a removable tapered sleeve in water containing and below grade applications: Use mechanical EPDM rubber plugs to seal holes made after removal of taper ties. Acceptable product is X-Plug by the Greenstreak Group, Inc. 800-325-9504. Follow manufacturers' instructions for installation. Friction fit plugs are not allowed.
  - 4. Wire ties and wood spreaders will not be permitted.
- D. Form coatings: Form release coating shall be neat oil with surface wetting agent or chemical release agent which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.
  - 1. On surfaces to receive an applied coating, use a residual free chemical form release agent which is compatible with the applied coating and will not prevent the applied finish from satisfactorily bonding to the concrete.
- E. Chamfer strips: Chamfer strips shall be wood or polyvinyl strips or approved equal, designed to be nailed in the forms to provide a 3/4" chamfer (unless indicated otherwise) at all exposed edges and corners of concrete members.

### 2.2 REINFORCEMENT

- A. Comply with the following as minimums:
  - 1. Bars: ASTM A615, Grade 60, unless otherwise shown on the Drawings, using deformed bars for Number 3 and larger.
  - 2. Welded wire fabric: ASTM A185.
    - a. Use sheet (mat) welded wire fabric only.
    - b. Welded wire fabric supplied in rolls will not be accepted.
  - 3. Bending: ACI 315 and ACI 318.
- B. Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in the CRSI "Manual of Standard Practices".
- C. Do not use reinforcement having any of the following defects:
  - 1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances.

2. Bends or kinks not indicated on the Drawings or required for this Work.
  3. Bars with excessive rust, scale, dirt, oil or other defects which will reduce the bond or the effective cross section of the bar.
- D. Furnish all support bars, tie bars, chairs, bolsters, etc. required for properly supporting and spacing bars in the forms.
1. For slabs on grade, use supports with stand plates or horizontal runners where wetted base materials will not support chair legs. Other supports must be approved by the Engineer.
  2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are hot-dip galvanized, plastic protected or stainless steel.
  3. Supply supports for welded wire fabric as follows:

**Welded Wire Fabric Support Spacing**

<u>Welded Wire Reinforcement (diameter)</u>	<u>Welded Wire Spacing (inches)</u>	<u>Maximum Support Spacing (feet)</u>
W9 or larger	12 and greater	4
W5 to W8	12 and greater	3
W9 and larger	Less than 12	3
W4 to W8	Less than 12	2
Less than W4	Less than 12	1.5

- E. Tie wire: FS QQ-W-461, annealed steel, black, 16 gauge minimum.
- F. Welding electrodes: AWS A5.1, low hydrogen, E70 series.
- G. Splice devices: Shall be sized to develop one hundred twenty-five (125%) percent of yield strength of bar.

### 2.3 CONCRETE MATERIALS

- A. Cement: Use portland cement: ASTM C150, Type I, Type I-P or Type II, low alkali.
1. Where concrete will be exposed to sewage, use Type II or I-P cement.
  2. Fly ash shall conform to ASTM C618, Class C or F.
  3. Fly ash content shall not exceed 20% by weight of the total amount of cementitious materials (portland cement plus fly ash).
- B. Aggregates:
1. Fine aggregate: Conform to ASTM C33.
  2. Coarse aggregate: Conform to ASTM C33, Size #57.
- C. Water: Clean and potable and free from injurious amounts of deleterious materials.
- D. Admixtures:
1. Air entraining admixture: ASTM C260.
  2. Water reducing, set controlling admixture: Conform to ASTM C494.
    - a. Type A - water reducing.
    - b. Type D - water reducing and retarding.

3. Superplasticizers: Conform to ASTM C494, Types F and G.
  - a. Use superplasticizers in thin section placements and in areas of congested reinforcing and/or embedded items, or where otherwise approved by the Engineer.
  - b. Use where conventional consolidation techniques are impractical.
4. Do not use admixtures containing calcium chloride.

E. Fiber reinforcing:

1. Use fiber reinforcing where indicated on the drawings.
2. Provide polypropylene or co-polymer fibers as manufactured by High Tech Fibers, Inc., Fibermesh Company or an approved equal.
3. Where required, use fiber reinforcing at a rate of 2.0 lbs. per cubic yard unless another rate is indicated on the drawings.

F. Curing compounds:

1. On all vertical and formed surfaces, construction joints, basin slabs, surfaces to receive an applied coating or finish, and other surfaces except as otherwise indicated or specified, use a non-residual, non-staining curing compound conforming to ASTM C309 Type 1 and 1D. Acceptable products are:
  - a. L&M Cure by L&M Construction Chemicals, Inc.
  - b. Horn WB-75 by A.C. Horn Company.
  - c. Sonosil by Sonneborn, Inc.
  - d. Approved equal.
2. On building floor slabs not otherwise receiving an applied coating or finish and on other flatwork as indicated on the Drawings, provide an acrylic copolymer curing and sealing compound conforming to ASTM C309 Type 1 and the following:
  - a. Non-yellowing.
  - b. Minimum 20% solids.
  - c. Maximum unit moisture loss in accordance with ASTM C156 - 0.40 kg./sq.m at 72 hours.
  - d. Acceptable products are Dress & Seal by L&M Construction Chemicals, Inc., Clear Seal Standard by A. C. Horn Company, Kure-N-Seal 0800 by Sonneborn, Inc., or approved equal.

## 2.4 CONCRETE MIXES

- A. Provide concrete with the compressive strengths shown on the Drawings. When such strengths are not shown on the Drawings, provide the following 28-day strengths as minimum:

- |    |  |          |
|----|--|----------|
| 1. | All structural concrete except as indicated in Nos. 2 and 3 below or as noted otherwise on the plans | 4000 psi |
| 2. | All sidewalks, curbs and gutters, and unreinforced foundations                                       | 4000 psi |
| 3. | Thrust blocking, backfill or encasement for piping, and concrete fill                                | 2500 psi |
| 4. | Prestressed or precast concrete:   | 5000 psi |

- B. Maximum water cement ratios:

4000 psi concrete	0.5
3000 psi concrete	0.53
2500 psi concrete	0.67

- C. Entrained air:
- |                            |              |
|----------------------------|--------------|
| 3000 and 4000 psi concrete | 5% ± 1%      |
| 2500 psi concrete          | Not Required |
- D. Slump:
- |                            |         |
|----------------------------|---------|
| 3000 and 4000 psi concrete | 4" ± 1" |
| 2500 psi concrete          | 5" ± 1" |
- E. Production of concrete:
1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C94 except as otherwise indicated.
  2. Monitor time and mix proportions by plant delivery slips.
  3. Air entraining admixtures: Add air entraining admixture into the mixture as a solution and measure by means of an approved mechanical dispensing device.
  4. Water reducing and retarding admixture: Add water reducing and retarding admixture and measure as recommended by the manufacturer.
  5. Addition of water to the mix upon arrival at the job site shall not exceed that necessary to compensate for a 1" loss in slump, nor shall the design maximum water-cement ratio be exceeded. Water shall not be added to the batch at any later time.
  6. Weather conditions: Control temperature of mix as required by ACI 306 "Cold Weather Concreting" and by ACI 305 "Hot Weather Concreting".

## PART 3 - EXECUTION

### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Water, mud, organic, and other detrimental material shall be removed from excavations before concrete is deposited.
- C. Notify the Engineer prior to placing concrete and place no concrete until the formwork, reinforcing and embedded items have been observed by the Engineer.

### 3.2 FORMWORK

- A. General:
1. Construct forms in conformance with ACI 347.
  2. Design, erect, support, brace and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.
  3. Construct forms to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structure.
  4. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and prevent fins.

B. Form construction and erection:

1. Construct forms in conformance with ACI 347.
2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other embedded items as required.
3. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the Engineer.
4. Unless specifically stated otherwise, provide 3/4" chamfer at all exposed edges of concrete.
5. Provide temporary openings in the formwork where necessary to facilitate cleaning and inspection of the formwork.
6. Coat form contact surfaces with approved form coating compound prior to placing reinforcing steel.
7. Do not allow excess form coating material to accumulate in the forms or to come in contact with reinforcing surfaces which will bond to fresh concrete.
8. Side forms for footings may be omitted, and concrete may be placed directly against excavation only when requested by the Contractor and approved by the Engineer.
9. Provide a positive means of adjustment of shores and struts and ensure that all settlement is taken up during concrete placing.
10. Construct blockouts and formed openings of sufficient size and proper location to permit final alignment of items within it or passing through it.
  - a. Allow sufficient space for grouting, packing or sealing around any items penetrating the opening as may be required to ensure watertightness.
  - b. Provide openings with continuous keyways with waterstops where required, and provide a slight flare to facilitate grouting and the escape of entrapped air during grouting.
  - c. Provide only blockouts or openings that are shown on the drawings or otherwise approved by the Engineer.

C. Formwork reuse: Reuse only forms that are in good condition and which maintain a uniform surface texture on expose concrete surfaces.

1. Apply a light sanding as necessary to obtain a uniform texture.
2. Plug unused tie holes and penetrations flush with the form surface.

D. Removal of forms:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
2. Do not remove forms before the following minimum times without prior approval from the Engineer:

a. Sides of footings or slabs on grade	24 hrs
b. Walls not supporting load	48 hrs
c. Vertical sides of beams	48 hrs
d. Columns not supporting load	48 hrs
e. Suspended slabs or beam bottoms (forms only)	10 days
3. In determining the minimum stripping times, consider only the cumulative time during which the ambient temperature of the air surrounding the concrete is above 50°.
4. Do not remove shoring for suspended slabs or beams until the concrete has reached 75% of the specified 28 day strength.

5. When reshoring or backshoring is permitted or required, plan the operations in advance and submit procedures to the Engineer for approval.
  - a. Design and plan all reshoring operations to support all construction loading and in accordance with ACI 347.
6. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged and that corners are true, sharp and unbroken.
7. Do not permit steel spreaders, form ties, or other metal to project from or be visible on any concrete surface except where so shown on the drawings.
8. Whenever the formwork is removed during the curing period, continue to cure the exposed concrete by one of the methods specified herein.

### 3.3 EMBEDDED ITEMS

- A. Embedded items: Set anchor bolts and other embedded items accurately and securely in position in the forms until the concrete is placed and set.
  1. Use templates where practical for all anchor bolts.
  2. Check locations of all anchor bolt and special castings prior to placing concrete and verify locations after concreting.
- B. Piping cast in concrete:
  1. Install and secure sleeves, wall pipes and pipe penetrations before placing concrete.
  2. Do not weld or otherwise attach piping to reinforcing steel.
  3. Support piping to be encased in concrete securely and on firm foundation so as to prevent movement or settlement during concreting.
- C. Locate electrical conduit so that it will not impair the strength of the construction.
  1. Do not use conduits running within (not passing through) a slab, wall or beam that are larger in outside diameter than  $1/3$  overall concrete thickness unless otherwise approved by the Engineer.
  2. Do not space conduits closer than three conduit diameters apart unless otherwise approved by the Engineer.

### 3.4 REINFORCEMENT

- A. General: Comply with the specified codes and standards and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as herein specified.
  1. Clean reinforcement and remove loose dust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
  2. Position and secure reinforcement against displacement by forms, construction, and the concrete placement operations.
  3. Use adequate number of ties to secure reinforcing.
  4. Do not weld or field bend reinforcing without prior approval by the Engineer.
- B. Placing reinforcing:
  1. Provide and install all chairs, runners, bolsters, standees and other accessories in sufficient quantities to satisfactorily position the reinforcing and hold it in place during concrete placement.
  2. Support reinforcing for slabs on ground on chairs or bolsters with stand plates or a properly sized concrete cube.
    - a. Use concrete bricks as supports only as approved by the Engineer.

3. Secure and tie dowels in place prior to placing concrete. Do not press dowels into wet concrete.
- C. Concrete cover: Unless otherwise indicated on the drawings or specified herein, install reinforcing with clear concrete coverage in conformance with ACI 318.
1. All reinforcement, regardless of size, exposed to water or sewage shall have 2" cover.
  2. Place reinforcement a minimum of 2" clear of any openings or metal pipe or fittings.
- D. Splicing reinforcement: Splice reinforcement steel in accordance with the latest revisions of ACI 318 "Building Code Requirements for Reinforced Concrete" unless shown otherwise on the drawings.
1. All splices at wall corners or intersections and at wall and foundation intersections shall be Class B tension splices per ACI 3-18, Sections 12.2.2 and 12.15.
  2. All other splices of vertical or horizontal steel in walls shall be Class B tension splices as per ACI 318 per ACI 318, Sections 12.2.2 and 12.15.
  3. Horizontal ring steel in circular, non-prestressed concrete tanks shall be Class B tension splices and the splices shall be staggered so that no more than 50% of the bars are spliced at any one location.
  4. All welded or mechanical splicing devices shall develop 125% of the yield strength of the bar.
  5. Column vertical bars shall lap 30 bar diameters with dowels at the base of the column unless otherwise noted. Dowels shall be the same size and quantity as column vertical bars unless otherwise noted.
  6. All splices not otherwise shown or specified shall be Class B tension lap splices per ACI 318, Sections 12.2.2 and 12.15.
- E. Tolerances: Place bars in the locations indicated within the tolerances conforming to the CRSI "Manual of Standard Practice".
- F. Welded wire mesh: Install welded wire fabric in as long of a length as practicable and lay flat before placing concrete.
1. Use only mat welded wire fabric. Do not use welded wire fabric from rolls.
  2. Support and tie mesh to prevent movement during concrete placement.
  3. Lap adjoining pieces at least one full mesh and lace splices with wire.
  4. Provide, at a minimum, supports for welded wire fabric according to the Table in Section 2.2.D.3. Confirm the adequacy of the support spacings listed therein for the anticipated construction loads. Increase the number of supports, if necessary, to assure that the final position of the welded wire fabric will conform to that shown on the drawings.
  5. Do not place welded wire fabric on the subbase surface and then hook or "pull up" the reinforcement during concrete placement.
  6. Do not lay welded wire fabric on top of the freshly placed concrete and then "walk it" into place.

### 3.5 PLACING CONCRETE

A. Preparation:

1. Remove foreign matter accumulated in the forms.
2. Rigidly close openings left in the formwork.
3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete.
4. Use only clean tools.

5. Provide and maintain sufficient tools and equipment on hand to facilitate uninterrupted placement of the concrete.
  6. Before commencing concrete, inspect and complete installation of formwork, reinforcing steel and all items to be embedded or cast-in.
- B. Conveying:
1. Transport and handle concrete from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete.
  2. Provide equipment for lifting, dumping, chuting, pumping or conveying the concrete, of such size and design as to ensure a practically continuous flow of concrete at the delivery and without separation of materials.
  3. Use hoppers and elephant trunks where necessary to prevent the free fall of concrete for more than 4'.
  4. Do not use concrete that is not placed within 1-1/2 hours after water is first introduced into the mix unless the slump is such that it meets the specified limits without the addition of water to the batch.
- C. Placing:
1. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
  2. Deposit concrete in horizontal layers not deeper than 2', avoiding inclined layers.
  3. Place concrete at such a manner that concrete upon which fresh concrete is deposited is still plastic.
  4. Bring slab surfaces to the correct level with screeds set to the proper elevation.
- D. Hot weather placement: Place concrete in hot weather in accordance with ACI 305 "Hot Weather Concreting" and as specified herein.
1. Do not place concrete whose temperature exceeds 100°F.
  2. Thoroughly wet forms and reinforcing prior to placement of concrete.
  3. Use additional set retarder as necessary to increase set time.
  4. Limit the size of the pour where it may reduce the likelihood of cold joints due to reduced set time.
  5. Shade the fresh concrete as soon as possible after placing.
  6. Start curing as soon as the concrete is sufficiently hard to permit without damage.
- E. Cold weather placement: Place concrete in cold weather in accordance with ACI 306 and as specified herein.
1. Except when authorized specifically by the Engineer, do not place concrete when the atmospheric temperature is below 40°F.
  2. When cold weather placement is approved by the Engineer, heat either the mixing water or aggregate or both so that the concrete temperature is between 65°F and 85°F.
  3. Protect the freshly placed concrete by adequate housing or covering and provide heat to maintain a temperature of not less than 50°F for not less than four days.
  4. Do not add salts, chemicals, or other materials to the concrete mix to lower the freezing point of the concrete.



F. Consolidation:

1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.
  - a. Use vibrators having a 2" head diameter and a minimum frequency of 8000 vibrations per second.
  - b. Provide sufficient number of vibrators to properly consolidate the concrete, keeping up with placement operations.
  - c. Provide at least one spare vibrator on site.
2. Insert and withdraw vibrators at points approximately 18" apart.
3. Do not vibrate forms or reinforcement.
4. Do not use vibrators to transport concrete inside the forms.

3.6 PROTECTION

- A. Protect the surface finish of newly placed concrete from damage by rainwater or construction traffic.
- B. Do not apply design loads to structures until the concrete has obtained the specified strength.
  1. Do not backfill against walls until they have reached the specified strength and all supporting or bracing walls, slabs, etc. have also reached the specified strength, unless otherwise permitted by the Engineer.
  2. Protect structures from construction overloads.

3.7 CURING

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures and mechanical injury.
- B. Continuously cure concrete for a period of not less than 7 days after placement.
  1. When seven-day cylinder breaks indicate, in the opinion of the Engineer, the possibility of low strength concrete, provide additional curing as per the request of the Engineer.
  2. When temperatures during the curing period fall below 40°F, provide additional curing time as directed by the Engineer.
- C. Unless otherwise directed by the Engineer, cure concrete not in contact with forms in accordance with one of the following procedures:
  1. Ponding or sprinkling: Keep entire concrete surface wet by continuously sprinkling or by allowing water to pond, covering all surfaces.
  2. Wet burlap: Thoroughly wet and cover all concrete surfaces with wet burlap mats as soon as the concrete has set sufficiently to avoid marring the surface.
    - a. Keep the burlap continuously wet during the curing period.
  3. Curing blankets: Thoroughly wet concrete surfaces to be cured and cover with curing blankets as soon as the concrete has set sufficiently to avoid marring the surface.
    - a. Weight the blankets down to maintain close contact with the concrete surface.
    - b. Use sheets of waterproof kraft paper with the joints between sheets taped continuously; or
    - c. Use sheets of 4 mil or thicker polyethylene with the joints between sheets continuously taped.

4. Wet sand: Apply a layer of sand over the entire surface and keep it continuously wet.
  5. Curing compound: Apply curing compound immediately after completion of the finish on uniformed surfaces and within two hours after removal of forms on formed surfaces.
    - a. Spray the entire surface with two coats of liquid curing compound, applying the second coat in the direction of 90° to the first coat.
    - b. Apply compound in accordance with the manufacturer's instructions to cover the surface with a uniform film which will seal thoroughly.
- D. Hot weather: When necessary, provide wind breaks, shading, fog spraying, sprinkling, ponding or wet covering with a light colored material applying as quickly as concrete hardening and finishing operations will allow.

### 3.8 CONCRETE FINISHING

- A. Finish schedule: Unless otherwise indicated on the drawings, finish all concrete surfaces in accordance with the following schedule:
1. Form finish: Formed surfaces not ordinarily exposed to view, including:
    - a. Interior walls of open tanks below a line one foot lower than the lowest normal water level.
    - b. The underside of slabs not exposed to view.
    - c. Walls below grade.
  2. Cementitious coating: All formed surfaces exposed to view including:
    - a. Interior walls of tanks above a line one foot lower than the lowest normal water level.
    - b. The underside of slabs, soffits, etc. exposed to view.
  3. Float finish: Slab surfaces not exposed to view or not receiving an applied thin finish, including:
    - a. Bottom slabs of tanks or structures containing water sewage or other liquid.
    - b. Foundations not exposed to view.
    - c. Roof slabs to be covered with insulation and/or built-up roofing.
  4. Trowel finish: Interior slab surfaces exposed to view or to receive an applied thin film coating or floor finish, including:
    - a. Interior, indoor slabs and floors of buildings.
    - b. Surfaces on which mechanical equipment moves.
    - c. Floors receiving vinyl tile, resilient flooring, carpet, paint, etc.
  5. Broom finish: Exterior, outdoor slabs exposed to view including:
    - a. Outdoor floor slabs and walkways.
    - b. Other floors which may become wet or otherwise require a non-skid surface.
    - c. Sidewalks and concrete pavements.
  6. Scratch finish: Surfaces which are to receive a thick topping or additional concrete cast against them including:
    - a. Surfaces receiving concrete equipment pads.
    - b. Floors receiving concrete topping.
    - c. Construction joints not otherwise keyed.
  7. Edge finish: Exposed edges of slabs not receiving chamfer including:
    - a. Sidewalk edges and joints.
    - b. Pavement edges and joints.
    - c. Other slab edges not chamfered.
- B. Finishing procedures:
1. Form finish:
    - a. Repair defective concrete.
    - b. Fill depressions deeper than 1/4".

- c. Fill tie holes.
  - d. Remove fins exceeding 1/8" in height.
2. Cementitious finish:
- a. Patch all tie holes and defects and remove all fins.
  - b. Within one day of form removal, fill all bug holes, wet the surfaces and rub with carborundum brick until a uniform color and texture are produced; or
  - c. Dampen surfaces, brush apply a grout slurry consisting of 1 part portland cement to 1-1/2 parts sand, and rub the surface vigorously with a stone. Remove all excess grout.
  - d. Provide a two coat cement base waterproofing, sealing finish of Thoroseal and Thoroseal Plaster Mix as manufactured by Standard Dry Wall Products, Inc. or an approved equal.
    - 1) Patch all tie holes and defects and removal all fins, and clean surface of all dirt, laitance, grease, form treatments, curing compounds, etc.
    - 2) Key coat: Apply key coat of Thoroseal at a rate of two (2) lbs. per sq. yd. by fiber brush. Mix material using one part of Acryl 60 to three parts clean water. Should material start to drag during application, dampen surface with water. During hot weather periods, dampen surfaces with water prior to application of key coat material. Key coat shall be allowed to cure for five (5) days before applying finish coat.
    - 3) Apply a finish coat consisting of a four (4) to six (6) lbs. per sq. yd. application of Thoroseal Plaster Mix using steel trowel or spray gun. Color to be selected by the Owner. Mix dry material using one (1) part Acryl 60 to three (3) parts clean water. Firmly press the mix into all voids and level with a steel trowel. When surface is set so that it will not roll or lift, float it uniformly using a sponge float.
3. Float finish:
- a. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
  - b. Cut down all high spots and fill all low spots and float the slab to a uniform sandy texture.
4. Trowel finish:
- a. Float finish as specified herein.
  - b. Power trowel to a smooth surface free of defects.
  - c. After the surface has hardened sufficiently, hand trowel until a ringing sound is produced as the trowel is moved over the concrete surface.
5. Broom finish:
- a. Float finish as specified herein.
  - b. Provide a scored texture by drawing a broom across the surface.
6. Scratch surface:
- a. Screed the surface to the proper elevations.
  - b. Roughen with rakes or stiff brushes.
7. Edge finish: Tool slab edges and joints with a 1/4" radius edging tool.

### 3.9 SURFACE REPAIR

#### A. Patching mortar:

- 1. Make a patching mortar consisting of 1 part portland cement to 2-1/2 parts sand by damp loose volume.
- 2. Mix the mortar using one part acrylic bonding admixture to two parts water.

#### B. Tie holes: Clean and dampen all tie holes and fill solidly with patching mortar.

- C. Surface defects:
  - 1. Remove all defective concrete down to sound solid concrete.
  - 2. Chip edges perpendicular to the concrete surface or slightly undercut, allowing no feather edges.
  - 3. Dampen surfaces to be patched.
  - 4. Patch defects by filling solidly with repair mortar.
- D. Allow the Engineer to observe the work before placing the patching mortar.
- E. Repair defective areas greater than 1 sq. ft. or deeper than 1-1/2" as directed by the Engineer using materials approved by the Engineer at no additional expense to the Owner.

### 3.10 JOINTS

- A. Construction joints:
  - 1. Unless otherwise approved by the Engineer, provide construction joints as shown on the drawings.
  - 2. If additional construction joints are found to be required, secure the Engineer's approval of joint design and location prior to start of concrete placement.
  - 3. Continue all reinforcing across construction joints and provide 1-1/2" deep keyways unless indicated otherwise on the drawings.
    - a. Form keyways in place.
  - 4. Provide waterstops in all construction joints of liquid containing structures, structures below grade or other structures as shown on the drawings.
- B. Expansion joints:
  - 1. Provide expansion joints of size, type and locations as shown on the drawings.
  - 2. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except smooth dowels bonded on only one side of the joints, where indicated on the drawings) to extend continuously through any expansion joint.
  - 3. Provide waterstops where required.
- C. Control or contraction joints:
  - 1. Locate and construct control and contraction joints in accordance with the Drawings.
  - 2. Where no specific joint pattern is indicated in slabs on grade or concrete pavements, submit a proposed joint layout to the Engineer for approval.
  - 3. Where no specific joint details are shown on the drawings, joints may be tooled, preformed or saw-cut.
  - 4. Saw-cut joints as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw.

### 3.11 FIELD QUALITY CONTROL

- A. Concrete cylinder tests:
  - 1. During construction, prepare test cylinders for compressive strength testing, using 6" diameter by 12" long single use molds, complying with ASTM C31.
    - a. Make a set of three test cylinders from each pour of 50 cubic yards or less, plus one additional set of cylinders for each additional 50 cubic yards or fraction thereof.

- b. Identify each and tag cylinder as to date of pour and location of concrete which it represents.
  - c. Deliver cylinders to testing lab selected by the Owner.
  - d. Cost for preparation and delivery of cylinders shall be borne by the Contractor. Cost for testing cylinders will be borne by the Owner.
2. Should strengths shown by test cylinders fail to meet specified strengths for the concrete represented, then:
- a. Engineer shall have the right to require changes in the mix proportions as he deems necessary on the remainder of the work.
  - b. Additional curing of those portions of the structure represented by the failed test cylinders shall be accomplished as directed by the Engineer.
  - c. Upon failure of the additional curing to bring the concrete up to specified strength requirements, strengthening or replacement of those portions of the structure shall be as directed by the Engineer.
  - d. The Engineer may require additional testing of concrete in question by either non-destructive methods such as the Swiss Hammer, Windsor Probe or Ultrasonics or by coring and testing the concrete in question in accordance with ASTM C42. Such testing shall be performed at no additional cost to the Owner.

B. Other field concrete tests:

1. Slump tests: Either the Engineer or a testing laboratory representative will make slump tests of concrete as it is discharged from the mixer.
  - a. Slump test may be made on any concrete batch at the discretion of the Engineer.
  - b. Failure to meet specified slump requirements (prior to addition of any superplasticizers) will be cause for rejection of the concrete.
2. Temperature: The concrete temperature may be checked at the discretion of the Engineer.
3. Entrained air: Air content of the concrete will be checked by a representative of the testing laboratory at the discretion of the Engineer.

C. Coordination of laboratory services: The Contractor shall be responsible for coordination of laboratory services.

1. Maintain a log recording quantities of each type of concrete placed, date and location of pour.
2. Inform the testing laboratory of locations and dates of concrete placement and other information as required to be identified in the laboratory's test reports.

D. Tests required because of extensive honeycombing, poor consolidation of the concrete or any suspected deficiency in the concrete will be paid for by the Contractor.

E. Dimensional tolerances:

1. Dimensional tolerances for allowable variations from dimensions or locations of concrete work, including the locations of embedded items shall be as given in ACI 301.
2. Where anchor bolts or other embedded items are required for equipment installation, comply with the manufacturer's tolerances if more stringent than those stated in ACI 301.

F. Watertight concrete:

1. All liquid containing structures, basements or pits below grade shall be watertight.
2. Any visible leakage or seepage shall be repaired as instructed by the Engineer at no expense to the Owner.
3. Where physical evidence of honeycombing, cold joints or other deficiencies which may impair the watertightness of a structure exists, the Engineer may at his discretion call for leak testing of the structure.
  - a. Fill the structure with water and allow to stand for not less than 48 hours.
  - b. Make repairs on the structure until all visible leaks are sealed and the leakage rate of the water in the structure is less than 0.1% of the volume held in the structure per day.
  - c. The cost of testing and repairs shall be performed at no expense to the Owner.

- G. Concrete which fails to meet strength requirements, dimensional tolerances, watertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the Engineer at no expense to the Owner.

3.12 MEASUREMENT AND PAYMENT

- A. No measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the item in which the concrete work is an integral part.

END OF SECTION

## SECTION 115213 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. Sand Volleyball Equipment
    - a. Foam Barrier Compression Pad
    - b. Referee Stands
    - c. Boundary Line Markers
    - d. Volleyball Nets
    - e. Volleyball Posts
    - f. Volleyball Antennas
    - g. Pole and Stand Padding
    - h. Multi Head & Foot Shower
  - 2. Miscellaneous Equipment
    - a. Ball Netting System
    - b. Perimeter Graphic Padding

#### 1.2 RELATED WORK

- A. Synthetic Turf Playing Field System
- B. Chain Link Fences and Gates
- C. Scoreboards / Timing Equipment

#### 1.3 SUBMITTALS

- A. Shop Drawings:
  - 1. Show application to project
  - 2. Include plans, elevations, component details, and attachments to other Work.
- B. Product Data: Submit manufacturer's product data and samples as noted for the following: Foam Barrier Compression Pad
  - 2. Referee Stands
  - 3. Boundary Line Markers
  - 4. Volleyball Netting
  - 5. Volleyball Posts
  - 6. Volleyball Antennas
  - 7. Pole and Padding
  - 8. Multi Head and Foot Shower

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Inline Ball Net System – Contractor to submit sealed shop drawings by a State Licensed Engineer for the upright post diameter and footing design.

## 1.5 QUALITY ASSURANCE

- A. Installer of outdoor sports equipment shall be the same Contractor. All installed equipment shall be under the supervision of Owner's groundskeeper.
- B. Inline Ball Net System Installer – Contractor to restretch/tighten netting if necessary 60 days after substantial completion.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code-Steel," and AWS D1.3, "Structural Welding Code – Sheet Steel."

## 1.6 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. Ball Netting System: 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.

## PART 2 - PRODUCTS

### 2.1 SAND VOLLEYBALL EQUIPMENT

- A. Foam Barrier Compression Pad
  - 1. Pads
    - a. 4" square compression foam thickness
    - b. Attachment to concrete curb via rigid outdoor Velcro
    - c. Available in standard colors, to be chosen by owner
  - 2. Foam Barrier Compression Pad Suppliers
    - a. Volleyball USA, (800) 494-3933, volleyballusa.com
    - b. Approved equal
- B. Outdoor Beach Volleyball Referee Stands
  - 1. Stands
    - a. 6'-2" Seat Height
    - b. High Grade UV / Water Resistant Cushion



2. Referee Stand Suppliers
  - a. Volleyball USA, (800) 494-3933,volleyballusa.com
  - b. Approved equal
- C. Boundary Line Markers
  1. Premium Boundary Lines
    - a. 18 oz. UV treated vinyl quad stitched
    - b. Adjustable with lock down clips
    - c. Zinc plated steel corner rings and center court markings
    - d. Plastic sand stakes with 2 foot bungee cord attached
    - e. Permanently attached bungee cords
    - f. Available in standards colors, to be chosen by owner.
  2. Boundary Lines Suppliers
    - a. Volleyball USA, (800) 494-3933,volleyballusa.com
    - b. Approved equal
- D. Volleyball Netting
  1. Netting
    - a. 4" Professional Pro Beach Power Net
    - b. 32' x 39"
    - c. #42 knotted nylon outdoor netting
    - d. 22 oz. 4" tapes, top, bottom, and sides made with Triple UV / Mildew Protected vinyl to prevent fading and weather damage
    - e. Ultra Strong Stitching, UV and Mildew Resistant
    - f. Galvanized Steel Aircraft Cable top and bottom with protective clear vinyl coating, cables are 42 feet long
    - g. 1 1/8" maple wooden dowels
    - h. Triple reinforced netting attachment to side tapes for extra durability
    - i. 2 X – Braces to be included for additional net tension
  2. Netting Suppliers
    - a. Volleyball USA, (800) 494-3933,volleyballusa.com
    - b. Approved equal
- E. Volleyball Posts
  1. Posts/Poles
    - a. Bazooka Professional Outdoor Poles
    - b. 3 1/2" O.D. ultra stiff posts

- c. 12' galvanized steel poles
  - d. High strength single unit hardware with stainless steel set screws and nuts
  - e. Powder coated winch
  - f. Single point adjustment capability
  - g. Top and bottom internal drive caps
  - h. Lockable winches to prevent vandalism and theft
  - i. Posts to be permanently set in the ground
- 2. Posts Suppliers
    - a. Volleyball USA, (800) 494-3933,volleyballusa.com
    - b. Approved equal
- F. Volleyball Antennas
- 1. Colored Ultra Velcro 2 Piece Volleyball Antenna Set
    - a. Constructed of heavy strength 2" vinyl
    - b. Each antenna sleeve has 96 in<sup>2</sup> of Velcro
    - c. 2 piece 6' solid fiberglass antenna
  - 2. Antenna Supplies
    - a. Volleyball USA, (800) 494-3933,volleyballusa.com
    - b. Approved equal
- G. Pole Padding
- 1. Custom Printed Pole Padding
    - a. 6'-6" tall standard height
    - b. 2" Nylon Velcro straps stiches to vinyl
    - c. Available in standards colors, to be chosen by owner
    - d. Custom colors available, graphics to be chosen and provided by owner upon request
  - 2. Pole Padding Suppliers
    - a. Volleyball USA, (800) 494-3933,volleyballusa.com
    - b. Approved equal
- H. Multi Head and Foot Shower
- 1. Head and Foot Shower
    - a. ADA compliant push valves
    - b. Free Standing -- 82" total height
    - c. Meets all health code requirements
    - d. ½" x 44" Risers
    - e. Stainless Steel Shower Heads
    - f. 3" x 60" stainless steel base
    - g. 304 quality stainless steel
    - h. Resistant to damage from chlorine and harsh weather conditions
    - i. 1/2" standard water supply inlet and valves
    - j. Chrome plated solid brass valves
    - k. 9" diameter stainless steel base cover
    - l. Carbon steel anchor bolts

2. Head and Foot Shower Suppliers
  - a. Volleyball USA, (800) 494-3933,volleyballusa.com
  - b. Approved equal

## 2.2 MISCELLANEOUS EQUIPMENT

### A. Removable Ball Net System

1. General
  - a. Framing System
    - 1) Manufacturer Contractor to submit sealed engineering drawings verifying footing and upright post diameters / sizes.
  - b. Height
    - 1) As per the drawings [Use applicable]
2. Netting and Appurtenances
  - a. 1 3/4" square mesh for behind soccer field (south end) and 4" square mesh for along softball outfield (east end)
  - b. #36 Black 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 Treated Flexa black or approved netting and cord
  - f. Cables, pulleys, accessories, etc., per drawing and manufacturers recommendations
3. Frame System Suppliers
  - a. Sports Field Specialties (www.sportsfieldspecialties.com)
  - b. Approved equal
4. Netting Suppliers
  - a. Keeper Goals, (800) 594-5126, keepergoals.com (preference)
  - b. Burbank Sports Nets, (866) 349-0057
  - c. Carron Net, (800) 558-7768, www.carronnet.com
  - d. West Coast Netting, Inc., www.westcoastnetting.com (888) 631-6387

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install in accordance with manufacturers recommendations and approved shop drawings.

1. Removable Ball Net System

- a. Verify Installation of removable system in presence of the Owner.
- b. Install per manufacturers recommendations.

END OF SECTION

## SECTION 116843 OUTDOOR SCOREBOARD

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Provide and install one main Outdoor Volleyball scoreboard with wireless controller, receiver/transmitter, carrying case and horn. In addition to the main scoreboard, 5 individual court scoreboards shall be provided. The main scoreboard and individual court scoreboards shall be linked and capable of providing timing and scoring for 5 courts simultaneously.

#### 1.2 REFERENCES

- A. ETL listed to Standard for Electric Signs, UL-48.
- B. ETL listed to Standard for Control Centers for Changing Message Type Signs, UL-1433.
- C. Tested to CSA standards and CE labeled for outdoor use.
- D. Standard for CAN/CSA C22.2
- E. Federal Communications Commission Regulation Part 15
- F. National Electric Code

#### 1.3 SUBMITTALS

- A. Product data: Submit manufacturer's product illustrations, data and literature that fully describe the scoreboards and accessories proposed for installation.
- B. Shop drawings: Submit mechanical and electrical drawings.
- C. Maintenance data: Submit manufacturer's installation, operation, and maintenance manuals.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Product delivered on site.
- B. Scoreboard and equipment to be housed in a clean, dry environment

#### 1.5 PROJECT CONDITIONS

- A. Environmental limitations: Do not install scoreboard equipment until mounting structure is secure and concrete has ample time to cure.
- B. Field measurements: Verify position and elevation of structure and its layout for scoreboard equipment. Verify dimensions by field measurements.
- C. Verify mounting structure is capable of supporting the scoreboard's weight and windload in addition to the auxiliary equipment.
- D. Installation may proceed within acceptable weather conditions.

## 1.6 QUALITY ASSURANCE

- A. All scoreboards shall be manufactured for outdoor use.
- B. Source Limitations: Obtain each type of scoring or related equipment through one source from a single manufacturer.
- C. ETL listed to UL Standards 48 and 1433
- D. NEC compliant
- E. FCC compliant
- F. ETL listed to CAN/CSA 22.2

## 1.7 WARRANTY/SERVICE PLAN

- A. Provide 5 years of warranty coverage.
- B. Provide an exchange program to supply replacement parts for components that fail during the coverage period. To minimize downtime, the exchange parts will be shipped on the same day the order is received or on the following day. The manufacturer will also enclose an air bill for return of the defective components.
- C. Provide access to a local Authorized Service Company.
- D. Provide a help desk staffed by experience technicians and coordinators who are thoroughly familiar with the scoreboard and available for technical support. This staff must be available at no additional cost to the customer and provide an "on-call" service during weekends.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Daktronics, Inc., 331 32nd Avenue, P.O. Box 5128, Brookings, South Dakota 57006-5128, 1-800-325-8766, [www.daktronics.com](http://www.daktronics.com)
- B. All American Score Boards, 401 S. Main Street Panderville, WI 53954, [www.allamericanscoreboards.com](http://www.allamericanscoreboards.com)
- C. Fair Play Scoreboards, 1900 Delaware Ave., Des Moines, IA 50317, 1-800-247-0265, [sales@fair-play.com](mailto:sales@fair-play.com)
- D. Approved equal.

### 2.2 PRODUCT

- A. Main outdoor Volleyball scoreboard shall provide times and scores for the sport of Volleyball. It shall have upper HOME and GUEST captions at 18" height, 7 LED segments each. All other digits are 15" height, 7 LED segments each. Digits are to illuminate red. Indicators illuminate red. Lower HOME and GUEST captions are 8" height, vinyl. All other captions are 6" height, vinyl. Team Name Message Center is to have 8x32 LED Matrices, LED pixels are on 34mm centers and LED's are to illuminate red. HOME and GUEST scores to 99. Digits can be dimmed for night

viewing. Sponsor displays (2 required) are to be 3'-6" high x 5' wide each. Display finish is finished aluminum. General display to be single face aluminum construction. Digit panels are to be finished 50% flat black. Accent striping to be 1/2" & 1" vinyl. Truss accent to be model DA-1001-20 by Daktronics or approved equal. Logo's and letter colors to be coordinated with owner. Analog clock to be custom, diameter 3'-0". Outdoor Sand Volleyball Scoreboard by Daktronics or approved equal.

- B. Individual Court auxillary scoreboards, typical of five (5), shall provide times and scores for the sport of Volleyball. It shall have HOME and GUEST captions at 10" height. All other captions shall be 8" height. LED digits to display HOME and GUEST to 99, Digits can be dimmed for night viewing. Scoreboard by Daktronics or approved equal.

## 2.3 SCOREBOARD

### A. General information

1. Dimensions: 15'-6" high, 20'-0" wide, 0'-6" deep
2. Weight: 1000 lbs
3. Power requirement: 240V AC, 6 amps, 1850 W
4. Color: To be selected and approved by owner

### B. Construction

1. Aluminum alloy 5052 construction, per ASTM B221
2. 100% solid state electronics housed in all aluminum cabinet.
3. LED color – Red

### C. Captions

1. Provide changeable caption plates/kits/overlays for volleyball scoreboard.

### D. Required Equipment

1. Carrying case for control console
2. Scoreboard border striping
3. Protective screen for LED digits
4. Hardware for suspension installation
5. Horn
6. (2) 3'-6" high x 5' wide non-backlit ad panels
7. Pole for changing captions, 25 feet maximum reach

## 2.4 SCORING CONSOLE

- A. Console is the All Sport 5010 controller with radio transmitter and receiver.
- B. Capable of controlling other scoreboards.
- C. Console has a maximum power requirement of 240V, 6 amps.
- D. Console recalls clock, score information if power is lost.
- E. Console includes:
  1. A rugged enclosure to house electronics

2. A sealed membrane water-resistant keyboard
3. An LED backlit 32-character liquid crystal prompting display to verify entries and recall information currently displayed
4. A 6' (1829 mm) power cord to plug into a standard grounded 240 V AC outlet
5. A 20' (6096 mm) control cable to connect to the control receptacle junction box
6. A practice timer mode
  - a. Can sound the horn at the end of each segment
  - b. Has 99 programmable segments
  - c. Displays the segment number and segment length
  - d. Has a programmable interval time
7. A dimmer control for scoreboard digits.

F. Required Equipment

1. Carrying case for console
2. 2.4 GHz spread spectrum radio for scoreboard control
3. Battery pack

2.5 PROTECTIVE EQUIPMENT

A. LED Digit Protective Screens

1. Provide protective screens for all LED digits on all scoreboards provided.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that mounting structure is ready to receive scoreboard. Verify that placement of conduit and junction boxes are as specified and indicated in plans and shop drawings. Verify concrete has cured adequately according to specifications.

3.2 INSTALLATION

- A. All power and control cables to scoreboards and displays will be routed in conduit, power to the scoreboards/displays as well as raceways shown on electrical plans by the Electrical Contractor. Scoreboard control wiring including conduit will be the responsibility of the contractor assigned the scoreboard equipment.
- B. Install scoreboards and exterior displays to beams in location detailed and in accordance with manufacturer's instructions. Verify unit is plumb and level.

3.3 INSTALLATION—CONTROL CENTER

- A. Provide boxes, cover plates and jacks in locations per plans.



- B. Test connect control unit to all jacks and check for proper operation of control unit, scoreboard and all features. Leave control unit in carrying case and other loose accessories with owner's designated representative.
- C. Verify earth ground does not exceed 15 ohms.

END OF SECTION



## SECTION 260001 ELECTRICAL

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. Provide all labor, material, 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.

#### 1.2 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. 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.

#### 1.3 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.

#### 1.4 CODES AND REGULATIONS

- A. General: Comply with the latest recognized edition of 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.

#### 1.5 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. (EPACT) National Energy Policy Act.
  - 6. (ETL) Electrical Testing Laboratory.
  - 7. (ICEA) Insulated Cable Engineers Association.
  - 8. (IEEE) Institute of Electrical and Electronic Engineers.

- |     |         |  |
|-----|---------|--|
| 9.  | (IESNA) | Illuminating Engineering Society of North America. |
| 10. | (NBFU)  | National Board of Fire Underwriters.               |
| 11. | (NEMA)  | National Electrical Manufacturers Association.     |
| 12. | (NESC)  | National Electrical Safety Code.                   |
| 13. | (NFPA)  | National Fire Protection Association.              |
| 14. | (UL)    | Underwriter's Laboratories.                        |

#### 1.6 PERMITS

- A. General: Obtain and pay for any and all permits required by all applicable agencies, prior to commencing work.

#### 1.7 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 all basic electrical equipment, devices, and materials to be used on the project. 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 all custom equipment and systems (e.g., panelboards) to be used on the project. Shop Drawings 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. For control systems, provide computer generated control ladder diagrams specifically developed for this project (standard diagrams not acceptable).
- F. Maintenance Manuals: Include operating and maintenance data in accordance with Division 1. Include all 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.

#### 1.8 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: Excavation, backfill, painting, patching, welding, carpentry, mechanical work, concrete pads 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.

#### 1.9 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.
- E. Coordination: Coordinate inspections with the local utility.

#### 1.10 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.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. Where Specified: Materials and equipment shall be as specified herein 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.

### ELECTRICAL

- 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.

## 2.3 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.

## 2.4 CONCRETE WORK

- A. Concrete:
  - 1. Minimum Strength: 3000 psi @ 28 days
  - 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 4" 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.
  - 1. Comply with equipment manufacturer's specifications and/or utility company requirements.

## 2.5 RACEWAY SYSTEMS

- A. Raceway Sizing: As required by the NEC (minimum) with oversized raceways as indicated and where required for ease of pulling cable. Minimum conduit size: 3/4-inch, unless indicated otherwise.
- B. Raceway Types: Rigid galvanized steel conduit, electrical metallic tubing (EMT), flexible steel conduit, liquid-tight flexible steel conduit and Schedule 40 heavywall and Schedule 80 extra-heavywall rigid non-metallic (PVC) conduit, conforming to applicable ANSI, NEMA and UL standards.
- C. Fittings: All raceway fittings (except for rigid non-metallic conduit) to be steel or malleable iron, and UL-listed for the intended application. EMT fittings to be compression type.

- D. Outlet Boxes (Concealed in Walls): Non-gangable, galvanized steel, with square cornered tile (or masonry) type extension rings or cover. Minimum size: two-gang masonry box or 4" square box with single-gang adapter (plaster) ring. Depth of adapter ring to suit application. Minimum depth: 1-1/2". Minimum capacity: 21 cubic inches.
- E. Outlet Boxes (Surface Mounted): Cadmium plated cast or malleable iron.
- F. Pull and Junction Boxes, and Wireways: Use as indicated and required. Junction and pull boxes for general indoor use (dry locations) to be of galvanized code gauge steel construction, minimum 4" square by 1-1/2" deep, with screw-on covers. Wireways to be UL listed, sheet steel construction with screw-on covers. For exterior and damp or wet indoor locations, use boxes and wireways approved for such use.
- G. Handholes: Light-weight and high-strength, constructed of fiberglass reinforced polymer concrete, gray color, suitable for use at temperatures down to -50°F, and resistant to sunlight, weathering, chemicals and freeze-thaw cycles, with bolt-on cover (with standard logo indicating type of service), and designed for in-grade use in areas with light vehicular traffic (5,000 lb. load over 10"x10" area). Acceptable Manufacturers: Quazite "Composolite," Styles "PC" or "PG."
- H. Pipe Sleeves: Rigid steel conduit or iron pipe.
- I. Conduit Seals: For Cast-in-Place Concrete Applications: Acceptable Manufacturers: O-Z/Gedney Type "FSK"; Thunderline Corp. "Link Seal" with "Link Seal Wall Sleeve." For Core Drilled and Pre-Cast Opening Applications: Acceptable Manufacturers: O-Z/Gedney Type "CSML"; Thunderline corp. "Link Seal."
- J. Pull Wires: No. 14 AWG zinc-coated steel monofilament plastic line with 200 lb. tensile strength.

## 2.6 600 VOLT CLASS WIRE

- A. General: All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled. Single-conductor, 98% conductivity, annealed, uncoated copper conductors with 600-volt rated type "THHN/THWN" insulation.
- B. Wire shall be annealed bare copper per ANSI/ASTM B3, UL 83, and Federal Specification JC-30A with 600 volt insulation, be stranded (except for #10 AWG and smaller may be solid), and be minimum size #12 AWG (Except for control wiring and signal circuits).
- C. Insulation: Provide THHN/THWN insulation for all conductors, except XHHW insulation may be used for conductors #4 and larger.
- D. Ampacity of conductors shall be rated for 75 degrees C regardless of temperature of conductor insulation when combining circuits in one conduit. Derate conductors and increase size per NEC when installing multiple circuits in a raceway, utilizing 75°C ampacity table.
- E. Connectors: Nylon shell insulated metallic screw-on connectors for #14-10 AWG, and bolted pressure or compression type lugs and connectors with insulating covers for #8 AWG and larger.

## 2.7 WIRING DEVICES

- A. Receptacles (General Use): 125 volt, 20 amp, NEMA 5-20R, duplex type. Acceptable Manufacturers: Leviton; Arrow-Hart; Hubbell; Pass and Seymour.

- B. GFI Receptacles: Ground fault circuit interrupter, feed-through, duplex type, 125 volt, 20 amp, NEMA 5-20R, with solid-state ground-fault sensing and 5 mA trip level. Acceptable Manufacturers: Leviton; Arrow-Hart; Hubbell; Pass and Seymour.
- C. Device Color: Brown, unless directed otherwise. Coordinate color with architect.
- D. Coverplates (Exterior Locations): Weatherproof cast aluminum or polycarbonate. Receptacles installed in damp or wet locations shall have an enclosure and cover that are weatherproof.

## 2.8 EQUIPMENT CONNECTIONS

- A. Materials as specified in this section, and as required.

## 2.9 HANGERS AND SUPPORTS

- A. General: All hangers, supports, fasteners and hardware shall be zinc-coated or of equivalent corrosion resistance by treatment or inherent property, and shall be manufactured products designed for the application. Products for outdoor use shall be hot dip galvanized.
- B. Types: Hangers, straps, riser supports, clamps, U-channel, threaded rods, etc. as indicated and/or required.

## 2.10 ELECTRICAL IDENTIFICATION

- A. Nameplates: 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. Each nameplate on all panelboards and switchgear shall indicate the following:
  - 1. Panel Name
  - 2. Voltage, Phase, Number of Wires
  - 3. Source
- B. Underground Warning Tape: Six-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and "CAUTION." Colors as follows:
  - 1. Red - Electric
  - 2. Orange - Communications
- C. Marking Pens: Permanent, waterproof, quick drying black ink. Acceptable Manufacturers: Sanford Fine Point "Sharpie," or equal.
- D. Wire Tags: Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.
- E. Arc Flash Panelboard Stickers: Provide per NEC 110.16.

## 2.11 ELECTRIC SERVICE

- A. Materials as specified elsewhere in this section, and as required by the serving electric utility company.

## 2.12 SAFETY SWITCHES

- A. General: Heavy duty, horsepower rated, fully enclosed, fusible (with rejection fuse clips) or non-fused as indicated, quick-make, quick break switching mechanism interlocked with cover, and



NEMA-1 enclosure for dry locations, and NEMA-3R enclosure for wet locations, unless indicated otherwise. Switches to be labeled as "Suitable for Use as Service Entrance Equipment," where so indicated or required.

- B. Ratings: Provide switches with ratings as indicated. If ratings are not indicated, provide switch with ratings to suit the electrical system and load served.
- C. Acceptable Manufacturers: General Electric; Square D; Cutler-Hammer, Siemens.

## 2.13 GROUNDING

- A. General: Ground rods, conductors, clamps and connectors, etc as required.
- B. Ground Rods: Minimum 5/8" diameter by 10' long copper clad steel.
- C. Welded Connectors: Exothermic process.

## 2.14 DRY TYPE TRANSFORMERS

- A. General: Transformers shall be UL listed and labeled, and meet all applicable NEMA, ANSI, and IEEE standards. Transformers shall be factory assembled, general purpose, ventilated type of size and electrical characteristics indicated.
- B. 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.
- C. Core and Coil: Constructed of continuous copper 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 bushing shall be made using fully rated flexible straps.
- D. Insulation System: 220°C temperature class for all transformers.
- E. Temperature Rise: Winding temperature rise by resistance limited to 115°C for all transformer sizes, 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.
- F. Taps: Two 5% FCBN taps for transformer sizes below 30 KVA;; referenced to nameplate voltage.
- G. Ratings: KVA rating, voltages, phases and configuration as indicated. Minimum impedance: 4.5%.
- H. Nameplates: The nameplate shall be permanently mounted to the exterior front, with permanently etched numbers and letters, and shall include the following:
  - 1. KVA size
  - 2. Primary and Secondary Voltage Ratings.
  - 3. Serial Number
  - 4. Weight
  - 5. Composition of Windings (Primary, Secondary)
  - 6. Wiring Diagram

7. Percent impedance
8. Taps
9. Basic Impulse Level

I. Acceptable Manufacturers: General Electric; Square D; Cutler-Hammer, Siemens; ACME.

## 2.15 PANELBOARDS

- A. Types: Two-row, bolt-on circuit breaker branch circuit panelboards, and circuit breaker or fusible switch type distribution panelboards, as indicated or required.
- B. General: Ratings, mains, mounting and complement of branch overcurrent protective devices as indicated below or on the Drawings.
- C. Short Circuit Ratings: Minimum 10,000 amps for 208/120 volt panelboards and 14,000 amps for 480/277 volt panelboards. Provide panelboards with higher ratings as indicated or as required.
- D. Enclosures: NEMA-1 for dry locations and NEMA 3R for wet locations (unless indicated otherwise). Provide galvanized steel rough-in box and cover with gray enamel finish Panel fronts are to have a door (circuit breakers) in door (circuit breakers & wiring gutters) in trim with concealed hinges and flush type tumbler lock. All panels shall be keyed alike. Doors in excess of 48" high shall be equipped with a three-point catch and vault handle with integral tumbler lock. Panel shall be dead front, safety type and be multi-section as noted or as necessary to comply with NEC.
- E. Bussing: Full capacity Copper, include solid copper ground bus, bonded to enclosure and solid copper neutral bus with lug for each branch circuit
- F. Acceptable Manufacturers: General Electric "A Series" and "Spectra Series"; Square D "NQOD," "NEHB," "I-Line" and "QMB"; Cutler-Hammer "Pow-R-Line C."
- G. Panelboard Schedules: Refer to the schedules on the Contract Drawings.

## 2.16 CIRCUIT BREAKERS

- A. General: Molded case with thermal and magnetic trips unless indicated otherwise. Minimum 10,000 amps interrupting capacity for 208V and 240V, 14,000 amps interrupting capacity for 480V and higher ratings as indicated or required.
- B. For Panelboard Mounting: Bolt-on type.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The installation of all electrical work shall be in accordance with the 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 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.

### 3.3 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.
- F. Space Requirements: Electrical equipment sizes indicated on drawings are generally based on specified manufacturer. Verify that the proposed equipment will fit in the space indicated on the drawings. Maintain clearances required by NEC.

### 3.4 DIMENSIONS

- A. Building Dimensions: For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.
- B. Site Dimensions: Field measurements take precedence over scaled electrical site plans.
- C. 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.
- D. Establish the exact location of electrical equipment based on the actual field verified dimensions of equipment furnished.

### 3.5 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.

### 3.6 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. Minimum Mounting Height: Install exposed raceway and all other electrical equipment (e.g., lighting fixtures) with not less than 7'-6" clear to finished floor, unless indicated or approved otherwise, and excluding raceway and equipment mounted on walls.
- 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. Install equipment according to manufacturer's written instructions.
- H. Install equipment, conduit, cable tray, hangers, and supports to withstand seismic forces for the seismic zone of the installation.

### 3.7 LAYOUT

- A. General: Install electrical systems, materials and equipment level and plumb, and parallel and perpendicular to other building systems and components, where installed exposed.
- 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.

### 3.8 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.

### 3.9 HOLES, SLEEVES, AND OPENINGS

- A. General: Provide all holes, sleeves, and openings required for the completion of Division 26 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 an annular space of not less than 1/4" and not more than 1" around the conduit. Patch around sleeve to match surrounding surfaces.

### 3.10 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. Repairs: Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

### 3.11 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.

### 3.12 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: 30" below finished grade or 6" below bottom of frost line, whichever is deeper, 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., unless otherwise noted. 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: 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 30" Below Surface of Paved Areas or 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. Refer to Contract Documents for Conduit Encased in Concrete Details.
- 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.

### 3.13 CONCRETE WORK

- A. General: All concrete shall be prepared from approved materials and poured on clean, stable surfaces.
- B. Exterior Base Surfaces: Twelve-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.

### 3.14 RACEWAY SYSTEMS

- A. Raceway Types: Unless indicated otherwise, use raceway types as follows:
  - 1. Outdoors, Below Grade: (Minimum 1-inch size). Schedule 40 rigid non-metallic conduit. Stub up using rigid galvanized steel elbows.

2. Outdoors, Exposed: Rigid galvanized steel conduit.
  3. Liquid-Tight Flexible Steel Conduit: Use where flexible steel conduit connections are required in damp, wet or oily locations, and for final connections to all motors and similar equipment.
- B. Raceway Routing: As required by job conditions unless specific routes or dimensioned positions are indicated on the drawings. Install tight to slabs, beams and joists wherever possible. Route exposed conduit, and conduit installed above ceilings, parallel or perpendicular to walls ceilings and structural members. Install to maintain minimum headroom and to present a neat appearance. Run parallel raceways together with bends made from same center line. Verify exact locations of all raceways, pull boxes, and junction boxes. Resolve any conflicts before installation.
  - C. Raceway Installation: Cut conduit ends square using saw or pipecutter and ream each cut end smooth. Carefully make all conduit bends and offsets so that the inside diameter of pipe is not reduced. Make bends so that legs are in the same plane. Make offsets so that legs are in the same plane and parallel. Protect stub-ups from damage, and carefully rebend when necessary.
  - D. Fittings: Make up all raceway fittings tight so that final installation of raceway, fittings and enclosures constitutes a firm mechanical assembly and a continuous electrical conductor. Where required, provide bonding jumpers to assure electrical continuity.
  - E. Protection: Protect all raceways, enclosures and equipment during construction to prevent entry of concrete, debris and other foreign matter. Free clogged conduits of all obstructions, or replace, prior to pulling wire. Do not pull wire within buildings until buildings are completely enclosed.
  - F. Boxes: Install all outlet, pull and junction boxes rigidly, plumb and level. Support and secure boxes independently from conduits terminating at box. Install all boxes so as to be accessible and so that covers may be easily removed.
  - G. Handholes: Provide as indicated, installed plumb and level. Where not indicated, install every 200' at a minimum.
  - H. Pull Strings: Provide pull strings in all spare conduits.

### 3.15 CONDUCTORS - 600 VOLT AND BELOW

- A. Minimum Conductor Size: All branch circuit wiring shall be minimum #12 AWG. All control circuit wiring shall be minimum #14 AWG, unless indicated otherwise. Provide larger sizes as indicated or required.
- B. Branch Circuit Conductor Sizes: Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors unless indicated otherwise. Provide branch circuit switch legs and travelers as required for the switching indicated.
- C. Equipment Grounding Conductor Required: For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250-122 (minimum), larger if so indicated.
- D. Feeders: Provide feeder conductor sizes and quantities as indicated.
- E. In Raceway: Install all wiring in conduit or other specified raceway, unless indicated otherwise.
- F. Terminations: Furnish and install terminations, including lugs if necessary, to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG



conductors using crimp, clamp, or box type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.

- G. Color: Conductors #10 and smaller shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. #8 and larger shall have stripes, bands, hash marks or color pressure-sensitive plastic tape. Color code all branch circuit and feeder conductors as follows:

1. 2040/120 Volts:

Phase	Color
A	Black
B	Red
Neutral	White

2. 480/277 Volts:

Phase	Color
A	Brown
B	Orange
C	Yellow
Neutral	Gray

3. Equipment Grounding Conductors: Green

- H. Phase Arrangement: Arrange phases in all electrical equipment as follows:

1. A, B, C: Front to Rear.
  2. A, B, C: Top to Bottom.
  3. A, B, C: Left to Right When Facing Established Front of Equipment.
- I. Provide conductors with not less than 90°C rated insulation when branch circuit wiring is attached to high temperature light fixtures (e.g. fluorescent & HID), boilers, incinerators, ovens, ranges, kitchen exhaust fans, other heat-producing equipment, and "100% Rated" overcurrent protective devices. Use special higher temperature wire as required for connection to specialty equipment as required by equipment manufacturer.

### 3.16 EQUIPMENT CONNECTIONS

- A. Connect complete, all equipment requiring electrical connections, furnished as part of this Contract or by others, unless indicated otherwise.
- B. 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.
- C. 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.
- D. Coordination: Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.

- E. Rough-In: 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. 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 steel conduit.
- F. Connections: Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others. Verify proper connections with manufacturer's published diagrams and comply with same. Verify that equipment is ready for electrical connections, wiring and energization, prior to performing same.
- G. Control Wiring: Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc., as required.

### 3.17 HANGERS AND SUPPORTS

- A. General: Rigidly support and secure all electrical materials, raceway and equipment to building structure using hangers, supports and fasteners, suitable for the use, materials and loads encountered. Provide all necessary hardware.
- B. Overhead Mounting: Attach overhead mounted equipment to structural framework or supporting metal framework. Do not make attachments to steel roofing, steel flooring or ceiling mineral tile.
- C. Wall Mounting: Support wall mounted equipment by masonry, concrete block, metal framing or sub-framing.
- D. Exterior Walls: Mount all electrical equipment located on the interior of exterior building walls, at least one inch away from wall surface, using suitable spacers.
- E. Structural Members: Do not cut, drill or weld any structural member.
- F. Independent Support: Do not support electrical materials or equipment from other equipment, piping, ductwork or supports for same.
- G. Temporary Conditions: Do not attach to or support electrical work from removable or knockout panels or temporary walls or partitions.
- H. Raceway Supports: Rigidly support all raceway with maximum spacings per NEC, and so as to prevent distortion of alignment during pulling operation. Use approved hangers, clamps and straps for individual runs. Do not use perforated straps or tie wires. Where multiple parallel raceways are run together, use trapeze type hanger arrangement made from U-channel and accessories, suspended by threaded rods, and allow at least 25% spare capacity for future installation of additional raceways. Rigidly anchor vertical conduits serving floor-mounted or "island" type equipment mounted away from walls with metal bracket or rigid steel conduit extension secured to floor.
- I. Miscellaneous Supports: Provide any additional structural support steel brackets, angles, fasteners and hardware as required to adequately support all electrical materials and equipment.

### 3.18 ELECTRICAL IDENTIFICATION

- A. General: 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. Use Contract Document designations for identification unless indicated otherwise.

- B. Nameplates: Provide nameplate engraved with equipment designation for each safety switch, panelboard, transformer, motor starter, and all other electrical cabinets, etc.
- C. Underground Warning Tape: 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.
- D. Marking Pen Labeling: Mark each junction and pull box indicating source designation and circuit number(s) for the enclosed conductors.
- E. Wire Tags: For 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. For 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.
- F. Panelboard Circuit Directories: At completion of project, accurately complete each panelboard circuit directory card, identifying load served or "spare" or "space" for each circuit pole. When modifying, adding or deleting circuits at an existing panelboard, update the existing (or provide new) circuit directory card to accurately reflect final conditions.
- G. Abandoned Equipment: Label all abandon equipment as "Abandon as of \_\_\_\_\_." For conduits and conductors include opposite end location.

### 3.19 ELECTRIC SERVICE

- A. General: Arrange with the local electric utility company, and pay all associated costs for providing temporary electric service (if required) and permanent electric service for the project as indicated and required. Comply with and coordinate all requirements of the utility company.
- B. Grounding: Provide grounding electrode system for the service, per the NEC and utility company requirements.

### 3.20 GROUNDING

- A. General: Provide all system and equipment grounding as indicated and as required by the NEC.
- B. Equipment Grounding: Provide a green equipment grounding conductor, sized per NEC 250-122 (larger if so indicated) with each feeder and branch circuit run.
- C. Provide exothermic welded connections where indicated.

### 3.21 DRY TYPE TRANSFORMERS

- 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 4" high concrete housekeeping pads.
- B. Conduit Connections: Make all conduit connections to transformer cases using flexible metal conduit.
- C. Ventilation Openings: Do not obstruct transformer ventilation openings.

- D. Taps: Set transformer taps for proper secondary voltage.

### 3.22 PANELBOARDS

- A. Secure rough-in boxes to building structure or steel framing, independent of conduits. Install with top of cabinet at 7'-0" above floor, but with minimum 8" clearance above floor unless so doing would exceed maximum 6'-6" disconnect height allowed by NEC.
- B. Cover all unused overcurrent protective device spaces.

### 3.23 SAFETY SWITCHES

- A. Mount securely at the location indicated on the drawings.
- B. Provide fuses as required.

### 3.24 CHECKOUT, TESTING, AND ADJUSTING

- A. General: Provide testing equipment, materials, instruments, and personnel 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: For all new and modified systems and equipment, 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.

### 3.25 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, and as requested by the Owner's Representative.

### 3.26 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 new or relocated 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



SECTION 260519  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
  2. Connectors, splices, and terminations rated 600 V and less.
  3. Sleeves and sleeve seals for cables.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NFPA 70.

## 1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

## PART 2 - PRODUCTS

### 2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Alcan Products Corporation; Alcan Cable Division.
  2. American Insulated Wire Corp.; a Leviton Company.
  3. General Cable Corporation.
  4. Senator Wire & Cable Company.
  5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

### 2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. AFC Cable Systems, Inc.
  2. Hubbell Power Systems, Inc.
  3. O-Z/Gedney; EGS Electrical Group LLC.
  4. 3M; Electrical Products Division.
  5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

### 2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum



0.052- or 0.138-inch thickness as indicated and of length to suit application.

- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

## 2.4 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Advance Products & Systems, Inc.
  2. Calpico, Inc.
  3. Metraflex Co.
  4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
  1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  2. Pressure Plates: Plastic. Include two for each sealing element.
  3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

- E. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- F. Class 2 Control Circuits: Type THHN-THWN, in raceway.
- G. Feeders and branch circuits shall have a ground conductor.
- H. Each branch circuit shall have an individual neutral conductor. Increasing the neutral conductor size, or "super neutral," is not allowed for multiple branch circuits.

### 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's 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. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

### 3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

- B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- C. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
  - 2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.
- D. Cut sleeves to length for mounting flush with both wall surfaces.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
- H. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- I. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

### 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has

been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Test Reports: Prepare a written report to record the following:
1. Test procedures used.
  2. Test results that comply with requirements.
  3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

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. This Section includes methods and materials for grounding systems and equipment.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with the requirements described in this Section, provide products by one of the listed manufacturers in the Sub-Sections below.

1. Ground Rods:
  - a) Copperweld Corp.
  - b) Eritech / Erico International Corporation
  - c) Galvan Industries, Inc.
  - d) Harger Lightning and Grounding, Inc.
  - e) Robbins Lightning, Inc.
2. Grounding electrode connectors:
  - a) Exothermic type:
    - 1) Cadweld / Erico International Corporation
    - 2) Furseweld
    - 3) Harger Lightning and Grounding, Inc. (Ultraweld)
    - 4) ThermOweld, a division of Continental Industries
  - b) Copper compression type:
    - 1) Dossert Corp.
    - 2) Framatome Connectors / Burndy
    - 3) Harger Lightning and Grounding, Inc.
    - 4) ILSCO
    - 5) O. Z. Gedney / EGS Electrical Group
    - 6) Panduit Corp.
    - 7) Robbins Lightning, Inc.

## 2.2 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. Tinned Conductors: ASTM B 33.
  4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

## 2.3 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory 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, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## 2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet in diameter.

## PART 3 - EXECUTION

### 3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. 4/0 AWG minimum.
  - 1. Bury at least 24 inches below grade.
  - 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- 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 UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with

waterproof, nonshrink grout.

- C. 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. 4/0 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

### 3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

### 3.4 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 Rods: Drive rods until tops are 2 inches 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.
- C. 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 so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

### 3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure



grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.

- a) Measure ground resistance not less 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.
- B. Report measured ground resistances that exceed the following values:
1. Substations and Pad-Mounted Equipment: 5 ohms.
  2. Manhole Grounds: 10 ohms.
- C. 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.

##### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

##### 1.4 PERFORMANCE REQUIREMENTS

- A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- B. 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 SUBMITTALS

- A. Product Data: For the following:
  - 1. Steel slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Steel slotted channel systems. Include Product Data for components.
2. Equipment supports.

#### 1.6 QUALITY ASSURANCE

- A. Comply with NFPA 70.

#### 1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

### 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. 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.
  2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. 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.

- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. 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. 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, stainless 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. 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.

## 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 in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch 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, IMC, 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.
- 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 thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69] [Spring-tension clamps.
  7. To Light Steel: Sheet metal screws.
  8. 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.

END OF SECTION 260529





## SECTION 260543

### UNDERGROUND DUCTS AND RACEWAYS 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. Conduit, ducts, and duct accessories for direct buried concrete-encased ductbanks and duct runs.
- B. Related Sections include the following:
  - 1. Division 31 Section "Earth Work" for excavation, backfill, and related items for ducts, manholes, and handholes.

##### 1.3 DEFINITION

- A. RNC: Rigid nonmetallic conduit.

##### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
  - 2. Accessories for handholes, boxes, and other utility structures.
  - 3. Warning tape.
- B. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
  - 1. Duct entry provisions, including locations and duct sizes.
  - 2. Cover design.
  - 3. Grounding details.
- C. Qualification Data: For professional engineer and testing agency.
- D. Source quality-control test reports.
- E. Field quality-control test reports.

## 1.5 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Testing Agency Qualifications: Handholes, boxes, and covers are required to conform to all test provisions for the most current ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 22 applications.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

## 1.7 PROJECT CONDITIONS

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

## 1.8 COORDINATION

- A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by the Engineer.

## PART 2 - PRODUCTS

### 2.1 CONDUIT

- A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

### 2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. ARNCO Corp.
  - 2. Beck Manufacturing.
  - 3. Cantex, Inc.
  - 4. CertainTeed Corp.; Pipe & Plastics Group.
  - 5. Condux International, Inc.
  - 6. ElecSys, Inc.
  - 7. Electri-Flex Company.
  - 8. IPEX Inc.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Manhattan/CDT; a division of Cable Design Technologies.
  - 11. Spiraduct/AFC Cable Systems, Inc.
- B. Duct Accessories:
  - 1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
  - 2. Warning Tape: Provide detectable aluminum foil plastic backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping. Tape shall be detectable by an electronic detection instrument. Provide tape in rolls, 6 inches minimum width, color; red, with warning and identification imprinted in big black letters continuously and repeatedly over entire tape length. Warning and identification shall read "CAUTION ELECTRICAL DISTRIBUTION BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.
  - 3. Pulling Cord: Install 200-lbf-test nylon cord in ducts, including spares.
  - 4.

### 2.3 Non-metallic duct encasement

- A. Concrete: Conform to Division 3 for concrete and reinforcing.
  - 1. Strength: 3,000 PSI minimum at 28-day compressive strength.
  - 2. Aggregate for Duct Encasement: 3/8-inch maximum size.

## 2.4 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.

## 2.5 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Description: Comply with ANSI / SCTE 77.
  - 1. Color: Gray or Green to match installed surface.
  - 2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
  - 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
  - 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 5. Cover Legend: Molded lettering, "ELECTRIC."
  - 6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armorcast Products Company.
    - b. Carson Industries LLC.
    - c. CDR Systems Corporation.
    - d. NewBasis.
    - e. Quazite (Hubbell)

## PART 3 - EXECUTION

### 3.1 UNDERGROUND DUCT APPLICATION

- A. Ducts for Electrical Feeders over 600 V: RNC, NEMA Type EPC-40-PVC, in red concrete-encased duct bank, unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
- C. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.
- D. Underground Ducts Crossing Paved Paths, Walks, and Driveways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

## UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

### 3.2 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
  - 1. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 8 structural load rating.

### 3.3 EARTHWORK

- A. Excavation and Backfill: Comply with Division 31 Section "Earthwork," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Cut and patch existing pavement in the path of underground ducts and utility structures according to Division 01 Section.

### 3.4 DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
- B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated.
- C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- D. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psihydrostatic pressure.
- E. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.
- F. Concrete-Encased Ducts: Provide concrete encased ducts at every road and future road crossing. The concrete encasement shall extend 5 feet on each side past the width of the roadway and future roadway. Support ducts on duct separators.
  - 1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
  - a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
  - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
7. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated.
8. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.
9. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

G. Direct-Buried Duct Banks:

1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Division 31 Section "Earth Moving" for pipes less than 6 inches in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature

- changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
  5. Depth: Install top of duct bank at least 24 inches below finished grade, unless otherwise indicated.
  6. Warning Tape: Bury warning tape approximately 12 inches above all ducts. Align tape parallel to and within 3 inches of the centerline of center duct.
  7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

### 3.5 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch above finished grade.
- D. 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 the enclosure.
- E. Field-cut openings for ducts and 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.

### 3.6 GROUNDING

- A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

### 3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
  - 1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
  - 2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
  - 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.

### 3.8 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION



SECTION 262726  
WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- C. TVSS: Transient voltage surge suppressor.
- D. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  3. Leviton Mfg. Company Inc. (Leviton).
  4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

### 2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 5351 (single), 5352 (duplex).
    - b. Hubbell; HBL5351 (single), CR5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5381 (single), 5352 (duplex).

### 2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; GF20.
    - b. Pass & Seymour; 2084.

### 2.4 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
1. Plate-Securing Screws: Metal with head color to match plate finish.
  2. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
  3. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

## 2.5 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
  - 1. Wiring Devices Connected to Normal Power System Gray, unless otherwise indicated or required by NFPA 70 or device listing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building

finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down.

F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

### 3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726



## SECTION 264313

### SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

#### 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 field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

##### 1.3 DEFINITIONS

- A. Inominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

### SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  1. ABB France.
  2. Advanced Protection Technologies Inc. (APT).
  3. Eaton Corporation.
  4. Emerson Electric Co.
  5. GE Zenith Controls.
  6. LEA International; Protection Technology Group.
  7. Leviton Manufacturing Co., Inc.
  8. PowerLogics, Inc.
  9. Schneider Electric Industries SAS.
  10. Siemens Industry, Inc.



## 2.2 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be at least 125 percent of the nominal system voltage.

## 2.3 PANEL SUPPRESSORS

- A. SPDs: Comply with UL 1449, Type 2.
  - 1. Include LED indicator lights for power and protection status.
- B. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- C. Comply with UL 1283.
- D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
  - 1. Line to Neutral: 1200 V for 480Y/277 V.
  - 2. Line to Ground: 1200 V for 480Y/277 V.
  - 3. Neutral to Ground: 1200 V for 480Y/277 V.
  - 4. Line to Line: 2000 V for 480Y/277 V
- E. SCCR: Equal or exceed 100 kA.
- F. Inominal Rating: 20 kA.

## 2.4 ENCLOSURES

- A. Outdoor Enclosures: NEMA 250, Type 3R.

## 2.5 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Wiring:
  - 1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
  - 2. Controls: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
  - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
  - 2. Inspect anchorage, alignment, grounding, and clearances.
  - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.
- B. An SPD will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

### 3.3 STARTUP SERVICE

- A. Complete startup checks according to manufacturer's written instructions.

- B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.
- C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION 264313



## 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 Green System described herein is the only acceptable lighting system. The system shall be a six pole lighting layout designed for the 2 side-by-side fields. The two control poles shall be sized to accommodate the future light fixture facing the practice field. The poles shall include the wire harness for the future lights. The control panel shall be sized and/or provide capacity for the future field lights.
- B. 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.
- C. 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.
- D. 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.
- E. 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 at 75 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 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.

### 1.4 INSPECTION AND TESTING PROCEDURES

- A. The lighting manufacturer shall guarantee the specified illumination levels and uniformity ratios for 25 years hours 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 soccer.
- 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.

#### 1.5 MANUFACTURER'S WARRANTY

- A. 25-Year Warranty: Manufacturer shall supply a signed warranty covering the entire system for 25 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.

#### 1.6 PRE-BID SUBMITTAL REQUIREMENTS

- A. 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. and Qualite Sports Lighting, Inc. 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. Special manufacturing to meet the standards of this specification may be required.
- B. Design Approval: The owner / engineer will review shop drawings from the manufacturer to ensure compliance to the specification.

#### 1.7 ADDITIONAL SYSTEM REQUIREMENTS FOR OTHER THAN BASIS-OF-DESIGN MANUFACTURER

- A. 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 shall be applied to the initial light level design to achieve the maintained light

levels of 80 footcandles for the volleyball courts. A scan for both initial and maintained light levels shall be submitted.

- B. Revised Electrical Distribution: Provide revised electrical distribution plans shall include changes to service entrance, panel, conduit, and wire sizing, as required.

## 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 90 MPH winds with 1.3 gust factors based on the International building code. Pole stress allowances shall be based on AASHTO 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.

2. Foundations

- a. The lighting system shall be designed so that the foundation will withstand winds of 90 mph based upon the International Building Code, utilizing the 50 year mean recurrent Isotach wind map data. 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.

Area of Lighting	Average Constant Light Levels	Grid Points	Grid Spacing
Volleyball high mode	80 fc	132	10' x 10'

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 1:1.5 for the courts at 80 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. Sports 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. Constant Wattage Auto Regulating metal halide lamp ballast which maintains lamp wattage within  $\pm 10$  percent upon  $\pm 10$  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. Auxiliary Mounting Provisions: The pole manufacturer shall coordinate and provide an integral means for mounting the Sound system speakers. Coordinate with Owner on concurrent product.

B. Manufacturers

- 1. Musco.

## 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 from soiling and staining.
  - c. For products subject to discoloration or deterioration from 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 274116.73 SOUND SYSTEM

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. Provide a performance grade, full range, 3-way sound system, with loudspeakers permanently installed, setup and secure at the venue per plans, along with all head-end equipment and accessories housed in a portable rack with all equipment as described herein and as shown on associated drawings.
- B. Systems to be capable of providing sound reinforcement of dynamic musical and vocal sources along with interfacing with other audio systems and ancillary audio equipment. The sound system shall consistently provide intelligible and natural sound reinforcement of voice and music throughout the seating and outer listening areas free of distortion or audio artifacts.
- C. A qualified Sound System Contractor will provide the sound system installation. The Sound System Contractor will provide all equipment as listed herein along with all the terminations, system setup, digital signal processor programming, testing, calibration and user training.
- D. Equipment to include wired and wireless microphones (handheld), CD player with iPod dock and auxiliary input jack, mixer with metering metering and limiting, amplifier with multichannel digital signal processor (equalization, compression, limiting, time alignment, feedback reduction filters, etc.), portable active loudspeaker systems with internal 1000W amplification and multi-channel digital signal processor (equalization, compression, limiting, time alignment, feedback reduction filters, etc.), power distribution with work lights, equipment storage and all associated cabling and connectors as required or as needed for optimum performance and functionality. The sound system will also be capable of providing a direct feed for press or video production use.
- E. Delivery to include assembly, terminations, setup, programming and testing along with demonstration and training.

#### 1.2 REFERENCE STANDARDS

- A. All equipment to comply with the latest applicable requirements and standards of the National Electrical Code (NEC), the Electronics Industries Association (EIA), the Federal Communications Commission (FCC), and the Audio Engineering Society (AES).

#### 1.3 PERFORMANCE SPECIFICATIONS

- A. The sound system shall be designed and installed to produce a clear and undistorted SPL of 85dB throughout the full bandwidth between 150Hz and 5kHz without exceeding or being below 3dB of the reference level at all frequencies throughout the primary listening areas.
- B. Reproduction of sound will be controlled utilizing a CPU based automatic mixer / digital signal processor (DSP). The DSP unit will be integral to the amplifier integral to the active loudspeaker system to provide the optimum fidelity and to insure system protection from excessive volume.
- C. The loudspeakers will be configured to provide articulate and full range sound reproduction for the spectator and athlete areas only and will be positioned to provide a minimum amount of acoustical interaction with the reflective surfaces of other structures. All loudspeakers will be weather resistant and will not require removal for precipitation or extreme temperature or humidity conditions.

#### 1.4 SOUND SYSTEM CONTRACTOR QUALIFICATION

- A. The sound system equipment shall be furnished by and installed under the direction of a qualified professional Sound System Contractor experienced in the installation, testing and adjustment of sound systems similar to the systems specified herein.
- B. Said Sound System Contractor is to have been a certified member of at least two of the following professional audio organizations:
  - 1. Audio Engineering Association (AES)
  - 2. InfoComm (formerly International Communications Industries Association)
  - 3. National Academy of Recording Arts & Sciences (NARAS)
  - 4. National Systems Contractor Association (NSCA)
- C. Said Sound System Contractor is to have received factory authorized training for analog and digital audio signal processing from at least three of the following professional audio equipment manufacturer's:
  - 1. Ashly Audio
  - 2. Digidesign
  - 3. Peavey Electronics
  - 4. QSC Audio
  - 5. Renkus-Heinz
  - 6. Sennheiser
  - 7. Shure
- D. Said Sound System Contractor shall employ a team of personnel highly trained and experienced in the fields of audio engineering. The team leader should have at least 10 (ten) years experience as an audio engineer and should, at a minimum, have earned a CTS (Certified Technology Specialist) certification from InfoComm.
- E. Safety in the workplace is the highest priority. All contracted personnel at the work site shall be regularly trained and certified for safe work practices. At a minimum, each worker should possess an OSHA 10 card.
- F. Said Sound System Contractor may be required to provide references from previous customers and authorization from equipment manufacturers.

#### 1.5 WARRANTY & SERVICE

- A. To maintain certain manufacturer's warranties, equipment must be installed, aligned and serviced by those installers authorized by said manufacturer to perform those duties. The Sound System Contractor will include a statement of warranty on the entire system and on the individual pieces of equipment. The system warranty will be one year from the date of system acceptance by the Owner. This warranty shall obligate the Sound System Contractor to provide equipment, material, and labor if required, at no charge to the Owner, during the warranty period, in the event of system or equipment malfunction due to defect.
- B. Sound System Contractor to maintain a dedicated service representative and point of contact for future support, and maintain an inventory of spare parts capable of providing future service.
- C. Response for service and/or operational assistance shall be within 24 hours of receiving such service call and will be provided during normal working hours Monday through Friday.



1.6 SUBMITTALS & CLOSE OUT DOCUMENTATION

- A. The Sound System Contractor shall provide electronic copies of the following submittals:
1. Product Data: Manufacturer's descriptive literature for each type of device or piece of equipment, and wire/cable to be used on the project, indicating compliance with specified requirements.
  2. Shop Drawings: Complete description and wiring riser diagram layout of sound system, clearly indicating all devices, equipment, etc.
  3. Operations / Maintenance Manual (Users Guides): Manufacturer's operational manuals for each type of device or piece of equipment requiring manual operation along with an as-built drawing accounting for any system configuration changes if such exist.
  4. Statement of Guarantee and Warranty: Manufacturer's operational manuals for each type of device or piece of equipment requiring manual operation along with an as-built drawing accounting for any system configuration changes if such exist.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Equipment listed herein is not intended to be restricted to specific manufacturers but provide a technical feature set and performance specifications on which the entire system's design is based. Each manufacturer and model listed has been carefully chosen based on technical performance requirements, specific feature sets, quality of manufacturing, and overall subjective experience with the success of such equipment in previous system installations. All substitutions must be authorized by the Electrical Engineer prior to system acceptance, purchase, and installation.

B. Bill of materials:

<u>Ref</u>	<u>Qty</u>	<u>Model</u>	<u>Manufacturer</u>	<u>Description</u>
1	1	WPXB/1NL4-SPEAKERS	Whirlwind	Custom speaker jack plate
2	1	DS-7E	Atlas	desktop microphone stand
3	1	NL4-025	Whirlwind	portable, 4 cond speaker cable
4	1	M-8DX	Furman Sound	rack mounted power distro w/ lights & meter
5	1	GE-DRAWER-2US	Gator	2RU storage drawer
6	1	GRR-10L	Gator	portable 10RU equipment rack
7	2	R.5HP	Community	3-way, all weather loudspeaker system
8	2	PMB-IRR	Community	pole mount system
9	2	PMB-BAND	Community	pole mount strap kit
10	1	ne1600pe	Ashly	2x800w amplifier w/ integral digital signal processor
11	1	SCM-268	Shure	5x1 rack mount mixer
12	1	SLX24/SM58-J3	Shure	handheld wireless microphone system
13	1	SM58-S	Shure	handheld microphone w/ switch
14	1	CD-200j	Tascam	CD player w/ iPod dock & aux input jack
15	1	M3503	Whirlwind	3ft dualRCA interconnect cable (for CD deck)
16	1	MK402np	Whirlwind	2ft XLR interconnect cable (for wireless)
17	1	MK420np	Whirlwind	20ft XLR interconnect cable (for hardwired mic)
18	1	MST10	Whirlwind	10ft stereo 1/8in audio cable
19	1	YR2F	Whirlwind	dualRCA-F to single RCA-M y-cable (for CD deck)

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Installation shall include delivery, unloading, setting in place, and inter-connecting wiring of system components, equipment alignment and adjustment and programming, and all other work whether or not expressly required herein which is necessary to result in complete operational systems.
- B. All installation practices shall be in accordance with, but not limited to, this specification. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of National, State, and Local authorities having jurisdiction.
- C. During installation, and up to the date of System Acceptance, the Electrical Contractor shall be under obligation to protect the Sound System Contractor's finished and unfinished work against damage and loss. In the event of such damage or loss, the Electrical Contractor shall replace or repair such work at no cost to the Sound System Contractor.

### 3.2 SYSTEM ACCEPTANCE

- A. A physical inventory will be taken of all equipment on site and will be compared to equipment lists in the contract documents.
- B. The operation of all system equipment shall be demonstrated by the Sound System Contractor. A Training Sign-Off sheet with signatures of all training attendees will be recorded and distributed at close out.
- C. All final "as built" drawings, cut sheets, manuals, and other required documentation shall be distributed at this time.

### 3.3 TRAINING

- A. The Sound System Contractor will provide on-the-job training by a qualified instructor, to instruct the Owner in the operation and maintenance of system. Owner is advised to provide system operators with basic sound system knowledge to be present at time of training. There shall be a minimum of two hours total training provided. This training may take place before, during and/or after System Acceptance. A Training Sign-Off sheet with signatures of all training attendees will be recorded and distributed at completion of said training.

END OF SECTION

## SECTION 310000

### DEMOLITION

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Demolish and remove from the site those items so indicated on the Drawings, including buildings, building pads, parking and roadway areas, miscellaneous structures, poles, walls, utilities, signs, etc.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
  - 2. Section 02110 – Clearing and Grubbing

##### 1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Comply with the Standard Building Code with due regard to the protection of the public and the provision of safeguards during the performance of the work.
- C. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner.
- D. Comply with requirements of governmental agencies having jurisdiction.
- E. Contractor is responsible for being aware of and complying with Asbestos NESHAP regulations, as well as other applicable codes, laws and regulations.
  - 1. The Owner is to be notified immediately upon discovery of asbestos materials.

#### PART 2 - PRODUCTS

- A. No products are required in this Section.

#### PART 3 - EXECUTION

##### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the safe, timely, and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 DEMOLITION

#### A. General:

1. Prior to start of demolition, carefully study the Drawings and these Specifications.
2. In company with the Owner's representative, visit the site and verify the extent of demolition to be performed under this Contract.

#### B. Using only the means and equipment approved for this purpose by the governmental agencies having jurisdiction, demolish and completely remove from the job site the existing construction designated to be removed.

1. Shut off, cap, reroute, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
2. Remove rocks larger than 12" diameter, roots, wood, and debris.

#### C. Demolished material shall be considered to be property of the Contractor and shall be completely removed from the job site.

#### D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

#### E. Use any means necessary to protect the public safety during the demolition process.

#### F. Use whatever means necessary to protect the adjacent structures from damage during demolition.

#### G. Protection of trees: It may become desirable to save certain trees in areas where cut or fill is eighteen inches or less and in parking areas. Consequently, the Contractor shall obtain approval from Engineer prior to removal of significant trees from such areas. The Contractor shall protect existing trees to remain during construction by constructing barricades around such trees as directed.

#### H. Erosion control: Construct and maintain erosion control as shown on the Drawings and in accordance with the City of Columbia requirements.

### 3.3 MEASUREMENT AND PAYMENT

#### A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the project.

END OF SECTION

## SECTION 310519.13 GEOTEXTILES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the installation of separation/stabilization fabric as shown on the Contract Drawings and as specified herein.

#### 1.2 QUALITY ASSURANCE

- A. The latest edition of the following standards, as referenced herein, shall be applicable.
  - 1. American Society for Testing and Materials (ASTM).

#### 1.3 SUBMITTALS

- A. Product Data:
  - 1. Submit Manufacturer's material specifications, product literature and installation instructions.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery:
  - 1. Deliver sufficient materials to the site to prevent interruption of the work.
  - 2. All materials shall be inspected by Contractor upon delivery. Contractor shall notify Engineer of any damage. Products received at the site torn, with holes, deteriorated, or otherwise damaged will not be approved and shall be returned and replaced at no expense to the Owner.
- B. Storage:
  - 1. All material shall be stored in strict accordance with the manufacturer's recommendations and as approved by the Engineer.
  - 2. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in way that protects it from elements, if stored outdoors, elevate and protect geotextile with waterproof cover.
- C. Handling:
  - 1. All material shall be handled in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

### PART 2 - PRODUCTS

#### 2.1 WOVEN GEOTEXTILE

- A. Stabilization Fabric: To be used beneath roadways and walks.
- B. Composed of polymeric yarn interlaced to form planar structure with uniform weave pattern.

- C. Calendered or finished so yarns will retain their relative position with respect to each other.
- D. Polymeric Yarn: Long-chain synthetic polymers (polyester or polypropylene) with stabilizer or inhibitors added to make filament resistant to deterioration due to heat and ultraviolet light exposure.
- E. Sheet Edges: Selvaged or finished to prevent outer material from separating from sheet.
- F. Unseamed Sheet Width: Minimum 12 feet.
- G. Physical Properties: Conform to requirements noted below:

Property	Design Value	Test Method
Tensile Strength	315 lbs	ASTM D4632
Elongation	12%	ASTM D4632
Trapezoidal Tear	113 lbs	ASTM D4533
CBR Puncture Strength	900 lbs	ASTM D6241
A.O.S.	40 (US Sieve)	ASTM D4751
Permittivity	.05 sec <sup>-1</sup>	ASTM D4491

## 2.2 NONWOVEN GEOTEXTILE

- A. Separation/Filtration Fabric: To be used in drainage ditches, haybale installation, culvert outfall installations, rip-rap outfall installations, and cover material separation
- B. Previous sheet of polyester, polypropylene, or polyethylene fabricated into stable network of fibers that retain their relative position with respect to each other. Nonwoven geotextile shall be composed of continuous or discontinuous (staple) fibers held together through needle-punching, spun-bonding, thermal-bonding, or resin-bonding.
- C. Geotextile Edges; Selvaged or otherwise finished to prevent outer material from pulling away from geotextile.
- D. Unseamed Sheet Width: Minimum 12 feet.
- E. Physical Properties: Conform to the requirements noted below:

Property	Design Value	Test Method
Tensile Strength	160 lbs	ASTM D4632
Elongation	50%	ASTM D4632
Trapezoidal Tear	60 lbs	ASTM D4533
CBR Puncture Strength	400 lbs	ASTM D6241
A.O.S.	70 (US Sieve)	ASTM D4751
Permittivity	1.4 sec <sup>-1</sup>	ASTM D4491

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The Contractor shall be responsible for the installation, and seaming of geotextile fabric in accordance with the specifications and the manufacturer's recommendations, as approved by the Engineer.

### 3.2 SUBGRADE PREPARATION

- A. Surfaces to be covered with geotextile fabric shall be smooth and free of rocks, sticks, roots, sharp objects, and all debris that may damage the fabric. The surface to be covered shall be firm and unyielding, with no sudden changes or breaks in grade. There shall be no standing water or excessive moisture on the surface when the fabric is placed.
- B. The compacted subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the fabric.

### 3.3 GEOTEXTILE INSTALLATION

- A. The fabric shall be cleaned of all debris or other materials that may negatively affect the fabric's performance.
- B. Mechanical equipment shall not be permitted to operate directly on the fabric unless authorized to do so by the manufacturer and approved by the Engineer.
- C. Geotextile Placement
  - 1. Fabric shall be placed as recommended by the manufacturer and approved by the Engineer on surfaces which have been prepared to conform with these Specifications and found acceptable for fabric installation.
  - 2. The fabric shall be placed as smooth and wrinkle-free as possible.
  - 3. When installing geotextile in trenches, swales, ditches, etc., overlap geotextile in the direction of flow.
  - 4. All areas of fabric damaged during installation as determined by the Engineer shall be repaired or replaced by the Contractor as specified at no additional cost to the Owner. Should the fabric be damaged during any step of the installation, the damaged section shall be repaired by covering it with a piece of fabric which extends at least 24 inches in all directions beyond the damaged area. The fabric shall be secured by sewing or bonding as approved by the Engineer.
  - 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. Fabric shall be placed with long dimension down slope.
  - 7. Fabric shall be protected at all times during construction from contamination by surface run-off and any fabric so contaminated shall be removed and replaced with uncontaminated fabric.
- D. Seams and Overlaps of Geotextile:
  - 1. All overlaps shall be a minimum of eighteen (18) inches (450 mm).

### 3.4 COVER MATERIALS OVER GEOTEXTILES

- A. Granular materials shall be placed on geotextiles as shown on the Contract Drawings. During backdumping and spreading, a minimum depth of 6 inches of granular material shall be maintained at all times between the fabric and wheels of trucks or spreading equipment. All equipment used in spreading or traveling on the cover layer for any reason shall exert low ground pressures and shall be approved by the manufacturer and Engineer. Dozer blades, etc. shall not make direct contact with the fabric; however, if tears occur in the fabric during the spreading operation, the granular material shall be cleared from the fabric and the damaged area repaired as previously described.
- B. The granular material shall be spread in the direction of fabric overlap. Large fabric wrinkles which may develop during the spreading operations shall be folded and flattened in the direction of the spreading. Occasionally, large folds may reduce the fabric overlap width. Special care shall be given to maintain proper overlap and fabric continuity.
- C. All equipment spreading cover material or traveling on the cover layer shall avoid making sharp turns, quick stops or quick starts.
- D. Fabric shall be covered as soon as possible after placement to minimize exposure to sunlight. Fabric shall not be exposed for more than 5 days.

### 3.5 DISPOSAL OF SCRAP MATERIALS

- A. On completion of installation, the Contractor shall legally dispose of all trash and scrap material off-site or in a location approved by the Owner and Engineer, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner.

END OF SECTION



SECTION 311100  
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Remove trees, underbrush, undesirable growth, stumps, roots, etc., from the area to the limits shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Section 02260 - Erosion and Sediment Control.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner.
- C. Comply with requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

No products are required for this work.

PART 3 - EXECUTION

3.1 AREA INCLUDED

- A. All streets, parking areas, and any other areas as indicated on the Drawings.

3.2 PROCEDURES

- A. Clearing and grubbing: The entire area within the limit lines described above shall be cleared and grubbed. Remove all vegetation, trees, brush, stumps, etc., from the area. All debris from this operation shall be burned if allowed by local regulations or shall otherwise be disposed of off the Owner's property.
- B. Selective clearing shall be done in areas designated by the Engineer. Selective clearing shall consist of removing vegetation, brush, stumps, etc., from the area. Selected trees shall be left standing and care shall be taken not to damage trees to be left. All debris from this operation shall be burned if allowed by local regulations or shall otherwise be disposed of off the Owner's property. Grubbing will not be required in areas designated for selective clearing.

- C. Removal of trees and shrubs: All trees to be removed shall be felled in such a manner as to avoid injury to remaining trees and to other features not proposed for removal. Trees shall be cut up and the trunks, limbs, and other debris shall be removed from the site. Undesirable shrubs and small trees shall be selectively removed as directed.
- D. Burning: Where applicable, grinding of debris is recommended over burning. Burning may be allowed upon Contractor's approval of local, state, and federal regulations, including the Forestry Department and the South Carolina Department of Health and Environmental Control and the following:
  - 1. The location of the burning must be a sufficient distance but not less than 1000 feet from public roadways and all residential, commercial, and industrial sites not a part of the contiguous property on which the burning is conducted.
  - 2. Winds during the time of the burning must be away from any area in which the ambient air may be significantly affected by smoke from the burning if that area contains a public roadway or residential, commercial, or industrial site.
  - 3. Minimize the amount of dirt on the material being burned.
  - 4. Do not burn any heavy oils, asphaltic materials, items containing natural or synthetic rubber, or any materials other than plant growth.
  - 5. Start the initial burning only between the hours of 9:00 a.m. and 3:00 p.m.; do not add any combustible material to the fire between 3:00 p.m. of one day and 9:00 a.m. the following day.
  - 6. No more than two piles 30' x 30' or equivalent may be burned within a six (6) acre area at one time.
  - 7. Do not burn any salvageable timber and pulpwood.
- E. Stumps and roots: All stumps and roots larger than 2" in diameter shall be completely removed by grubbing except in areas of building site, parking areas and drives, they may be cut off not less than 18" below any subgrade. The area of operation then shall be cleared of resulting debris and matted roots, weeds and other extraneous matter and such shall be hauled away from the site. Generally, all material that cannot be compacted to 90% maximum density in lawn areas and 95% of maximum density elsewhere shall be removed.
- F. Protection of trees: It may become desirable to save certain trees in areas where cut or fill is eighteen inches or less and in parking areas. Consequently, the Contractor shall obtain approval from Engineer prior to removal of significant trees from such areas. The Contractor shall protect existing trees to remain during construction by constructing barricades around such trees as directed.
- G. Erosion control: Construct and maintain erosion control as shown on the Drawings and in accordance with Section 02260: Erosion and Sediment Control, and the local County's requirements.

### 3.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the project.

END OF SECTION

## SECTION 312200

### SITE GRADING

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Cut, fill, excavate, backfill, compact and grade the site as necessary to bring the roads, drives, paved areas and open areas to the lines and grades shown on the drawings.
1. The work includes, but is not necessarily limited to:
    - a. Roadway, parking area, drive and walk subgrade preparation.
    - b. Excavations and formations of embankments.
    - c. Dressing of graded areas, shoulders and ditches.
- B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
  2. Section 02110 - Clearing and Grubbing.
  3. Section 02221 - Trenching, Backfilling for Utilities.
  4. Section 02260 - Erosion and Sediment Control.
  5. Section 02721 - Sewers: Storm Drainage.
- C. Definitions:
1. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way and parking areas.
  2. Maximum density: Maximum weight in pounds per cubic foot of a specific material.
  3. Optimum moisture: Percentage of water in a specific material at maximum density.
  4. Rock excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation.
  5. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be removed by dragline, dredge or other special equipment, are designated as muck. No extra payment will be made for muck removal.
  6. Unsuitable material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technician. In addition to organic matter, sod, muck, roots and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
  7. Suitable material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.

8. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1-1/2" in diameter.
9. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.
10. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

D. The Contractor must determine for himself the volume of material required by the site.

## 1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Comply with requirements of governmental agencies having jurisdiction.
- C. A testing laboratory retained by the Owner will make such tests as are deemed advisable. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts of fill material and shall keep the laboratory informed of his progress. The cost of the initial tests shall be paid for by the Owner. Subsequent tests required as a result of improper compaction shall be paid for by the Contractor.

## 1.3 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

## 1.4 JOB CONDITIONS

- B. Notification of intent to excavate:
  1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil penalty of up to one thousand dollars (\$1,000) for each violation of the Act.
  2. Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.
  3. Notify Owner so that their privately owned utilities may also be located prior to construction.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. Soil material used as fill, backfill, subgrade for structures or pavements, embankments, or site grading shall consist of suitable material as found available on site until such supply of on-site material is depleted.

1. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2-1/2" in their greatest dimension.
  2. Do not permit rocks having a dimension greater than 1" in the upper 6" of fill or embankment.
- B. Should the quantity of suitable on-site material be insufficient to complete the work, suitable borrow material as approved by the Engineer shall be provided by the Contractor at no additional expense to the Owner.
- C. Select materials may be provided from on-site if acceptable material as approved by the Engineer is available on site. Otherwise approved select material shall be provided by the Contractor from an off-site source.

## 2.2 TOPSOIL

- A. Use screened topsoil consisting of material removed from the top 3" to 6" of existing on-site soils.
- B. Use topsoil containing no stones, roots or large clods of soil.
- C. Stockpile topsoil separate from other excavated material.
- D. If insufficient volume of topsoil is not available from existing on-site soils, then screened topsoil shall be imported at no additional expense to the Owner.

## 2.3 WEED KILLER

- A. Provide a dry, free-flowing, dust free chemical compound, soluble in water, capable of inhibiting growth of vegetation and approved for use on this work by governmental agencies having jurisdiction.

## 2.4 EQUIPMENT

- A. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner without undue waste or damage of material.

# PART 3 - EXECUTION

## 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

## 3.2 PREPARATION

- A. Clearing and grubbing: Clear and grub areas to be graded prior to commencement of the grading operations, if necessary.
- B. Where so directed by the Owner, protect and leave standing designated desirable trees.
- C. Complete any demolition and/or removal work as may be required prior to grading operations.
- D. Dispose of all clearing, grubbing and demolition debris and other deleterious material off the project site.

- E. Topsoil: Strip topsoil to a depth of 3" to 6" without contamination from the subsoil and stockpile topsoil separate from other excavated materials.
  - 1. Transport and deposit topsoil in storage piles convenient to areas that are to receive topsoil or in other locations as indicated or approved by the Engineer.
  - 2. Deposit topsoil in areas that are already graded and will not be disturbed by on-going construction.
  - 3. Dispose of unsuitable or unusable stripped material off-site or as otherwise directed by the Engineer.
- F. Sampling and preliminary testing:
  - 1. Prior to beginning the grading operations, the Contractor shall submit to the Engineer his proposed sequence of excavation operations.
  - 2. Based upon the sequence of excavation, samples of the fill materials will be obtained as excavation proceeds and tested for grain size permeability and moisture density relationship using the Standard Proctor Method (ASTM D698, Method A).
  - 3. Allow sufficient time for completion of laboratory tests before any fill operations begin, using the soils being tested.

### 3.3 FINISH ELEVATIONS AND LINES

- A. Construct areas outside of building or structure lines true to grades shown.
  - 1. Where no grade is indicated, shape finish surface to drain away from buildings or structures, as approved by the Engineer.
- B. Degree of finish shall be that ordinarily obtainable from blade grader, supplemented with hand raking and finishing.
- C. Finish surfaces to within 0.10' above or below the established grade or approved cross section.

### 3.4 GENERAL PROCEDURES

- A. Existing utilities:
  - 1. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
  - 2. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly notify the Engineer and take necessary steps to assure that service is not interrupted.
  - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
  - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
  - 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of persons and property:
  - 1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.
  - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.
- C. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- D. Maintain access to adjacent areas at all times.
- E. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

### 3.5 EXCAVATING (CUTS)

- A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.
- B. Suitable excavated materials:
  1. Use all suitable materials removed from the excavation as far as practicable in the formation of the embankments, subgrades, shoulders, building sites and other places as directed.
  2. Unless otherwise indicated on the drawings or approved by the Engineer, surplus suitable material shall be removed from the site and disposed of by the Contractor.
- C. Unsuitable excavated material: Remove from the site and dispose of all unsuitable material unless otherwise approved by the Engineer.
- D. Rock excavation:
  1. Notify the Engineer upon encountering rock or similar material which cannot be removed or excavated by conventional earth moving or ripping equipment.
  2. Do not use explosives without written permission from the Engineer.
  3. When explosives are permitted, use only experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Store, handle and use explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.
  4. The Contractor shall be solely responsible for any damage resulting from the use of explosives.
  5. The Contractor is responsible for securing all permits required in performing this work.
- E. Unauthorized excavation:
  1. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.
  2. Unauthorized overexcavation shall be backfilled and compacted without any additional expense to the Owner.
- F. Authorized overexcavation:
  1. In the event that it is necessary to remove unsuitable material to a depth greater than that shown on the drawings or otherwise specified, the Contractor, upon receiving direction from the Engineer, shall remove, replace and compact such material as directed by the Engineer at the unit prices determined by the Engineer.

### 3.6 FILLING AND BACKFILLING

- A. Use fills formed of suitable material placed in layers of not more than 8" in depth measured loose and rolled and/or vibrated with suitable equipment until compacted.
- B. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.
- C. Do not use broken concrete or asphaltic pavement in fills, unless it is crushed and graded to acceptable standards.
- D. Selection of borrow material:
  - 1. Material in excess of that available on the site shall be suitable material furnished by the Contractor from private sources selected by the Contractor. The material shall be approved by the Engineer before use. All expenses involved in securing, developing, transporting and placing the material shall be borne by the Contractor.
- E. Placing and compacting:
  - 1. Place backfill and fill materials in layers not more than 8" in loose depth.
  - 2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
  - 3. Compact each layer to required percentage of maximum density for the area.
  - 4. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
  - 5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
  - 6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.
- F. Moisture control:
  - 1. Do not use soil material that is either too dry or too wet to achieve proper compaction.
  - 2. Where subgrade or layer of soil material is too dry to achieve proper compaction, uniformly apply water to surface of soil material such that free water does not appear on the surface during or subsequent to compacting operations.
  - 3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
  - 4. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the Engineer.
- G. Compaction requirements:
  - 1. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor).



2. Fill beneath structures and beneath an area extending 10' beyond the limits of the foundation:

Top 12" of subgrade	100%
All other fill material	98%
(See Section 02220 for additional compaction requirements for fill beneath structures)	

3. Fill beneath roadway:

Top 12" of subgrade	100%
All other fill material	95%

4. Embankments:

Top 12" of subgrade	98%
All other fill material	95%

5. Fill beneath walkways:

Top 12" of subgrade	95%
All other fill material	90%

6. Lawn and unpaved open areas:

All other fill material	90%
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### 3.7 FINISH GRADING

#### A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth the finished surfaces within specified tolerance.
3. Grade with uniform levels or slopes between points where elevations are shown on the drawings, or between such points and existing grades.
4. Where a change of slope is indicated on the drawings, construct a rolled transition section having a minimum radius of approximately 8'0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

#### B. Grading adjacent to structures: Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.

#### C. Ditches and gutters and swales:

1. Cut accurately to the cross sections, grades and elevations shown.
2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the work.
3. Dispose of excavated materials as specified herein; do not in any case deposit materials within 3'0" of the edge of a ditch.

### 3.8 FIELD QUALITY CONTROL

#### A. Secure the Engineer's construction review and observation and approval of subgrades and fill layers before subsequent construction is permitted thereon.

#### B. Field density tests will be performed as determined by the Owner, considering the following:

1. At areas to receive paving, at least one field density test for every 5,000 sq. ft. of subgrade area, but not less than three tests.
2. In each compacted fill layer, one field density test for every 5,000 sq. ft. of overlying paved area, but not less than three tests.
3. In fill beneath structures.
4. Other tests as deemed necessary by the Engineer or Owner.

- C. If, in the Engineer's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing until specified requirements are met.
  - 1. Additional testing will be provided by the Owner's selected testing laboratory and all costs for the additional testing will be borne by the Contractor.
- D. Proofrolling:
  - 1. The Contractor shall proofroll subgrade of areas to receive paving, structures on fill or impervious lining material.
    - a. Make not less than 3 passes of a 25 to 50 ton rubber tired roller over the full area.
    - b. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory materials, compacted as specified herein.

### 3.9 PLACING TOPSOIL

- A. Upon completion of site grading and other related site work, screened topsoil shall be uniformly spread over the graded or improved areas. Topsoil shall be evenly distributed to conform to final grade elevations shown on the plans.
- B. Place, level and lightly compact topsoil to a depth of not less than 4".
- C. Maintain topsoil free of roots, rocks, debris, clods of soil and any other objectionable material which might hinder subsequent grassing or mowing operations.
- D. Any surplus materials shall be disposed of in approved areas on the site.

### 3.10 MAINTENANCE

- A. Protection of newly graded areas:
  - 1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
  - 2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

### 3.12 MEASUREMENT AND PAYMENT

- A. The work under this Section and all costs for same shall be included in the price bid for the item to which it pertains with additional or deductive payments allowed for the specified items based on the unit prices given in the Bid Form.
- B. Additive or deductive items:
  - 1. Rock excavation above or below that indicated on the drawings.
  - 2. Removal of additional unsuitable material.
  - 3. Backfill and compaction of suitable material to replace unsuitable material.

END OF SECTION

## SECTION 312316.16 STRUCTURE EXCAVATION FOR MINOR STRUCTURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the excavation, backfilling, compaction, protection and dewatering for placement of minor structures, as shown on the Drawings and as specified herein.
- B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.
- C. The Engineer shall determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

#### 1.2 QUALITY ASSURANCE

- A. Reference Standards:
  - 1. The latest edition of the following standards, as referenced herein, shall be applicable.
    - a. "Standard Specifications, Construction and Materials, South Carolina Department of Transportation, Office of Engineering."
    - b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."
- B. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications, in accordance with Section "Quality Requirements."

#### 1.3 SUBMITTALS

- A. Samples:
  - 1. The Contractor shall furnish earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.
- B. Test Results:
  - 1. The testing laboratory shall submit written reports of all tests, investigations, and recommendations to the Contractor and the Engineer.

#### 1.4 PROJECT REQUIREMENTS

- A. Notify the Engineer of any unexpected subsurface condition.
- B. Protect excavations by shoring, bracing, sheet, piling, underpinning or by other methods, as required to ensure the stability of the excavation.
- C. Underpin or otherwise support structure adjacent to the excavation which may be damaged by the excavation. This includes service lines.

D. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Comply with OSHA requirements.
2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.
3. Provide a minimum of forty-eight (48) hours notice to the Owner and receive written notice to proceed before interrupting any utility.
4. Demolish and completely remove from the site any existing underground utilities designated to be removed, as shown on the Drawings or as specified in Section "Clearing and Grubbing."
5. Repair any damaged utilities as acceptable to the Engineer, at no additional cost to the Owner.

E. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.
2. Operate warning lights as recommended by authorities having jurisdiction.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Select Structural Fill and Selected Fill: sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of SCDOT and meeting the following gradation requirements:

<u>Sieve</u>	<u>Percent Passing</u>
4"	100
No. 40	0 - 70
No. 200	0 - 10

1. Fines passing No. 200 shall be non-plastic.
2. Particle size analysis shall shown no gap grading.

- B. Crushed stone: free from organic material, elongated particles or other deleterious materials, conforming to the requirements of SCDOT and meeting the following gradation requirements:

<u>Sieve</u>	<u>Percent Passing</u>
1-1/2"	100
1"	90 - 100
1/2"	0 - 15

- C. Select Granular Material: sound, durable, sand, gravel, stone or blends with these materials, free from organic, frozen, or other deleterious materials, conforming to the requirements of SCDOT and meeting the following gradation requirements:

<u>Sieve</u>	<u>Percent Passing</u>
2"	100
1/4"	30 - 65
No. 40	5 - 40
No. 200	0 - 10

- D. Geotextile: SUPAC 8NP by Phillips Fibers Corporation, or equal.
- E. Select granular material shall be used in lieu of selected fill as directed by the Engineer, based upon job conditions.

### PART 3 - EXECUTION

#### 3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

- A. A 100-pound minimum representative sample shall be obtained from each potential borrow source. If different material gradations are known to exist in the pit, samples shall be obtained for each material. Each sample shall be mixed thoroughly and reduced to test specimen size, in accordance with AASHTO T87. The tests shall be performed in the order shown. Failure to pass any test is grounds for disqualification and shall lead to cessation of the test program for that material.
1. Particle Size Analysis:
    - a. Method: AASHTO D422.
    - b. Number of Tests: One (1) per potential source.
    - c. Acceptance Criteria: Gradation within specified limits.
  2. Maximum Density Determination:
    - a. Method: ASTM D698, Standard Proctor.
    - b. Number of Tests: One (1) per potential source.
  3. Re-establish gradation and maximum density of fill material if source is changed during construction.

#### 3.2 PREPARATION

- A. Establish required lines, levels, contours and datum.
- B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to the Owner.
- C. Establish location and extent of utilities before commencement of excavation.

#### 3.3 EXCAVATION

- A. Excavate subsoil in accordance with the lines and levels as shown on the Drawings and as necessary for installation of the work. The excavation lines shall be such that sufficient clearance exist for the proper execution of the work, including space for formwork and bracing.

- B. Maintain the slopes of excavation in safe condition until completion of the backfilling operation, in accordance with OSHA requirements.
- C. Trim the bottom of all excavation to the required levels, and leave free from loose or organic matter. Fill overexcavated areas under structure bearing surfaces with concrete as specified for foundations, or other material as approved by the Engineer.
- D. When the excavation has been carried to the required depth, the Contractor shall await inspection of the bearing surface by the Engineer and authorization to proceed with the work.
- E. Sloping surfaces under footings and foundations, or other work where required, shall be cut in steps as indicated on the Drawings or as directed by the Engineer.
- F. Any excess excavation shall be removed from the site to disposal areas at the Contractor's expense.

#### 3.4 DRAINAGE AND DEWATERING

- A. Perform dewatering operations in accordance with Section "Dewatering" in Specification Section (Earthwork).
- B. Prevent surface, subsurface or ground water from flowing into excavation and from flooding project area, as well as surrounding areas.
- C. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to the stability of subgrades.
- D. Provide and maintain the pumps, well points, sumps, suction and discharge lines, and other dewatering components necessary to convey water away from excavations.
- E. Provide and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations by dewatering, to collection or run-off areas.

#### 3.5 STRUCTURAL FILL, BACKFILL, AND COMPACTION

- A. Place fill materials in the types and thicknesses as detailed on the Drawings. All backfill shall be Selected Fill unless otherwise directed by the Engineer, or shown on the Drawings.
- B. After approval of the subgrade by the Engineer, the geotextile shall be placed, where shown on the Drawings, upon the subgrade in accordance with the manufacturer's instructions and the following:
  1. After acceptance of the subgrade, the fabric shall be installed prior to placement of the first course of structural fill.
  2. Geotextile may be joined by either sewing or overlapping. Sewn seams shall be lapped a minimum of 4 inches and double sewn with nylon or polypropylene. Overlapping seams shall have a minimum overlap of 18 inches, except where placed underwater where the overlap shall be a minimum of 3 feet.
  3. Fabric which is torn or damaged shall be replaced or patched. The patch shall extend 3 feet beyond the perimeter of the tear or damage.
  4. Traffic or construction equipment shall not be permitted directly upon the fabric. Maintain a minimum of 8 inches loose thickness of aggregate above the stabilization fabric subject to traffic.

- C. Place backfill and fill materials in layers not more than 12" in loose depth. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with 12" 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.
- D. 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 at the Contractor's expense.
- E. Moisture Control:
  - 1. Where fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill. 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.
- F. All fill shall be thoroughly and satisfactorily compacted to 95 percent of the maximum density of material used.
- G. If the surface of any layer becomes contaminated by mud or unsuitable materials, the contaminated soil shall be removed.
- H. Fill placement shall be suspended when wet weather prevents proper operation of compaction equipment.
- I. Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to structure shall be increased at approximately the same rate on all sides of the structure.
- J. No backfilling or compaction shall take place against any cast-in-place concrete footings or slabs prior to 7 days initial concrete set, or against any cast-in-place concrete walls prior to achieving the desired design strength,  $f=c$ .
- K. Heavy equipment shall not be operated within 4 feet of any structure. Heavy vibratory compactors shall not be operated within 4 feet of any structure.
- L. Excavated material meeting the requirements of Selected Fill shall be spread and allowed to dry until obtaining the required moisture content prior to re-use.

### 3.6 FIELD QUALITY CONTROL

- A. Notify the Engineer at least one (1) working day in advance of all phases of filling and backfilling operations.
- B. Compaction testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:
  - a. Method: AASHTO T191, Sand Cone Method  
AASHTO T238, Nuclear Method
  - b. Number of Tests: One (1) per 8" vertical lift.
- 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. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

### 3.7 CLEAN UP

- A. Provide and maintain protections on newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing.
- B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.
- C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION



## SECTION 312333

### TRENCHING, BACKFILLING FOR UTILITIES

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the Work.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
  - 2. Section 02721 - Sewers: Storm Drainage.

##### 1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

##### 1.3 JOB CONDITIONS

- A. Existing utilities:
  - 1. There now exists in the construction areas, waterworks, storm drainage, sanitary sewers, street paving, gas mains, power, telecommunications and other utilities.
  - 2. Approximate location of certain underground lines and structures are shown on the plans for information only, other underground lines or structures are not shown.
  - 3. Locate these and other possible unknown utility lines using electronic pipe finder, or other approved means.
  - 4. Locate, excavate and expose all existing underground lines in advance of trenching operations.
  - 5. The Contractor will be held responsible for the workmanlike repair of any damage done to any of these utilities in the execution of his work under this Section.
  - 6. The Contractor shall familiarize himself with the existing conditions and be prepared to adequately care for and safeguard himself and the Owner from damage.
- B. Notification of intent to excavate:
  - 1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil penalty of up to one thousand dollars (\$1,000) for each violation of the Act.

2. Notification of intent to excavate may be given by calling this toll free number: 1-888-721-7877.
  3. Notify Owner so that their privately owned utilities may also be located prior to construction.
- C. Protecting trees, shrubbery and lawns:
1. Trees and shrubbery in developed areas and along the trench line shall not be disturbed unless absolutely necessary, and subject to the approval of the Engineer.
    - a. Any such trees and shrubbery necessary to be removed shall be heeled in and replanted.
  2. Where trenches cross private property through established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replacement is approved by the Engineer.
    - a. Topsoil underlying lawn areas shall be removed and kept separate from general excavated materials.
- D. Clearing:
1. Perform all clearing necessary for installation of the complete work.
  2. Clearing shall consist of removing all trees, stumps, roots, brush and debris in the rights-of-way obtained for the Work.
  3. All timber of merchantable size shall remain the property of the Owner and shall be trimmed and cut in such lengths as directed and stacked along the edge of the right-of-way.
  4. All other material, including trimmings from above, shall be completely disposed of in a satisfactory manner.
- E. Removing and resetting fences:
1. Where existing fences must be removed to permit construction of utilities:
    - a. Remove such fences and, as the Work progresses, reset the fences in their original location and condition.
    - b. Provide temporary fencing or other safeguards as required to prevent stock and cattle from wandering to other lands.
- F. Restoration of disturbed areas:
1. Restore all areas disturbed by, during or as a result of construction activities to their existing or better condition.
    - a. For existing areas with sod type grasses, replace with new sod. Existing sod may be reused where properly removed and stored.
  2. Do not interpret this as requiring replacement of trees and undergrowth in undeveloped sections of the rights-of-way.
- G. Minimizing silting and bank erosion during construction:
1. During construction, protective measures shall be taken and maintained to minimize silting and bank erosion of creeks and rivers adjacent to the work being performed during construction.
  2. Sack breakers are to be used on steep slopes along creek banks and fill slopes to prevent washing of ditch. Sack breakers are to be placed at the direction of the Engineer.

- H. Blasting (Only if previously approved in writing by Owner and all Federal, State and/or Local Agencies):
  - 1. Store all explosives in a secure manner, complying with all laws, ordinances, and regulations.
  - 2. Contractor shall be responsible for damage caused by blasting operations.

## PART 2 - PRODUCTS

### 2.1 EXCAVATED MATERIALS

- A. Perform all excavation of every description and of whatever substances encountered to depths indicated or specified.
- B. Pile material suitable for backfilling in an orderly manner at safe distance from banks or trenches to avoid overloading and to prevent slides or cave-ins.
- C. Remove and deposit unsuitable or excess materials as directed by the Engineer.

### 2.2 BACKFILL MATERIALS

- A. Provide from materials excavated for installation of utility.
  - 1. Select soil material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension for backfill up to 12" above top of utility being covered.
  - 2. Do not permit rocks larger than 2" in greatest dimension in top 6" of backfill.

### 2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.
- B. Should the quantity of suitable on-site material be insufficient to complete the work, provide suitable borrow material as approved by the Engineer at no additional expense to the Owner.
- C. Provide select materials from on-site if acceptable material as approved by the Engineer is available on-site. Otherwise, provide approved select material from an off-site source at no additional expense to the Owner.

## PART 3 - EXECUTION

### 3.1 PROCEDURES

- A. Existing utilities:
  - 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
  - 2. If active utility lines are encountered and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
  - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.

4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
  5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Locations within streets or highways:
1. Comply with South Carolina Department of Transportation's (SCDOT) "Encroachment Permit" issued for the Work, and the South Carolina Department of Transportation's (SCDOT) "*A Policy for Accommodating Utilities on Highway Rights-of-Way*".
  2. Take all precautions and comply with all requirements as may be necessary to protect the improvements, including barricades for protection of traffic.
  3. Keep minimum of one lane open to traffic at all times where utility crosses street or highway.
- C. Protection of persons and property:
1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.
  2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
  3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.
- D. Dewatering:
1. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.
  2. Maintain the ground water level a minimum of 3-feet below the trench bottom during excavation, installation and backfilling.
    - a. Material disturbed below the invert elevation due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.
    - b. Use sumps, pumps, drains, trenching, wells, vacuum or well point system as necessary to maintain the ground water level a minimum of 3-feet below the trench bottom and maintain a dry excavation.
    - c. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.
    - d. Provide monitoring wells sufficient in size, location, number and depth to monitor the ground water level in the construction area during excavation and backfill operations.
    - e. Maintain dewatering operations until backfilling and compaction operations are complete.
  3. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.
    - a. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
    - b. Prevent flooding of streets, roadways, or private property.
    - c. Provide engines driving dewatering pumps with residential type mufflers.
- E. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

F. Maintain access to adjacent areas at all times.

### 3.2 TRENCH EXCAVATION (Unclassified)

A. Remove all materials of whatever substance encountered.

B. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

C. Open cut:

1. Excavate for utilities by open cut.
2. If conditions at the site prevent such open cut, and if approved by the Engineer, tunneling may be used.
3. Short sections of a trench may be tunneled if, in the opinion of the Engineer, the conductor can be installed safely and backfill can be compacted properly into such tunnel.
4. Remove boulders and other interfering objects, and backfill voids left by such removals, at no additional cost to the Owner.
5. Remove wet or otherwise unstable soil incapable of properly supporting the utility, as determined by the Engineer, to depth required and backfill to proper grade with stone bedding material, at no additional cost to the Owner.
6. Excavating for appurtenances:
  - a. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
  - b. Overdepth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Owner.

D. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.

E. Provide sheeting and shoring necessary for protection of the Work and for the safety of personnel.

1. Remove in units when level of backfilling has reached the elevation necessary to protect the utility work and adjacent property.
2. Sheeting at the bottom of trenches over 10' deep for sewers 15" and larger in size, shall remain in place and be cut off no less than 2" above top of pipe, at no additional cost to the Owner.

F. Depressions:

1. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
2. Except where rock is encountered, do not excavate below the depth indicated or specified.
3. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified, and to provide 6" clearance in any horizontal direction from all parts of the utility and appurtenances.

- G. Special requirements relating to excavation for specific types of utilities shall comply with the following:
1. Water distribution lines:
    - a. Provide depth of cover shown or minimum cover of 36", whichever is greater.
    - b. Where minimum cover only is required, carry excavations to depths necessary to properly grade the pipe on tangents and vertical curves as directed by the Engineer.
    - c. Provide minimum clearance of 6" between pipe walls and trench walls or sheeting and bracing lines.
    - d. If minimum cover of 36" cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other Engineer-approved material.
  2. Sanitary or storm sewer lines:
    - a. Comply with requirements of Section 02722 and Section 02721.
    - b. Do not excavate trench more than 200' ahead of pipe laying, unless permitted by Engineer.
    - c. Maintain trench sides vertical to point not less than 2' above top of pipe.
    - d. Upper portion of trench may be sloped to any width which will not cause damage to adjoining structures, utilities, pavements or private property.
  3. Sewers, Sanitary Pressure: (Force Main):
    - a. Comply with requirements of Section 02723.
    - b. Grade trenches to avoid high points, unless otherwise indicated.
    - c. Provide minimum cover of 36".
    - d. Provide minimum clearance of 6" between pipe walls and trench wall or sheeting and bracing lines.
    - e. If minimum cover of 36" cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other Engineer-approved material.
  4. Electrical conduit:
    - a. Provide depth of cover shown or minimum cover of 36", whichever is greater.
    - b. Where minimum cover only is required, carry excavations to depths necessary to properly grade the conduit on tangents and vertical curves as directed by the Engineer.
    - c. Provide minimum clearance of 12" between conduit and trench wall or sheeting and bracing lines.
    - d. If minimum cover of 36" cannot be provided, then thermoplastic piping may not be used. Use ductile iron piping or other Engineer-approved material.
  5. Gas distribution lines:
    - a. Provide depth of cover shown or minimum cover of 48", whichever is greater.
    - b. Where lines are constructed in the rights-of-way of the South Carolina Department of Transportation, provide minimum cover of 48" below the elevation of the pavement.
    - c. Where minimum cover only is required, carry excavations to depths necessary to properly grade the pipe on tangents and vertical curves as directed by the Engineer.
    - d. Grade trenches to avoid high points.
    - e. Provide minimum clearance of 6" between pipe walls and trench walls or sheeting and bracing lines.
- H. Comply with pertinent OSHA regulations in regards to the excavation of utilities.

### 3.3 BACKFILLING

#### A. General:

1. Backfill trenches and excavations immediately after the pipes are laid, unless other protection is directed or indicated.
2. Select and deposit backfill materials with special reference to the future safety of the pipes.
3. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the Engineer.
4. Surplus material shall be disposed of as directed by the Engineer.
5. Original surface shall be restored to the approval of the Engineer.
6. Maintain proper dewatering during backfill and compaction operations.

#### B. Lower portion of trench:

1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24" over sewers and 12" over other utility lines.
2. Take special care in backfilling and bedding operations not to damage pipe and pipe coatings.

#### C. Remainder of trench:

1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or 1/2 the layered thickness, whichever is smaller, in any dimension.
2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the soil engineer.

#### D. Adjacent to buildings: Mechanically compact backfill in 6" layers within ten (10') feet of buildings.

#### E. Under roads, streets and other paved areas:

1. Mechanically tamp in 6" layers using heavy duty pneumatic tampers or equal.
2. Tamp each layer to a density equivalent of not less than 100% of an ASTM D 698 Proctor Curve.
3. Provide additional compaction by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone.
4. Refill any settlement with crushed stone and continue such maintenance until replacement of pavement is authorized by the Engineer.

#### F. Undeveloped areas:

1. Backfill in wooded, swampy or undeveloped areas shall be as specified hereinbefore, except that tamping of the backfill above a level 2' over the top of the pipe will not be required.
2. Mound excavated material neatly over the ditch to provide for future settlements.

### 3.4 MEASUREMENT AND PAYMENT

#### A. Unclassified excavation for trenching:

1. No measurement or direct payment will be made for the Work under this Section and all costs for same shall be included in the price bid for the utility line to which it pertains.

END OF SECTION



## SECTION 312513

### EROSION AND SEDIMENT CONTROL

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Provide protection of the environment during the construction of this project to reduce soil erosion and siltation to the lowest reasonably achievable level.

##### 1.2 GENERAL

- A. Exercise every reasonable precaution, throughout the life of the project, to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground or roadway surfaces, or other property. Erosion control practices to be used for this project are shown on the drawings and are to conform to South Carolina Department of Health and Environmental Control regulations.

#### PART 2 - PRODUCTS

##### 2.1 CRUSHED STONE

- A. Provide #57 crushed stone for project entrance and exit.
- B. Provide #57 crushed stone for temporary sediment barriers around inlets and for temporary stone check dams.

##### 2.2 GRASSING

- A. Comply with Section 02800 - Turf & Grassing.

##### 2.3 SILT FENCE

- A. All posts to be self-fastener angle steel, 5' in length.
  - 1. Wooden posts are not acceptable.
- B. Woven wire shall conform to the requirements of ASTM A 116, Class I zinc coating for wire. Each woven square shall measure 5.33" X 12". The top and bottom wires shall be 10 gauge. All other wires shall be 12-1/2 gauge.
  - 1. Securely attach woven wire to posts with wire ties.
- C. Filter fabric shall be Mirafi 600X synthetic fabric as manufactured by Celanese Fibers Co., Bidim C34 as manufactured by DuPont or approved equal.
  - 1. Limit splices in filter fabric using continuous rolls whenever possible.
  - 2. Whenever splices are necessary a minimum overlap of 6" is required and all splices must occur at a post so that the integrity of the fence is not compromised.
  - 3. Securely attach filter fabric to top of woven wire and at posts with wire ties.
- D. Silt fences should be continuous and transverse to the flow. The silt fence should follow the contours of the site as closely as possible. Place the fence such that the water cannot runoff around the end of the fence.

## 2.4 EROSION CONTROL BLANKET

- A. Use erosion control blanket S150, from North American Green or approved equal.
  - 1. Use Biostakes where staples are required or indicated on the drawings for stabilization.
    - a. Staple in pattern recommended by blanket manufacturer.
  - 2. Staple locations must be clearly marked on the blanket when stakes are used.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Construct and maintain all erosion control measures until the substantial completion of the project.

### 3.2 TEMPORARY CONSTRUCTION ENTRANCE/EXIT

- A. Construct a gravel area or pad at points where vehicles enter and leave a construction site.
- B. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade and place gravel to the grade and dimensions shown on the plans.
- C. Construct drainage channels to carry water to a sediment trap or other suitable outlet.
- D. Use geotextile fabrics to improve stability of the foundation in locations subject to seepage or high water table.
- E. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site by periodic top dressing with two inches of stone.
- F. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary.
- G. Immediately remove objectionable materials spilled, washed, or tracked onto public roadways.

### 3.3 TEMPORARY GRASSING

- A. Provide a temporary cover for erosion control on disturbed areas that will remain unstabilized for a period of more than 30 days in accordance with Section 02930.
- B. This practice applies to cleared areas, diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles where vegetation is needed for less than 1 year.
- C. Provide grassing on slope 5% or greater within 14 days of disturbance. Comply with Section 02930.

### 3.4 SILT FENCE

- A. Provide silt fence barrier where shown on the plans and on utility construction parallel to the disturbed trench where perpendicular sheet flow runoff occurs on disturbed areas with slopes greater than 4%.
- B. Place at the extreme limits of the area to be disturbed as shown.
- C. Construct temporary sediment barriers of filter fabric, buried at the bottom, stretched and supported by posts and install below small disturbed areas as indicated on the drawings to retain sediment by reducing the flow velocity to allow sediment deposition.
- D. Space posts 10'-0" on center, maximum or as indicated on the drawings.
- E. Remove sediment deposits prior to reaching one-third height of the fence.
- F. Monitor site frequently and place additional silt fencing should evidence indicate that erosion is about to occur at locations other than those shown on plan.

### 3.5 INLET PROTECTION

- A. Construct temporary sediment barriers around storm drain curb inlets using block and gravel as indicated on the drawings.
- B. Construct metal frame barriers around grate and frame of drop inlets as indicated on the drawings.
- C. Sediment tubes may be used as an inlet protection method. This shall comply with current SCDHEC requirements.
- D. Inspect structure after each rainfall and repair as required.
- E. Remove sediment when trap reaches one-half capacity.
- F. Repair any torn fabric or bent posts.
- G. Remove structure when protected areas have been stabilized.

### 3.6 EROSION CONTROL BLANKET

- A. Provide on areas as shown on the plans or on all embankments with slopes equal to or steeper than 2-1/2:1.

### 3.9 MAINTENANCE

- A. Place all erosion control devices or measures prior to any land disturbing activity within the drainage area they are located.
- B. Inspect erosion control devices and clean or otherwise remove silt buildup as necessary once a week or 24-hours following a rain event of  $\geq 0.1$ ".

### 3.10 REMOVAL

- A. Remove temporary structures after protected areas have been stabilized.

3.11 MEASUREMENT AND PAYMENT

- A. No separate measurement or direct payment will be made for the items under this Section and all costs for same shall be included in the price bid for the project.

END OF SECTION

## SECTION 321116 SUBBASE COURSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes provisions for prepared subbase courses for under walks and pavements.
- B. Proof rolling of subgrade for walks and pavements is included in this Section.
- C. Replacement of unsuitable subgrade materials is included in another Section.
- D. Final grading of pavement subbase is specified in this Section.
- E. Stabilization fabric is included in another Section.

#### 1.2 REFERENCES

- A. "Standard Specifications, Construction and Materials, South Carolina Department of Transportation, Office of Engineering."
- B. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."
- C. "American Society for Testing and Materials (ASTM)."

#### 1.3 SUBMITTALS

- A. Source Quality Control Test Reports: Submit test reports directly to Engineer from the testing agency with copy to Contractor.
- B. Field Testing Reports: Submit results of field testing directly to Engineer with copy to Contractor. Reference testing location to plan, and cross-reference to all retesting required to accept installed subbase material.
  - I. Note action taken next to all sub-standard test results.

#### 1.4 QUALITY ASSURANCE

- A. Testing Laboratory Qualifications: To qualify for acceptance, the soil testing laboratory must demonstrate to Engineer's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct the required testing without delaying the progress of the Work.
- B. Field Testing and Inspection Service: Contractor shall retain the services of the same independent soil testing laboratory used for source qualification testing to provide soil testing during pavement subbase installation.

PART 2 - PRODUCTS

2.1 OPTIONAL TYPES:

A. Select one of the following subbase options:

1. Option A: Subbase courses consisting of a layer of Type 3 subbase material followed by a layer of Type 4 subbase material. The upper layer of Type 4 subbase material shall be at least four inches thick, after compaction.
2. Option B: Subbase course consisting of a single layer of Type 1 subbase material.
3. Option C: Subbase course consisting of a single layer of Type 2 subbase material.
4. Option D: Subbase course consisting of a single layer of Type 4 subbase material.

2.2 SOURCE QUALIFICATION TESTING

A. Contractor shall employ and pay for a qualified independent soil testing laboratory to perform soil testing services for source qualification.

1. Obtain a 100-pound minimum representative sample from each potential aggregate source. Obtain samples for each different material gradation known to exist in the pit. Mix each sample thoroughly in accordance with AASHTO T87, and submit to the testing laboratory for reduction to specimen size. The laboratory shall perform the following tests in the order shown. Each material shall pass all tests in order to qualify.

a. Particle Size Analysis:

Method: ASTM D422  
Number of Tests: Two (2) per potential source.  
Acceptance Criteria: Gradation within specified limits.

b. Plasticity Index Determination:

Method: ASTM D424  
Number of Tests: One (1) particle size analysis on material passing no 40 mesh.  
Acceptance Criteria: Plasticity Index within specified limits.

c. Maximum Density Determination:

Method: ASTM D1557 Modified Proctor  
Number of Tests: Two (2) per potential source.

d. Magnesium Sulfate Soundness Loss Test:

Method: [SCDOT] Standard Test Method  
Number of Tests: Two (2) per potential source.  
Acceptance Criteria: Four cycle loss within specified limits.

Re-establish subbase material properties if source is changed during construction.

- B. SCDOT Pre-Qualified Material Sources: Contractor may submit, in lieu of independent laboratory test results, a copy of recent SCDOT Materials Bureau certification of proposed source.
1. Engineer may require additional testing by an independent testing laboratory when:
    - a. The latest test for the source is two (2) years old.
    - b. A change in the character of the material occurs.
    - c. The Engineer determines that additional testing is necessary due to the observed properties of the supplied material.

### 2.3 MATERIALS

- A. Processed Gravel Subbase Course: Materials shall consist of sound, durable blast furnace slag, stone, sand, gravel or blends of these materials.
- B. Crushed Rock Subbase Course: Materials shall consist solely of approved blast furnace slag or stone which is the product of crushing ledge rock.
- C. All materials shall be well graded from course to fine and free from organic or other deleterious materials, conforming to the requirements of SCDOT, and meeting the following gradation requirements:

TYPE	SIEVE	PERCENT PASSING
1	3"	100
	2"	90-100
	1/4"	30-65
	No. 40	5-40
	No. 200	0-10
2	2"	100
	1/4"	25-60
	No. 40	5-40
	No. 200	0-10
3	4"	100
	1/4"	30-75
	No. 40	5-40
	No. 200	0-10
4	2"	100
	1/4"	30-65
	No. 40	5-40
	No. 200	0-10

1. Magnesium Sulfate soundness loss after 4 cycles shall be less than 20 percent for types 1, 2, and 4. Magnesium sulfate soundness loss after 4 cycles shall be less than 30 percent for type 3.
2. Plasticity Index of material passing No. 40 sieve shall not exceed 5.0.
3. Not more than 30 percent, by weight, of the particles retained on a 1/2 inch sieve shall consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than 3 times its least dimension.

4. All material shall meet the specified gradation prior to placement. All processing shall be completed at the source.
  5. Stabilization Fabric: Conform to Section "Geotextiles"
- D. Material substitutions and/or additives such as glass, Blast Furnace Slag, Recycled Portland Cement Concrete Aggregate (RCA) and Reclaimed Asphalt Pavement shall be allowed for Types 1, 3 and 4, in accordance with SCDOT and are subject to approval and acceptance by the Engineer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Establish required lines, levels, contours, and datum.
- B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to Owner.
- C. Proof-roll existing subgrade to the satisfaction of the Engineer. Should the subbase course become unstable at any time prior to the placement of the overlying course(s), correct the unstable condition to the satisfaction of the Engineer. Replace unstable or weak subgrade materials with suitable material as provided in the Specifications.
- D. Place stabilization fabric in locations as directed on the plans and in accordance with Section "Geotextiles" after subgrade has been proof-rolled and accepted by the Engineer.

### 3.2 INSTALLATION

- A. Place subbase material in uniform horizontal layers, with a maximum compacted thickness of 12 inches.
- B. Place subbase in a manner to avoid segregation. Uncontrolled spreading shall not be permitted.
- C. Do not place Type 3 material within 4 inches of the bottom of a pavement course.

### 3.3 COMPACTION

- A. Where subbase courses must be moisture-conditioned before compaction, uniformly apply water to the surface. Prevent free water from appearing on the surface during or subsequent to compaction operations.
- B. Compact all portions of each layer to a density not less than 95 percent of the maximum density.
- C. Final tolerances for the top surface of the subbase course requires that the surface does not extend more than ¼ inch above nor more than ¼ inch below the specified grade at any location.

### 3.4 TRAFFIC ON SUBBASE

- A. The movement of vehicular traffic over the final surface of the subbase may be permitted at locations designated by, and under such restrictions as ordered by the Engineer, provided such movements take place prior to the final finishing of this course to the specified tolerance. The movement of construction equipment on this course may be permitted, at locations designated by and under such restrictions as ordered by the Engineer at locations where permission is granted for such movement, the temporary surface of the course upon which the construction traffic is



running, shall be placed and maintained for at least 2 inches above the final surface of this course. Just prior to paving, and after all construction traffic not required for the removal has ceased, remove the 2 inch protective layer, prepare the exposed surface of the course, and compact to the specified tolerance.

- B. Should the subbase become mixed with the subgrade or any other material, through any cause whatsoever, remove such mixture and replace it with the specified subbase material.

### 3.5 FIELD QUALITY CONTROL

- A. Notify the Engineer at least one (1) working day in advance of all phases of subbase installation.

- B. Comply with the requirements of this Section for in-place relative density testing.

- 1. In-place relative density:

Method: AASHTO T238, Nuclear Method  
Number of Tests: One (1) per specified interval.  
Acceptance Criteria:  $\pm$  Two (2) percent of specified percent compactions.

- 2. Compaction tests shall be provided for every 1000 SY of subbase placement. A minimum of three for each lift is required.
- 3. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions.
- 4. Acceptance Criteria: The sole criterion for acceptability of in-place subbase shall be in situ dry density. Minimum dry density for all subbase shall be 95 percent of the maximum dry density. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION



## SECTION 321613

### CONCRETE CURB AND GUTTER, AND SIDEWALK

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Work included: Provide cast-in-place concrete, including formwork, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

##### 1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Reference standards: Comply with the following codes, specifications and standards, except as otherwise shown or specified:
  - 1. American Concrete Institute (ACI) Publications:
    - ACI 305 Recommended Practice for Hot Weather Concreting
    - ACI 306 Recommended Practice for Cold Weather Concreting
  - 2. American Society for Testing and Materials (ASTM) Publications:
    - A 185 Welded Steel Wire Fabric for Concrete Reinforcement
    - C 31 Making and Curing Concrete Test Specimens in the Field
    - C 33 Concrete Aggregates
    - C 39-72 Compressive Strength of Cylindrical Concrete Specimens
    - C 94 Ready-Mixed Concrete
    - C 150 Portland Cement
    - C 260 Air-Entraining Admixtures for Concrete
- C. Testing agency: A testing laboratory will be retained by the Owner to perform material evaluation tests required by these specifications.
- D. Qualifications of contractors performing concrete work: Minimum of two (2) years experience on comparable concrete projects.
- E. Plant qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C 94.

##### 1.3 SUBMITTALS

- A. Comply with the pertinent provisions of Section 01340.
- B. Within 15 calendar days after receiving the Owner's Notice to Proceed, submit proposed mix designs for approval.

1. Proportions shall be determined by means of laboratory tests of concrete made with the cement and aggregate proposed for use.
  2. Provide report in detail from an approved testing laboratory showing 7-day and 28-day strengths obtained using materials proposed.
  3. Required average strength above specified strength:
    - a. Determinations of required average strength above specified strength ( $f_c$ ) shall be in accordance with ACI 318 and ACI 301.
  4. Cost of this work shall be borne by the Contractor.
- C. Manufacturer's data: Submit manufacturer's specification with application instructions for proprietary materials and items, including curing compound, form release agents, admixtures, patching compounds, and others as required by the Engineer.

#### 1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

### PART 2 - PRODUCTS

#### 2.1 FORMS

- A. Use form materials conforming to ACI 347.
- B. Form coatings: Form release coating shall be neat oil with surface wetting agent or chemical release agent which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.
  1. On surfaces to receive an applied coating, use a residual free chemical form release agent that is compatible with the applied coating and will not prevent the applied finish from satisfactorily bonding to the concrete.

#### 2.2 SIDEWALK REINFORCEMENT

- A. Fiber reinforcing:
  1. Use fiber reinforcing where indicated on the drawings.
  2. Provide polypropylene or co-polymer fibers as manufactured by High Tech Fibers, Inc., Fibermesh Company or an approved equal.
  3. Where required, use fiber reinforcing at a rate of 2.0 lbs. per cubic yard unless another rate is indicated on the drawings.
- B. Provide welded wire mesh for sidewalk reinforcement in compliance with ASTM A 185.

#### 2.3 PREMOLDED JOINT FILLERS

- A. In concrete pavements (exterior) and concrete sidewalks, use asphalt impregnated cellulose fiber joint fillers complying with ASTM D 1751.

#### 2.4 CONCRETE MATERIALS

- A. Cement: Use portland cement: ASTM C 150, Type I, Type I-P or Type II, low alkali.
- B. Aggregates:
  1. Fine aggregate: Conform to ASTM C 33.

2. Coarse aggregate: Conform to ASTM C 33, Size #57.
- C. Water: Clean and potable and free from injurious amounts of deleterious materials.
- D. Admixtures:
1. Air entraining admixture: ASTM C 260.
  2. Water reducing, set controlling admixture: Conform to ASTM C 494.
    - a. Type A - water reducing.
    - b. Type D - water reducing and retarding.
  3. Do not use admixtures containing calcium chloride.
- E. Curing compounds:
1. On all vertical and formed surfaces and construction joints, use a non-residual, non-staining curing compound conforming to ASTM C 309 Type 1 and 1D. Acceptable products are:
    - a. L&M Cure by L&M Construction Chemicals, Inc.
    - b. Horn WB-75 by A.C. Horn Company.
    - c. Sonosil by Sonneborn, Inc.
    - d. Approved equal.

## 2.5 CONCRETE MIXES

- A. Provide concrete with the compressive strength of 3000 psi for a 28-day strength as minimum:
- B. Entrained air: 3000 psi concrete, 5%  $\pm$ 1%.
- C. Slump: 3000 psi concrete, 4"  $\pm$ 1".
- D. Production of concrete:
1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C 94 except as otherwise indicated.
  2. Monitor time and mix proportions by plant delivery slips.
  3. Air-entraining admixtures: Add air-entraining admixture into the mixture as a solution and measure by means of an approved mechanical dispensing device.
  4. Water reducing and retarding admixture: Add water reducing and retarding admixture and measure as recommended by the manufacturer.
  5. Addition of water to the mix upon arrival at the job site shall not exceed that necessary to compensate for a 1" loss in slump, nor shall the design maximum water-cement ratio be exceeded. Water shall not be added to the batch at any later time.
  6. Weather conditions: Control temperature of mix as required by ACI 306 "Cold Weather Concreting" and by ACI 305 "Hot Weather Concreting".

## PART 3 - EXECUTION

### 3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Water, mud, organic, and other detrimental material shall be removed from excavations before concrete is deposited.
- C. Notify the Engineer prior to placing concrete and place no concrete until the formwork, reinforcing and embedded items have been inspected by the Engineer.

### 3.2 FORMWORK

- A. General:
  - 1. Construct forms in conformance with ACI 347.
  - 2. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement.
  - 3. Coat form contact surfaces with approved form coating compound prior to placing reinforcing steel.
- B. Formwork reuse: Reuse only forms that are in good condition and which maintain a uniform surface texture on exposed concrete surfaces.
  - 1. Apply a light sanding as necessary to obtain a uniform texture.
- C. Removal of forms:
  - 1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
  - 2. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged and that corners are true, sharp and unbroken.
  - 3. Whenever the formwork is removed during the curing period, continue to cure the exposed concrete by one of the methods specified herein.

### 3.3 PLACING CONCRETE

- A. Preparation:
  - 1. Remove foreign matter accumulated in the forms.
  - 2. Rigidly close openings left in the formwork.
  - 3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete.
  - 4. Use only clean tools.
  - 5. Provide and maintain sufficient tools and equipment on hand to facilitate uninterrupted placement of the concrete.
  - 6. Before commencing concrete, inspect and complete installation of formwork and wire mesh.
- B. Conveying:
  - 1. Transport and handle concrete from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete.

2. Provide equipment for lifting, dumping, chuting, pumping or conveying the concrete, of such size and design as to ensure a practically continuous flow of concrete at the delivery and without separation of materials.
  3. Do not use concrete that is not placed within 1½ hours after water is first introduced into the mix unless the slump is such that it meets the specified limits without the addition of water to the batch.
- C. Placing:
1. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
  2. Place concrete at such a manner that concrete upon which fresh concrete is deposited is still plastic.
- D. Hot weather placement: Place concrete in hot weather in accordance with ACI 305 "Hot Weather Concreting" and as specified herein.
1. Do not place concrete whose temperature exceeds 100°F.
  2. Thoroughly wet forms and reinforcing prior to placement of concrete.
  3. Use additional set retarder as necessary to increase set time.
  4. Start curing as soon as the concrete is sufficiently hard to permit without damage.
- E. Cold weather placement: Place concrete in cold weather in accordance with ACI 306 and as specified herein.
1. Do not place concrete when the atmospheric temperature is below 40°F.
  2. Do not add salts, chemicals, or other materials to the concrete mix to lower the freezing point of the concrete.
- F. Consolidation:
1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.
    - a. Use vibrators having a 2" head diameter and a minimum frequency of 8000 vibrations per second.
    - b. Provide sufficient number of vibrators to properly consolidate the concrete, keeping up with placement operations.
    - c. Provide at least one spare vibrator on site.
  2. Insert and withdraw vibrators at points approximately 18" apart.
  3. Do not vibrate forms.
  4. Do not use vibrators to transport concrete inside the forms.

### 3.4 PROTECTION

- A. Protect the surface finish of newly placed concrete from damage by rainwater or construction traffic.
- B. Do not apply design loads to structures until the concrete has obtained the specified strength.

### 3.5 CURING

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures and mechanical injury.

- B. Curing compound: Apply curing compound immediately after completion of the finish on uniformed surfaces and within two hours after removal of forms on formed surfaces.
1. Spray the entire surface with two coats of liquid curing compound, applying the second coat in the direction of 90° to the first coat.
  2. Apply compound in accordance with the manufacturer's instructions to cover the surface with a uniform film that will seal thoroughly.

### 3.6 CONCRETE FINISHING

- A. Finish schedule: Unless otherwise indicated on the drawings, finish all concrete surfaces in accordance with the following schedule:
1. Form finish: Formed surfaces not ordinarily exposed to view, including the underside of slabs not exposed to view.
  2. Broom finish: Exterior, outdoor slabs exposed to view including:
    - a. Outdoor floor slabs and walkways.
    - b. Other floors which may become wet or otherwise require a non-skid surface.
    - c. Sidewalks and concrete pavements.
  3. Edge finish: Exposed edges of slabs not receiving chamfer including:
    - a. Sidewalk edges and joints.
    - b. Pavement edges and joints.
    - c. Other slab edges not chamfered.
- B. Finishing procedures:
1. Form finish:
    - a. Repair defective concrete.
    - b. Fill depressions deeper than 1/4".
    - c. Fill tie holes.
    - d. Remove fins exceeding 1/8" in height.
  2. Broom finish:
    - a. Float finish as specified herein.
    - b. Provide a scored texture by drawing a broom across the surface.
  3. Edge finish: Tool slab edges and joints with a 1/4" radius edging tool.

### 3.7 SURFACE REPAIR

- A. Patching mortar:
1. Make a patching mortar consisting of 1 part portland cement to 2-1/2 parts sand by damp loose volume.
  2. Mix the mortar using one part acrylic bonding admixture to two parts water.
- B. Surface defects:
1. Remove all defective concrete down to sound solid concrete.
  2. Chip edges perpendicular to the concrete surface or slightly undercut, allowing no feathered edges.
  3. Dampen surfaces to be patched.
  4. Patch defects by filling solidly with repair mortar.
- C. Allow the Engineer to inspect the work before placing the patching mortar.
- D. Repair defective areas greater than 1 sq. ft. or deeper than 1-1/2" as directed by the Engineer using materials approved by the Engineer at no additional expense to the Owner.



### 3.8 JOINTS

#### A. Construction joints:

1. Unless otherwise approved by the Engineer, provide construction joints every ten (10) feet, or as shown on the drawings.
2. Continue all reinforcing across construction joints and provide 1-1/2 " deep keyways unless indicated otherwise on the drawings.

#### B. Expansion joints:

1. Provide 1/2" expansion joints with premolded joint filters every thirty (30) feet.

### 3.9 FIELD QUALITY CONTROL

#### A. Concrete cylinder tests:

1. During construction, prepare test cylinders for compressive strength testing, using 6" diameter by 12" long single use molds, complying with ASTM C 31.
  - a. Make a set of three test cylinders from each pour.
  - b. Identify each and tag cylinder as to date of pour and location of concrete which it represents.
  - c. Deliver cylinders to testing lab selected by the Owner.
  - d. Cost for preparation and delivery of cylinders shall be borne by the Contractor. Cost for testing cylinders will be borne by the Owner.
2. Should strengths shown by test cylinders fail to meet specified strengths for the concrete represented, then:
  - a. Engineer shall have the right to require changes in the mix proportions as he deems necessary on the remainder of the work.
  - b. Additional curing of those portions of the structure represented by the failed test cylinders shall be accomplished as directed by the Engineer.
  - c. Upon failure of the additional curing to bring the concrete up to specified strength requirements, strengthening or replacement of those portions of the structure shall be as directed by the Engineer.
  - d. The Engineer may require additional testing of concrete in question by either non-destructive methods such as the Swiss Hammer, Windsor Probe or Ultrasonics or by coring and testing the concrete in question in accordance with ASTM C 42. Such testing shall be performed at no additional cost to the Owner.

#### B. Other field concrete tests:

1. Slump tests: A testing laboratory representative will make slump tests of concrete as it is discharged from the mixer.
  - a. Slump test may be made on any concrete batch at the discretion of the Engineer.
  - b. Failure to meet specified slump requirements will be cause for rejection of the concrete.
2. Temperature: The concrete temperature may be checked at the discretion of the Engineer.
3. Entrained air: Air content of the concrete will be checked by a representative of the testing laboratory at the discretion of the Engineer.

#### C. Coordination of laboratory services: The Contractor shall be responsible for coordination of laboratory services.

1. Maintain a log recording quantities of each type of concrete placed, date and location of pour.

2. Inform the testing laboratory of locations and dates of concrete placement and other information as required to be identified in the laboratory's test reports.
- D. Tests required because of extensive honeycombing, poor consolidation of the concrete or any suspected deficiency in the concrete will be paid for by the Contractor.
- E. Dimensional tolerances for allowable variations from dimensions or locations of concrete work, including the locations of embedded items shall be as given in ACI 301.
- F. Concrete which fails to meet strength requirements, dimensional tolerances, watertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the Engineer at no expense to the Owner.

### 3.10 MEASUREMENT AND PAYMENT

- A. No measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the project.

END OF SECTION

## SECTION 321813 SYNTHETIC TURF SYSTEM

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

- A. Provide all labor, equipment, and materials, and do work necessary to construct synthetic turf concourse areas, as indicated on the Drawings and as specified. Work shall include but shall not be limited to:
1. Synthetic surface including all related finish work.
  2. Installation of perimeter anchor systems, including dynamic stone base and geotextile separation fabric.

#### 1.2 REFERENCES

- 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 395 - Rubber Property – Compression Test
    - b. D 418 - Pile Yarn Floor Covering Construction
    - c. D 2256 - Breaking Load (Strength) and Elongation of Yarn by the Single-Strand Method
    - d. D 3776 - Mass Per Unit Area (Weight) of Woven Fabric
    - e. D 3786 - Hydraulic Bursting Strength of Knitted Goods and Non-Woven Fabrics: Diaphragm Bursting Strength Tester Method,
    - f. D 4491 - Water Permeability of Geotextiles by Permittivity
    - g. D 4533 - Trapezoid Tearing Strength of Geotextiles
    - h. D 4632 - Breaking Load and Elongation of Geotextiles (Grab Method)
    - i. D 4833 - Index Puncture Resistance of Geotextiles, Geo-membranes, & Related Products
    - j. F 355 - Shock Absorbing Properties of Playing Surface Systems and Materials
    - k. F 405 - Corrugated Polyethylene (PE) Tubing and Fittings

- l. F 449 - Subsurface Installation for Agricultural Drainage or Water Table Control
- m. F 667 - 8, 10, 12 and 15-inch Corrugated Polyethylene Tubing and Fittings

### 1.3 DEFINITIONS

- A. Subgrade: The undisturbed earth or the compacted soil layer immediately below proposed drainage fill .
- B. Dynamic Stone Base & Topping Stone: In conformance with manufacturers requirements.

### 1.4 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 material, panel drains, geotextile fabric perimeter turf anchoring system, irrigation system heads, valves, boxes, fittings, wire connectors, pipe and appurtenances, goal post system and foundation sleeve and dynamic stone base.
- B. Material Certifications: Manufacturer's or vendor's certified analysis for rubber and sand infill amendments.
- C. Synthetic Turf Material Samples and Test Reports:
  - 1. Synthetic Turf – Three samples, approximately 7" x 11"
  - 2. Submit to Owner for approval - quality assurance information as delineated in paragraphs 1.5 Quality Assurance below.
  - 3. Certified list of successful existing installations, including Owner representative and telephone number, attesting compliance with quality assurance information.
  - 4. Certified copies of independent (third-party) laboratory reports on ASTM tests as follows:
    - a. Pile Height, Face Weight & Total Fabric Weight - ASTM D418
    - b. Primary & Secondary Backing Weights – ASTM D418
    - c. Tuft Bind – ASTM D1335
    - d. Grab Tear Strength – ASTM D1682
    - e. Dynamic Cushion Test (G-max) - ASTM F-355, Procedure A (system)
  - 5. Seam – Sewn or glued per manufacturers' recommendation
    - a. 24 inches in length.
  - 6. Color: Submit sample of line markings for approval by Owner.
- D. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System.
- E. Shop Drawings :
  - 1. Sample Warranty
  - 2. Seam layout of the field

3. Construction detail sketches, especially those that may deviate from the plans and specifications. Include but not limited to the following; perimeter turf anchor details, details at irrigation valves, valve boxes, other inserts or fixed features, etc.
- F. Manufacturer's Review: submit written statement, signed by Contractor and synthetic field surfacing installer stating that the Drawings and Specifications have been reviewed by qualified representatives of the materials manufacturer, and that they are in agreement that the materials and system to be used for synthetic field surfacing are proper and adequate for the applications shown
- G. Statement of Supervision: Upon completion of the Work, Contractor to submit a written statement signed by the synthetic turf manufacturer stating that the field supervision by the manufacturer's representative was sufficient to insure proper application of the complete system and materials, that the Work was installed in accordance with the Contract Documents, and that the installation is acceptable to the manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. The synthetic turf contractor shall have previously installed at least six (6) artificial turf fields larger than 50,000 square feet in the last (3) years.
  1. The turf contractor is responsible for the subgrade fine grading, installation of fabric, installation of the perimeter nailing system and installation of the dynamic stone base.
- B. The turf installation shall be performed by a firm and crew having completed at least six (6) installations in the last three (3) years on projects of similar size and type to this project. The firm shall have the approval of the synthetic surfacing materials manufacturer. The turf installation superintendent shall provide a list of the five (5) projects for which he was responsible.
- C. The Turf Contractor and the Synthetic Turf Manufacturer/Supplier must have been in business under the same ownership for at least three years, and shall have been installing similar turf projects for that entire period.
- D. Provide test results from certified laboratory certifying capability of aggregate base course (dynamic stone) to meet permeability and stability requirements before construction.
- E. Lay test strip and establish compaction and density rates for each course with nuclear gauge before beginning permanent work.
- F. The turf manufacturer/supplier shall submit a list of all completed products, using the specified turf system, in the Mid Atlantic United States. The list shall include references for at least five of the projects.
- G. The synthetic turf surfacing manufacturer shall provide evidence indicating that the specified materials have been successfully utilized on work of similar scope to that shown and specified for this Project.

#### 1.6 QUALITY CONTROL

- A. Prior to construction: Submit samples of each of the following materials to establish Baseline specification and ratios for the remainder of the testing process.
  1. Gravel Drainage Material: Provide a one-gallon sample of each gravel drainage source and for each type of gravel material to be used for testing. This could include:

- a. Gravel trench drainage material
  - b. Dynamic Base Stone
  - c. Topping Stone
- B. During Construction: Submit samples of each of the following during mass production of gravel materials for performance testing and prior to shipping. All costs associated with materials testing shall be paid for by the Contractor.
- 1. Earthwork Material Qualification and Testing
    - 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.
  - 2. Earthwork/Compaction Testing
    - a. All compaction testing shall be performed by as required in Section 312333 "Trenching and Backfilling".
    - b. Compaction testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:
      - 1) In-place relative density:
        - a) Method: ASTM D-1556, Sand Cone Method
        - b) ASTM D-2922, Nuclear Method
      - 2) Number of Tests:
        - a) One (1) per 5,000 SF in each vertical lift.
    - c. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions.
    - 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.

3. Gravel Drainage/Dynamic Stone/Topping Stone Material:
  - a. A minimum of one-gallon sample for every 500 cubic yards of each material used shall be tested by the Testing Agent for general compliance with the established Baseline specifications.

C. Testing Agents

1. The Owner shall contract with, and pay for, an independent testing agent to certify and make recommendations regarding compaction, concrete, geotechnical and other items required by the Work. The Turf Surfacing Contractor shall notify the Owner regarding timing, scheduling and use of these agents.
2. Turf Surfacing Testing Agent:
  - a. The Owner shall hire an independent Testing Agent to perform testing of the turf system material components, as well as to certify the capability of the dynamic stone base course to meet permeability and stability requirements before construction. This Agent shall be A2LA accredited and insured.
  - b. Gravel Materials Test Reports: The Turf Surfacing Testing Agent is to report/submit test results as they are known and simultaneously to the Turf Surfacing Contractor, the Owner and its representatives.

1.7 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. Materials shall be inspected for damage immediately upon delivery.
- 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.
- F. Drainage Gravel and Dynamic Stone Base:
  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.

1.8 COMPLETION AND ACCEPTANCE

- A. General: Completion shall be separated into 2 phases, "Preliminary Completion" and "Substantial Completion."
- B. Preliminary Completion: Scheduled date for preliminary completion shall be at least 10 calendar days before Substantial Completion. Notify the Turf Surfacing Designer/Engineer and Owner in

writing, 3 days prior to scheduled date for observation for "Preliminary Completion." To be considered "Preliminarily Complete" the following items shall be provided:

1. Dynamic stone base in place, compacted and to grade.
2. Synthetic turf installed.

C. Substantial Completion: After "Preliminary Completion" observation, the Turf Surfacing Designer/Engineer and Owner shall prepare and submit to the Contractor, a punch list of items to be completed to achieve "Substantial Completion". Contractor shall notify the Turf Surfacing 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" the following items shall be provided:

1. All "Preliminary Completion" 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. Submit (5) copies of all certified surveys performed during construction for Quality Control.
4. Smooth, level surface level to grading tolerances.
5. Written warranties/guarantees.
6. Stockpiling or storage of required "attic stock" materials.
7. Upon completion of the turf surface, the contractor shall provide the owner with 2 hours of maintenance training that shall be recorded on a video tape and supplied to the Owner.

#### 1.9 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 "Turf Surfacing 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. Synthetic turf product as specified and represented by the Turf manufacturer/vendor.
  3. All materials and products specified.
  4. Dynamic stone base shall be guaranteed to have a percolation rate greater than 6 inches per hour.
- C. Installer Guarantee: Provide in writing a "Full System Guarantee" agreement. The President(s) of the synthetic turf manufacturer (if different) shall sign this document and it shall include the following:
1. All work executed under this section will be free from defects of material and workmanship for a period of eight (8) years from date of Substantial Completion.



2. Any defects will be remedied on written notice at no additional cost to the Owner.
  3. Guarantee shall include removal and replacement of materials (parts and labor) as required to repair synthetic turf surfacing at no cost to the Owner.
  4. The 8 year warranty shall not be prorated and be provided by third party non-cancelable insurance policy.
  5. At no time in the life of the Guarantee shall the G-Max exceed 175 at any one point on the field.
- D. Statement of Supervision: Upon completion of the Work, Contractor to submit a written statement signed by the synthetic turf manufacturer stating that the field supervision by the manufacturer's representative was sufficient to insure proper application of the complete system and materials, that the Work was installed in accordance with the Contract Documents, and that the installation is acceptable to the manufacturer.
- E. G-Max Testing: The synthetic surface manufacturer shall retain a third party certified testing laboratory and shall perform G-Max testing during the first year of the life of the Guarantee.
1. Testing shall be performed at within 10' of the center and at the ends of each rectangular sections. This results in a total of 6 tests. The testing shall be performed between 90 and 120 days after substantial completion. (These tests are paid for by the Contractor).
  2. Testing shall consist of shock attenuation per ASTM F-355 procedure A.
    - a. G-Max shall not change more than 5% (five percent) at any one location per year over the life of the Guarantee.
      - 1) In cases where the results of the above testing exceed the specified values, the condition shall be corrected by the synthetic surface manufacturer. The synthetic surface manufacturer shall provide adequate information to confirm that the mitigation measures were effective.
    - b. At no time in the life of the Guarantee shall the G-Max exceed 175 at any one point on the field.
  3. Future testing shall be performed by a certified independent lab and paid for by the Owner.

## PART 2 - PRODUCTS

### 2.1 EARTHWORK MATERIALS

- A. Earthwork materials shall meet the requirements of Specification "Earth Moving".

### 2.2 PERIMETER TURF ANCHOR/NAILER

- A. The perimeter turf anchor/nailer shall be located at the perimeter or turf edges and shall be as per drawings, or approved equal.

2.3 SYNTHETIC TURF PRODUCT

A. Fiber/Products:

1. AstroTurf "Puregrass"
  - a. An infilled UV stable, extruded "diamond" monofilament polyethylene fiber system with nylon thatch zone.
  - b. Finish pile height 1.25" min. inches
  - c. Permeability 15" per hr. min.
  - d. G-max at install 100-125 max
  - e. G-max over life of field 175 max
  
2. Shaw/Sportex "Victory Turf"
  - a. An infilled UV stable, slit film fiber with nylon thatch zone.
  - b. Finish pile height 1" min. inches
  - c. Permeability 15" per hr. min.
  - d. G-max at install 100-125 max
  - e. G-max over life of field 175 max
  
3. A-Turf "Versa Play"
  - a. An infilled UV stable, slit film fiber with nylon thatch zone.
  - b. Finish pile height 1 1/8" min. inches
  - c. Permeability 15" per hr. min.
  - d. G-max at install 100-125 max
  - e. G-max over life of field 175 max

B. Appearance/Feel:

1. The finished turf surface shall appear as mowed grass with no irregularities and shall afford excellent traction for shoes of all types.
2. The finished surface shall resist abrasion and cutting from normal use.

C. Infill Materials

1. Rubber shall be dust toxics & metal free. Particle sizes shall be consistent in size and shape, between .25 and 3 mm.
2. Sand shall meet the following gradation:

Sieve Size	% Retained
2 mm	0
.5 mm	20-30
.25 mm	40-50
.15 mm	30-40
.05 mm	5-10

3. Infill material shall be as recommended by the turf system MFR. The sand component shall be as recommended by the turf system MFR.

- D. Glued seams
  - 1. Adhesives for bonding tufted synthetic turf shall be as recommended by the synthetic turf manufacturer. Adhesives shall be one-part moisture cured polyurethane.
- E. Sewn Seams
  - 1. Cord for sewing seam turf shall be as recommended by the synthetic turf manufacturer.

#### 2.4 SYNTHETIC INFILL TURF MAINTENANCE EQUIPMENT

- A. Provide (one) turf sweeping unit including all necessary tools and equipment to properly maintain the synthetic turf system:
  - 1. Supply a 6' wide field sweeper with magnet, which shall include a towing mechanism compatible with a field utility vehicle. The field sweeper shall be the LitterKat 760 sweeper, or equivalent.
  - 2. Supply one turf groomer. Turf groomer shall be 6' wide and be the Sportsturf Groomer 720-SDE by Greens Groom or the G7 Groomer by Go Groomer Go, or equal.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION AND PROTECTION

- A. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Do not proceed with any work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.
- B. 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.
- C. 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.
- D. 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.
- E. Installation of synthetic turf surfacing shall be done only after excavation and construction work which might injure it has been completed. Damage caused during construction shall be repaired before acceptance.
- F. The Contractor shall coordinate the installation of the synthetic turf surface and the surrounding surfaces for optimum interface at all edges.

### 3.2 EARTHWORK EXECUTION / SUBGRADE

#### A. Preparation

1. Establish required lines, levels, contours and datum. Turf Surfacing Contractor shall coordinate and ensure that the final grade of various materials such as the Dynamic Stone Base, etc., will result in the final grades shown on the Contract Drawings when the complete system is installed.
2. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to the Owner.
3. Establish location and extent of utilities before commencement of grading operations.
4. 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.

#### B. Grading

1. The finished grade lines are shown on the contract drawings. Upon completion of this work, all debris shall be cleaned out and removed from the premises.
2. Grade Verification: Upon completion of the field subgrade, dynamic stone base and the finished synthetic surface, the Contractor shall provide drawings, completed by a licensed surveyor, sharing the elevations at each of the phases. Elevations shall be taken on a 25' grid across the entire turf area.
3. All cutting, filling, backfilling and grading necessary shall be done to bring the area to the following grade or subgrade levels:
  - a. The final elevation of the Subgrade shall be within one-half inch 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. Subgrade shall mirror the final finish elevation of the turf surface in regards to slope except where noted on the drawings.
  - c. All surfaces shall be graded to drain to drainage structures with no ponding. Grading tolerances given above do not relieve the Contractor from this requirement.
4. 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.

### 3.3 TURF PERIMETER NAILER/ANCHOR

- A. Install approved anchoring system at entire perimeter/edges of turf installation.
- B. Install anchoring/nailing "collar" around other in place or installed items (quick coupler boxes, power/communication boxes, etc.), as appropriate to installation sequencing.

### 3.4 INSTALLATION OF DYNAMIC STONE BASE/TOPPING STONE

- A. Install tested and approved material at a uniform depth as indicated on drawings.
- B. Placement of the dynamic stone base shall proceed from a stable area next to the geotextile fabric and systematically worked outward onto the turf area.
  - 1. The cover material shall be pushed forward and not dumped onto the liner.
  - 2. Laser operated equipment shall be utilized.
  - 3. All equipment used in spreading or traveling on the cover layer shall exert low ground pressures and shall be approved by the manufacturer and Engineer.
  - 4. During placement and spreading,
    - a. A minimum depth of 6 inches of granular material shall be maintained at all times between the fabric and wheels of trucks or spreading equipment.
    - b. Dozer blades, etc. shall not make direct contact with the fabric. If tears occur in the fabric during the spreading operation, the granular material shall be cleared from the fabric and the damaged area repaired as previously described.
    - c. All equipment traveling on the cover layer shall avoid making sharp turns, quick stops or quick starts.
    - d. Care shall be taken to not disturb, displace or damage the geotextile fabric or the drainage system.
- C. Placement of the Topping Stone: This stone layer shall be placed over the dynamic stone base at an approximate depth of one-half inch to produce a level/smooth surface prior to the placement of the synthetic turf.
- D. Finish grade for Dynamic Stone Base and Top Dressing Stone shall be verified using laser operated survey instrument with a tolerance of +/- one-quarter inch over 25 feet in any direction.
  - 1. A survey of the finished spot grades is to be developed by a State licensed surveyor over the entire surface in a 25 foot grid. The survey shall be certified (signed) and submitted to the Owner and its representatives for approval prior to installing the synthetic turf.

### 3.5 INSTALLATION OF SYNTHETIC TURF

- A. Synthetic turf shall be installed by crews employed by the Synthetic Turf manufacturer, in strict accordance with manufacturer's recommendations and instructions including but not limited to, fabric, adhesives, seaming and abutting or attaching to adjacent materials.
- B. Field markings and lining of synthetic field surfacing shall be laid out as shown on the drawings and as approved by the Owner with Contractor submitted drawings.
- C. Turf panel seams shall be sewn with high strength thread using a double loop stitch or glued with an adhesive as recommended by the synthetic turf manufacturer and installed per manufacturer's instructions. All seams shall be flat, tight and permanent with no separation or fraying.
- D. All inlaid lines shall be backed using seaming tape with a width of 12 inches.

- E. Anchor turf edges at perimeter as shown on drawings and as recommended per synthetic turf manufacturer.
- F. At the end of each day, remove all scraps and other debris created by the synthetic turf installation from the turf surface.
- G. Anchor turf edges at curb and at perimeter as shown on drawings.
- H. The finish turf surface shall have a permeability test performed on 5 locations on the surface.
- I. The permeability test shall utilize a dual ring infiltrometer in accordance with ASTM test method. All test results must be greater than 6 inches per hour.

### 3.6 MARKINGS

- A. Any lines or logos shall be tufted or inlaid per Owner requests.

### 3.7 CLEAN UP

- A. 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.

END OF SECTION

SECTION 321814 SYNTHETIC TURF SUBSURFACE DRAINAGE SYSTEMS

PART I - GENERAL

1.1 SUMMARY

- A. This Section includes installation of the Athletic Field Subsurface Drainage System, as indicated on the Contract Drawings and as specified herein.

1.2 RELATED DOCUMENTS

- A. Review Contract Documents for requirements that affect work of this section. Specification Sections that directly relate to work of this section include, but are not limited to:
  - 1. Section Earthmoving
  - 2. Section Synthetic Turf System

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Should the standards conflict with other specified requirements, the most restrictive requirement shall govern.
  - 1. American Association of State Highway and Transportation Officials (AASHTO).
  - 2. American Society for Testing and materials (ASTM):
    - F 405 Corrugated Polyethylene (PE) Tubing and Fittings
    - F 449 Subsurface Installation for Agricultural Drainage or Water Table Control
    - F 667 8, 10, 12 and 15-inch Corrugated Polyethylene Tubing and Fittings
  - 3. Occupational Safety and Health Administration (OSHA)

1.4 SUBMITTALS

- A. Manufacturer's Product Data
  - 1. Provide certifications stating that the material used to comprise the system comply with the system comply with the requirements.
  - 2. Material Samples: Submit three samples of each:
    - a. Geotextile Fabric (6" x 11")
    - b. Gravel Materials:
      - 1) 1 gallon samples of dynamic stone and topping stone.

1.5 QUALITY ASSURANCE

- A. All piping and appurtenances shall be new, clean and in accordance with material specifications, unless specifically noted on the plans.
- B. Size and classification shall be shown on the plans or as specified herein.

- C. The contractor who performs this work shall have installed five similar installations in the last three years. Submit complete list of projects, including project description, date of completion, and contact information.

1.6 PRODUCT DELIVERY

- A. Take all required measures to ensure that all piping and related appurtenances are protected from damage.
- B. Special care shall be exercised during delivery and storage to avoid damage to the products.
- C. All materials shall be delivered and stored within the Contractor’s work limits or in an area approved by the Owner.
- 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.

PART 2 - PRODUCTS

2.1 DYNAMIC STONE BASE AND TOPPING STONE

- A. The dynamic stone base shall conform to the turf vendor’s standard specifications subject to the engineer’s approval and meet the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1 1/2" (37.5mm)	100
3/4" (19mm)	45-80
1/4" (4.75mm)	25-60
No. 8 (2.36mm)	15-45
No. 40 (425mm)	5-25
No. 100 (150mm)	0-10
No. 200 (75mm)	0-5

- B. The topping stone must conform to the turf vendor’s standard specs, is subject to the Engineer’s approval, and meets the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1/2"	100
3/8"	90-100
1/4"	75-100
No. 8	35-75
No. 16	10-55
No. 60	0-15
No. 200 (75mm)	0-4



## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Examine the areas and conditions under which the subsurface drainage system work is to be installed. Correct any and all conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.

END OF SECTION



## SECTION 323113 CHAIN LINK FENCE AND GATES

### 1.1 RELATED DOCUMENTS

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

### 1.2 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 (Use as applicable, verify specification section numbers, headings)

- A. Synthetic Turf System

### 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 framing.

- 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.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Include 10 ft. length of fence and gate complying with requirements.
  - 2. Approval of mockups is also for other material and construction qualities specifically approved by Engineer in writing.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing
  - 4. Approved mockups may become part of the completed work if undisturbed at time of Substantial Completion
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination"

#### 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:

Fence Height	Line Posts	End, Corner & Pull Posts	Rails & Braces	Gate Frames	*Gate Posts	Concrete Foundation Dia.		Depth
						Diameters	Corner/End	
						Line Posts	Pull & Gate Posts	
3'	1-1/2"	2"	1-1/4"	1-1/2"	3"	12"	12"	4'
3'-6"	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
4'	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
4'-6"	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
5'	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
6'	2"	3"	1-1/4"	1-1/2"	4"	12"	18"	4'
8'	2"	3"	1-1/4"	1-1/2"	4"	12"	18"	4'
10'	3"	4"	1-1/4"	1-1/2"	4"	18"	18"	4'
12'	3"	4"	1-1/4"	1-1/2"	4"	18"	18"	5'
16'	3-1/2"	4"	1-1/4"	1-1/2"	4"	18"	18"	5'

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
2	2.375	3.65
2-1/2	2.875	5.79
3	3.500	7.58
3-1/2	4.000	9.11

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	3.12
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:

- I. Steel Wire Fabric: <Galvanized or Polymer-coated> wire
  - a. 0.148 inch (9 gauge) diameter for fences and gates
  - b. 0.192 inch (6 gauge) diameter for backstops

- B. Mesh Size:
  - 1. 2 inches for fences
  - 2. 1-3/4" for tennis court fencing

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 over 6 feet high.
- B. Latch: Provide plunger bar type complete with flush plate set in concrete for all double gates and single gates over 10 feet. 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. Angle Beams, I Beams and Steel Shapes: ASTM A-36.
- G. 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: Green, Olive Green, Brown, Black, complying with ASTM F 934.
- B. Chain Link Fabric:
  - I. 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:
  - I. 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
  - 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. Begin installation in general site areas or those not directly adjacent to the playing field only after final grading including topsoiling and paving is completed in that area or as otherwise permitted by Engineer.
  - 2. For installation directly adjacent to the playing field, coordinate footing installation timing with final installation of playing field materials so as not to contaminate, destroy or displace these playing field materials.
  - 3. 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 coordinated with construction of concrete adjacent to posts or as shown on drawings. Do not attach fabric to posts until concrete has cured a minimum of 7 days.
- D. Setting Posts and Footings in Grass Areas: Set posts in center of hole. Embed post so that bottom of post is flush 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 concrete in a dome shape above ground to shed water. Do not attach fabric to posts until concrete has cured a minimum of 7 days.
- E. 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.



- F. Install top rail continuously through post caps or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.
- G. Install intermediate rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.
- H. Diagonally brace corner posts, pull posts, and terminal posts to adjacent line posts with truss rods and turnbuckles.
- I. 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. 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.
- J. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and score excess threads.
  - I. Secure post tops, extension arms, and caps with one-way cadmium plated steel screws.
- K. 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.
- L. 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



## SECTION 323114 ORNAMENTAL PICKET SWING GATE

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Ornamental picket swing gate.

#### 1.2 SUBMITTALS

- A. Changes in specification may not be made after the published date of bid. All submittals of substitutions must be approved before bid date.
- B. Shop Drawings of gates with all dimensions, details, and finishes. Drawings must include post foundations.
- C. Product Data: Manufacturer's catalog indicating materials and a letter certifying that all conditions of the specifications have been met.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURER

- A. Products from other qualified manufacturers who have five years or more experience manufacturing picket swing gates will be considered by the architect as equal if they meet all specifications for design, size gauge of metal parts and fabrication.
- B. Picket fences and gates must be obtained from a single source.
- C. Approved Manufacturers:
  - 1. Iron World, Howard County, MD (Phone 301-776-7448 Fax 301-776-7449)
  - 2. BETA FANCE USA, 3309 SW Interstate 45, Ennis, TX 75119 (Phone 972-878-7000)
  - 3. Ryan Brewer Enterprises, LLC, 1446 Pineview Drive, Columbia, SC 29209 (Phone 803-360-6054)
  - 4. Approved equal.

#### 2.2 ORNAMENTAL PICKET FENCE

- A. Gate Frame: *Ornamental* picket swing gate frames to be fabricated of galvanized steel tubing, ASTM A-653, of structural steel having a 45,000 psi (310 Map) tensile strength and a G90 [0.9 oz/ft zinc coating. Members welded with stainless steel rods, forming a rigid one piece unit. Vertical upright member's 2"sq. 13ga. metal thickness.
- B. Horizontal rails and pickets.
  - 1. For gate leaves up to 8'0" the horizontal rails to be "U" channels, formed of hot rolled, structural steel 1 " wide by 1-1/2" high, 11 gauge [0.120"] metal thicknesses. Rails must be punched to receive pickets and rivets. Rails stainless steel welded inside vertical

members. Pickets are galvanized steel 1" to match fence sections. Pickets attached to "U" channels using 1/4" industrial drive rivets.

2. For gate leaves 8'1" up to 12'0" provide an additional 1-1/2" sq. stiffener welded to one top and one bottom "U" channel. Use stainless steel rods for welds.
  3. For gate leaves 12'1" to 18'0" supply 2 additional 2" sq. horizontal members welded to the 2" sq. vertical members forming a 2" sq. rectangular frame. Welds to be stainless steel.
  4. For gate leaves 18'1" to 24'0" 2 additional horizontal stiffeners 2' sq. to be welded behind 2" horizontal members. Welds to be stainless steel.
  5. Bracing: Provide diagonal adjustable length truss rods to prevent sagging. One truss rod per 8' maximum of length of gate panel.
  6. Double gates consist of 2 each of the above gate leaves.
- C. Hardware: Galvanized steel and or malleable steel to suit application. Latch shall have provision for padlocking. Hinges shall grip post and frame firmly to prevent slippage. Hinges shall have a load capacity of 1,000 lbs. Hinges shall allow gate leaf to swing 180.
- D. Gate keepers shall be provided for any leaf wider than 5'0" to hold gate in open position.
- E. Double leaf gates to have center drop rod to enable one leaf to be made stationary while that latch shall lock both leaves together.
- F. Gate Posts: Square gate posts (ASTM A-653) 45,000 psi (MPa) tensile strength with G90 galvanized coating in sizes shown below.
- 3"sq. for gate leaf sizes 3'0" to 4'0"
  - 4"sq. for gate leaf sizes 4'1" to 8'0"
  - 6"sq. for gate leaf sized 8'0" to 12'0"
  - 8"sq. for gate leaf sized 12'1" to 18'0"
  - 10"sq. for gate leaf sizes 18'0" to 24'0"
- G. Finish: All steel parts to be galvanized to prevent corrosion. Next, pre-treat and clean surfaces to accept finish coat. Apply 3 mils of TGIC polyester powder coating applied by electrostatic spray process baked at 450 F until finished is cured onto metal. Gates to be coated after all welding is completed.

## 2.3 POST SETTING

- A. Concrete: Minimum 28 day compressive strength of 3,000 psi (20 mpa).

## PART 3 - EXECUTIONS

### 3.1 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Property lines and legal boundaries of work and all gate locations to be clearly established by the general contractor or property owner.

### 3.2 GATE INSTALLATION

- A. Install gate posts a minimum of 36" into firm soil. The diameter of the footing to be 4 times the diameter of the post. Footing should be 6" deeper than the bottom of the posts, 42". Finish concrete with a slop for all water to drain away from post.
- B. Attach all hardware to gate in such a way that it cannot be removed by unauthorized persons.

### 3.3 CLEANING

- A. Clean up debris and remove from the site

END OF SECTION



## SECTION 328300

### UNDERGROUND IRRIGATION SYSTEM

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION OF WORK:

- A. The work covered by this Section consists of furnishing all labor, equipment and materials and performing all operations necessary for installing an automatic irrigation system as shown on the Drawing and/or described by these Specifications. The work includes: preparation and excavation of trenches, installation of irrigation system (including: plastic pipe, fittings and connectors, sprinkler heads, automatic control valves and valve boxes, drip accessories, electric control cable, wiring to controller and required submittals).
- B. This specification applies to soccer field work only.

##### 1.2 QUALITY ASSURANCE:

- A. Subcontract work to a single firm specializing in irrigation systems.
- B. Manufacturer Qualifications. Provide underground sprinkler system as a complete unit produced by a single acceptable manufacturer including heads, valves, piping circuits, controls and accessories.

##### 1.3 SUBMITTALS

- A. Product Data: Submit three (3) copies (neatly stapled into sets) of manufacturer's catalog cuts, equipment data sheets, or shop drawings for the following products:
  - 1. Sprinkler heads
  - 2. Swing Joints
  - 3. Valves: electric and manual
  - 4. Controller and controller accessories
  - 5. Valve boxes
  - 6. Pipe and pipe fittings
  - 7. Control wire and splice connectors
  - 8. Drip components
  - 9. Solvent, primer and Teflon tape
- B. Submit a written proposal including a breakdown of components to be used in the system and a complete description of the scope of work.

Include all information of plumbing and/or electrical permits and fees. Also include with the written proposal:

1. A letter(s) from the manufacturer(s) of all major components of the system (sprinklers, electric valves, controllers, and drip components) that a local authorized service center exists. The name and address of that service center shall be included in the letter. The same letter(s) shall also include the name of the local authorized manufacturer's representative.

## PART 2 - PRODUCTS

### 2.1 SPRINKLER SYSTEM:

- A. Manufacturer. Irrigation system products shall be by the following manufacturers:

- Rainbird Sprinkler Mfg. Corp. 1-800-247-3782 [www.rainbird.com](http://www.rainbird.com)
- Walla Walla Sprinkler Co. 1-509-525-7907 [www.mprotator.com](http://www.mprotator.com)
- The Toro Company 1-800-664-4740 [www.toro.com](http://www.toro.com)

### 2.2 GRAVEL:

- A. Material for gravel sump shall be pea gravel or approved equal.

### 2.3 PLASTIC PIPE AND FITTINGS:

- A. The plastic pipe shall be rigid unplasticized PVC class 200 or class 160 (SDR 26), unless otherwise noted on drawings, extruded from virgin parent material. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles and dents. All plastic pipe shall be manufactured by CertainTeed, Johns-Mansville or approved equal.
- B. All plastic pipe fittings shall be schedule 40 PVC and shall be manufactured by the same manufacturer as the plastic pipe.

### 2.4 SHRUB AND LAWN SPRINKLER HEADS:

- A. All full and part circle sprinklers shall be of the fixed spray variety as is specified on the Drawing. These sprinklers shall be of the pop-up type with spring retraction. The body of the sprinkler shall be constructed of Cicolac Material and the sprinkler shall be easily serviced from the



Manufacturer's specifications with regard to the diameter of throw and gallonage at a given pressure. Spacing of heads shall not exceed the manufacturer's maximum recommendation.

- B. Matched precipitation will be required on all full and part circle sprinklers operation on the same zone.

#### 2.5 PVC SLEEVING:

- A. Schedule 40 PVC pipe shall be as noted on the drawings. These sleeves are to be used for proposed irrigation lines. Irrigation sub-contractor shall coordinate installation with General Contractor.

#### 2.6 AUTOMATIC CONTROL VALVES:

- A. The remote control valve shall be a normally closed 24 volt A.C. 50/60 cycle solenoid type. Valve pressure rating shall not be less than 150 PSI.
- B. The valve body and bonnet shall be constructed of heavy duty glass-filled nylon, diaphragm shall be on nylon reinforced nitrile rubber. Solenoid coil shall be encapsulated in molded epoxy.
- C. The valve body shall be activated by a low power, 2.0 watt 24 volt A.C. solenoid. The solenoid plunger shall have a filter to insure positive valve operation.
- D. The valve shall have a flow control stem with wheel handle for regulation or shutting off the flow of water and a bleed screw for manual operation without electrically energizing the solenoid coil.
- E. The valve construction shall be such as to provide for all internal parts to be removable from the top of the valve without disturbing the valve installation.

#### 2.7 VALVE BOXES:

- A. All control valves shall be installed in a valve box in accordance with manufacturer's specifications.

#### 2.8 CONTROL VALVE CABLE:

- A. All wiring to be used for connecting the automatic remote control valve to the automatic controllers shall be Type "UF", 14-1 stranded or solid

copper, single conduction wire with PVC insulation and bear UL approval for direct underground burial feeder cable. Wire connections to remote control electric valves and splices of wire in the field shall use Pen-Tite wire connectors or approved equal and scaling cement.

#### 2.9 BACKFLOW PREVENTER:

- A. Install size as indicated on drawings and as per local codes.

#### 2.10 DRIP IRRIGATION ACCESSORIES:

- A. Filter. Provide filter at valve to each drip zone. Provide screen having equivalent of 140-mesh filtration capacity.
- B. Pressure Regulator. Incorporate regulator into each drip system if supply pressure exceeds 40 PSI.
- C. Closure Caps. Provide in accordance with manufacturer's recommendations.

#### 2.11 AUTOMATIC RAIN SENSOR

- A. The rain sensor shall be a micro electronic solid-state type, capable of interrupting the power from the irrigation controller to the valves when rainfall exceeds a preselected setting of 1/8" to 3/4". Device shall be made of corrosion resistant plastic casing.

#### 2.12 AUTOMATIC CONTROLLER:

- A. The controller shall be capable of operating 24 V.A.C. electric remote control valves. The controller shall have an active day light with timing accurate to 1 minute per month. (See plan for more specific information).
- B. The wall mount type controller cabinet shall be of injection molded high impact plastic which shall resist corrosion and provide for an attractive appearance. The door shall be mated with the other cabinet parts and be made of the same material. The controller shall be wall mounted as shown on the irrigation plan. The controller shall have adequate lightning protection.

### PART 3 - EXECUTION

#### 3.1 LAYOUT OF LINES:

- A. The water lines will be laid at the locations shown on the plans. The Landscape Contractor shall stake out the location of each run of pipe and all sprinkler heads or valve locations for approval by Landscape Architect prior to digging trench.
- B. The lawn irrigation system shall be installed so that it will drain at all points.
- C. Install PVC pipe in dry weather when temperature is above 40° F in strict accordance with manufacturer's instructions. Allow joints to cure at least 24 hours at temperature above 40° F (4°C) before testing unless otherwise recommended by manufacturer.

### 3.2 EXCAVATION AND BACKFILL:

- A. Trenches for PVC pipe main lines shall be excavated to sufficient depth of 12" minimum and an unspecified width to permit proper handling and installation of pipe and fittings. Trenches for PVC pipe lateral sprinkler lines shall be excavated to sufficient depth of 12" minimum and an unspecified width to permit proper handling and installation of pipe and fittings.
- B. On sodded areas the Landscape Contractor will remove and replace the sod where possible from the trench area to the necessary width and depth required to facilitate his installation.
- C. The backfill shall be thoroughly compacted and brought to finish grade, with proper allowance for topsoil. Selected dirt or sand shall be used if soil conditions are rocky. In rocky areas the trenching depth shall be two inches (2") below normal trench depth to allow for this bedding. The pea gravel fill shall be used in filling the top 4" above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than three inches (3"). The top six inches (6") of backfill shall be free of rocks over one inch (1") diameter, subsoil or trash.

### 3.3 PLASTIC PIPE AND FITTINGS:

- A. All pipe fittings and valves, etc. shall be installed and joined in accordance with the manufacturer's recommendations. Interior of pipes shall be kept free from dirt and debris and when pipe laying is not in progress, open ends of pipe shall be closed by approved means.

- B. Pipe shall be firmly supported throughout its entire length. Extreme care shall be exercised to prevent low points except at drains so that every section of pipe is placed with positive gravity drainage flow towards a drain valve.
- C. Sharp changes in alignment and grade shall be made with appropriate fittings. All elbows, tees and fittings shall be installed with a reaction block bearing against undisturbed soil to prevent breakage or separation of the joint.

#### 3.4 AUTOMATIC CONTROL VALVES:

- A. Automatic control valves shall be installed in accordance with the manufacturer's specifications.

#### 3.5 VALVE BOXES:

- A. Valve boxes shall be installed on a suitable base of gravel for proper foundation box and easy leveling of box to proper grade and also to provide proper drainage of the box. All valve boxes shall be provided with the proper size extensions, wherever required, to bring the valve boxes level with the finished grade.

#### 3.6 ELECTRICAL INSTALLATION:

- A. The Contractor will be required to make connections to the building electrical system as is required for the proper operation of the automatic control system. The entire installation shall fully comply with all local and state laws and ordinances and with all the established codes applicable thereto.
- B. All control circuitry, whether electrical or hydraulic, passing through the wall of the building or beneath a sidewalk, road or drive shall be installed in a suitable sleeve; whereas in all other locations they shall be installed in the pipe trench and protected by the pipe whenever possible.
- C. The joining of all underground wires shall be by the use of wire nuts covered with Scotch Lok per installation instructions provided by manufacturer.

#### 3.7 CONTROL VALVE CABLE:

- A. All control valve cables shall be installed by direct burial at a minimum depth of 12". Where practical the wire shall be installed in same trench as mainline pipe.
- B. Extreme care shall be exercised during backfilling of trench to avoid damage and displacement of mainline pipe.
- C. Control valve cable shall be fed through conduit from inside the building.
- D. Each control valve shall be connected to one station of the controller by a control wire. All of the valves shall be connected to a common ground.

### 3.8 SPRINKLER HEADS:

- A. Sprinkler heads shall be installed as shown on the drawings and in accordance with manufacturer's specifications. The height of each sprinkler head in relation to the finish grade shall be approved by the Landscape Architect.

### 3.9 INSTALLATION OF DRIP IRRIGATION SYSTEM:

- A. Install main lines and valves. Before installing emitter laterals, perform pressure test then flush out sand, plastic shaving and other foreign matter.
- B. Emitter Hose. Bury emitter laterals under 3 inches of mulch. Solvent weld each connection in accordance with manufacturer's recommendation to standard weight Schedule 40 PVC fittings and bushings. Install hose in a serpentine manner. When cutting hose, use a shearing tool such as a pipe cutter, knife or shears. Use only manufacturer's recommended tool and procedure when punching hose for emitters.
- C. Emitter Heads. Connect emitter on a rigid PVC nipple to PVC drip lateral with a tee or elbow. Attach tubing to barbed fitting and daylight distribution tubing at rootball secured with stake. Add bug cap at end of secured distribution tubing. If necessary after installing emitters and before operating system, open end of drip lateral and flush lines clean. The number of emitters on a line shall not exceed manufacturer's recommendations for that hose or distribution tubing size and length.

### 3.10 BACKFLOW PREVENTERS: METERS

- A. Install backflow preventer in new connection between connection and control valves, as per local codes.
- B. Irrigation meter- Contractor shall pay for and install a separate irrigation meter to be utilized for this system. Location as shown on plan.

### 3.11 FLUSHING:

- A. After all new sprinkler piping and risers are in place and connected for a given section, and all necessary work has been completed and prior to installation of sprinkler heads, all control valves shall be opened and a full head of water shall be flushed through the system to remove any foreign material.

### 3.12 TESTING:

- A. Tests shall be made on portions of the line as completed. Final testing, however, shall be made on the entire system. Trenches shall be partially backfilled to prevent displacement of pipes.
- B. Pressure test shall be performed to a maximum hydrostatic pressure of 200 PSI based on the elevation of the lowest point in the system and corrected to the elevation of the test gauge. Duration of the pressure test shall be at least one hour.
- C. Leakage test shall be performed after satisfactory completion of the pressure test. The leakage test shall be conducted at a hydrostatic pressure of 130 PSI without showing a leakage in excess 7.5 gallons per hour. Extend the leakage test for a period of time necessary to allow inspection, but in no case shall the duration be less than two hours.
- D. Remove and replace any defective materials of installations discovered in testing and repeat the test until satisfactory to the Landscape Architect. This work shall be performed at the Landscape Contractor's expense.
- E. The tests shall be witnessed by the Landscape Architect.

### 3.13 AS-BUILT DRAWINGS:

- A. After completion of the piping installation, the Landscape Contractor shall furnish a signed "as-built" drawing and a digital drawing in AutoCad 2007 or later showing exact dimensions, depths and locations of all pipe, drains, controls, heads, etc. of sprinkler system.

### 3.14 MAINTENANCE AND OPERATING INSTRUCTIONS:

- A. Provide four (4) hours of instruction for Owner's Representative's personnel upon completion of check/test/start-up/adjust operations. Owner's Representative shall be notified at least one (1) week in advance of check/test/start-up/adjust operations.
- B. Upon completion of the irrigation system and in conjunction with application for final payment, submit one Maintenance and Operation Manual. Each Manual shall be a 3-ring binder with:
  - 1. One (1) hard copy and one digital drawing in AutoCad 2007 or later of the "RECORD" drawing of the irrigation system, and
  - 2. One (1) complete set of the "APPROVED" Submittals required in paragraph 1.06 above.
  - 3. One (1) copy of the suggested "SYSTEM OPERATING SCHEDULE" which shall call out the controller program required in order to provide 1.0" of water per week to each planted zone area and 1.5" of water per week to each turf zone area.
  - 4. A typewritten description of the procedures to be followed for proper winterization of the entire system.
- C. Contractor shall be responsible for the first year's winterization and subsequent spring start-up procedures and shall perform these operations in the presence of the Owner's Representative's personnel.

### 3.15 CLEAN-UP:

- A. Upon completion of the work and before acceptance and final payment will be made, the Landscape Contractor shall make any necessary repairs, adjustments and corrections to the work as required by the Drawings and Specifications. The Landscape Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures and all other items not incorporated into the work. The site shall be left in a neat and presentable condition. Any damage to roads buildings, walks, vegetation, utilities or any other item of personal property which is the responsibility of the Landscape Contractor, through accident, negligence or normal usage, shall be satisfactorily repaired or replaced as a requirement for completion of this contract.

### 3.16 GUARANTEE:

- A. For a period of one year from date of final acceptance of the work performed under this Contract, the Landscape Contractor shall promptly furnish, without cost to the Owner, any and all parts and labor which prove defective in material, workmanship, or proper functioning of system.

END OF SECTION



## SECTION 328301

### POND AERATOR SYSTEM

#### 1. GENERAL

- 1.1 The following specifications direct attention to certain required features of the design package, but do not purport to cover all details entering into the design, construction, and/or installation of the equipment.
- 1.2 Furnish ONE floating fountain . Fountain shall consist of a motor, a direct drive propeller/impeller driven at a constant speed, a nozzle, a propeller guard and an integral float.
- 1.3 Pond aerator system shall be Font-N-Aire "Ready" fountain or engineer approved equal.

#### 2. PERFORMANCE

- 2.1 Each fountain shall be capable of a direct pumpage rate of 1,000 gpm.
- 2.2 Each unit shall have a minimum operating depth of 24" inches.
- 2.3 All units shall be designed so that 95% of the weight of the unit is below the top level of the flotation.

#### 3. FOUNTAIN DRIVE MOTOR

- 3.1 Each motor shall deliver one (1) brake horsepower and deliver a motor shaft speed of 3,450 rpm on 230 volt, 60 HZ, single phase power service.
- 3.2 The motor shall be totally enclosed, water-cooled, water-lubricated, and rated for chemical duty.
- 3.3 The motor shall, in all cases, equal or exceed standard NEMA specifications.
- 3.4 The motor winding shall be hermetically sealed with an anti-track resin system.
- 3.5 Basic insulation shall equal or exceed NEMA Class H.
- 3.6 A minimum service factor of 1.6 shall be furnished.
- 3.7 The manufacturer's nameplate shall be provided with each motor and shall be securely fastened thereto. The voltage, motor speed, basic insulation class, amperage, service factor, serial number, and manufacturer's name and address shall be stamped or otherwise permanently affixed.

### 3.8 MOTOR SHAFT

- 3.8.1 Each motor shall have a one piece shaft, continuous from the bottom bearing to the fountain's propeller/impeller.
- 3.8.2 The motor shaft shall be manufactured from type 303 stainless steel.
- 3.8.3 The motor shaft shall be machined to a tolerance of (plus or minus) .002 T.I.R. from lower bearing to upper end of the motor shaft.
- 3.8.4 The motor shaft shall measure 5/8" in diameter at the top bearing.
- 3.8.5 The motor shaft nominal length shall not extend more than 1-1/2" beyond the motor end bell.

### 3.9 MOTOR BEARINGS

- 3.9.1 Bearings shall be water-lubricated. No ball bearings shall be used.
- 3.9.2 The top and bottom motor bearings shall be radial sleeve type.
- 3.9.3 The lower thrust bearing shall be a Kingsbury self-aligning, self-equalizing, water-lubricated thrust bearing.

### 3.10 MOTOR TERMINAL

- 3.10.1 The motor terminal shall be of the removable type, submersible connector construction, field replaceable without disturbing the seal of the stator.

## 4. NOZZLES

- 4.1 The nozzles shall be manufactured from corrosion resistant materials.

## 5. MOUNTING HARDWARE

- 5.1 Mounting fasteners shall be a minimum 316 type alloy stainless steel.
- 5.2 Motor mounting hardware shall be designed in such a way as to furnish maximum rigidity and stability with minimum flow interference.

## **6. FLOTATION**

- 6.1 The flotation unit shall be square in shape for stability, rotationally molded of polyethylene for durability and shall not be less than 1/8" sectional thickness.
- 6.2 The flotation unit shall be filled with closed cell, non-hygroscopic, pressure molded polystyrene.
- 6.3 The flotation shall be capable of supporting not less than two (2) times the weight of the unit.

## **7. ELECTRICAL SERVICE CABLE (SERVICE TO FOUNTAIN)**

- 7.1 All units shall be furnished with 100' feet of AWG# 12/4 gauge UL listed, water resistant electrical cable standard. Up to (400' feet maximum) optional and additional.
- 7.2 All units will have a water tight removable power cord from the junction box located on the unit.

## **8. PROPELLER PUMP MODEL #FNA-PP**

- 8.1 The propeller shall be specifically designed for the application intended and made of \_\_\_\_\_ corrosion resistant material.
- 8.2 The propeller shall be streamlined to prevent cavitation, reduce drag and shall have trailback blades to assure foul resistant operation.
- 8.3 The propeller shall be hydraulically balanced to assure equalization of load while \_\_\_\_\_ in operation.
- 8.4 Each propeller pump unit shall have a spray height of 8 feet.
- 8.5 Each propeller pump unit shall have a spray diameter of 25 feet.

## **9. CENTRIFUGAL PUMP MODEL # FNA-CP**

- 9.1 The pump shall be manufactured from corrosion resistant material.
- 9.2 The impeller shall be specifically designed for the application intended.
- 9.3 The impeller shall be hydraulically balanced to assure equalization of load under full operation.

## **10. IMPELLER SHROUD**

10.1 An impeller shroud shall be used to minimize possible damage to the unit.

10.2 The impeller shroud shall be constructed of corrosion resistant materials.

## **11. MOORING**

11.3 Mooring rope and anchors are to be supplied by others.

## **12. OPERATION AND MAINTENANCE MANUAL**

13.1 Operation and maintenance manuals shall be furnished before start up of the equipment.

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## SECTION 328423 AUTOMATIC SPORTS FIELD IRRIGATION SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes installing underground irrigation system main lines as shown and specified for the sand volleyball court facility only. The work includes:
  - 1. Automatic irrigation system main including piping, valves, fittings, thrust blocks, and accessories.
  - 2. Control wire.
  - 3. Testing.
  - 4. Excavating and backfilling irrigation work.

#### 1.2 REFERENCE STANDARDS

- A. Materials, equipment, and methods of installation shall comply with the following codes and standards:
  - 1. All local and State codes.
  - 2. National Fire Protection Association, (NFPA): National Electrical code.
  - 3. American Society for Testing And Materials, (ASTM).
  - 4. National Sanitation Foundation, (NSF).
  - 5. The Irrigation Association, (IA).
- B. Installer's qualifications: minimum of five (5) years experience installing irrigation systems of comparable size. The irrigation system contractor shall have an installation crew consisting of a minimum of three (3) persons who each have a minimum of three years experience installing irrigation systems.
  - 1. The contractor shall be located within 2 hours driving distance from the project.
  - 2. The contractor shall be able to demonstrate his ability to perform emergency or warranty repair work within a minimum of 24 hours notice from the city. The contractor shall have a dedicated service department independent from his installation crews.
  - 3. The contractor must provide a list of the last 3 projects done within the last 2 years that are of similar size and complexity. Name, address and phone numbers shall be included.

#### 1.3 SUBMITTALS

- A. General: Submit the following in accordance with the Conditions of Contract and Division 1 Specification Sections.
- B. Submit manufacturer's product data and installation instructions for each of the system components including but not limited to manual valves, quick coupling valves, valve boxes, pipe, fittings, wire, wire connectors, etc.
- C. Upon irrigation system acceptance, submit five (5) copies of written operating and maintenance instructions, including winterization procedure. Provide format and contents as directed by the Landscape Architect.

D. 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, corner of buildings, large caliper trees, etc.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver irrigation system components in manufacturer's original undamaged and unopened containers with labels intact and legible.
- B. Deliver plastic piping in bundles, packaged to provide adequate protection of pipe ends.
- C. Store and handle materials to prevent damage and deterioration.
- D. Provide secure, locked storage for valves, and similar components that cannot be immediately replaced, to prevent installation delays.

1.5 PROJECT CONDITIONS

- A. Known underground and surface utility lines are indicated on other drawings.
- B. Protect existing trees, plants, lawns, and other features designated to remain as part of the final landscape work.
- C. Promptly repair damage to adjacent facilities caused by irrigation system work operations. The cost of repairs shall be at the Contractor's expense.
- D. Minor adjustments in system layout may be necessary to clear existing and proposed fixed obstructions. Final system layout shall be acceptable to the Landscape Architect.
- E. Cutting And Patching:
  1. Cut through concrete and masonry for conduits with core drills. Jack hammers are not permitted.
  2. Materials and finishes for patching shall match existing cut surface materials and finish. Exercise special care to provide patching at openings in exterior walls water tight.
  3. Methods and materials used for cutting and patching shall be acceptable to the Landscape Architect.

## 1.6 WARRANTY

- A. For a period of one (1) year from the date of final acceptance of the irrigation system, the contractor shall promptly furnish and install any parts, which prove defective due to faulty product or faulty installation by the contractor.
- B. During the warranty period, the contractor shall extend to the Owner, any and all warranties that apply to equipment found to be defective in either materials or workmanship, as extended by the manufacturer and/or distributor to the contractor. The limits of this equipment warranty shall be expressly stated by the appropriate manufacturer/distributor in writing.

## 1.7 COORDINATION

- A. Coordinate work of this Section with that of other trades, under this and other Contracts with the Owner, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- B. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Landscape Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.
- C. Do not interrupt existing services without Owner's approval. Schedule interruptions in advance, according to Owner's instructions. Interruptions shall be scheduled at such times of day and work so that they have minimal impact on Owner's operations.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Sprinkler Manufacturers: Toro Company, Rainbird Corporation, Hunter Industries, or approved equal.
- B. Manufacturer's products shall conform to the specifications and shall be deemed acceptable by the Landscape Architect.

### 2.2 MATERIALS

- A. General:
  - 1. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind.
  - 2. Comply with pipe sizes indicated. No substitution of smaller pipes will be permitted. Larger sizes may be used subject to acceptance of the Landscape Architect.
  - 3. Provide pipe continuously and permanently marked with manufacturer's name or trademark, size schedule and type of pipe, working pressure and National Sanitation Foundation (NSF) approval.

B. Pipe, Fittings, And Connections:

1. Polyvinyl chloride pipe: ASTM D2241, Type 1, Grade I rigid, unplasticized PVC, extruded from virgin parent material, conforming to CS256-63. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles, and dents.
  - a. All piping for sleeves under roadways, sidewalks, etc., shall be PVC, Schedule 80, unless otherwise stated on the plans.
  - b. All main line piping shall be polyvinyl chloride pipe and shall be SDR 21, Class 200, integrated bell and spigot type rubber gasketed joint.
  - c. All lateral piping shall be polyvinyl chloride pipe and shall be SDR 21, Class 200, solvent weld bell end.
2. Fittings:
  - a. 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.
  - b. Fittings for PVC lateral piping shall be schedule 40 PVC fittings, suitable for solvent weld and threaded connections.

C. Valves and Associated Equipment:

1. Manual Gate Valves:
  - a. Manual gate valve shall be installed where indicated on the plans. Non-Rising Stem: Valves shall be Class 125 and 200 psi CWP, non-rising stem, screw-in bonnet, solid wedge and USA manufactured in accordance with MSS-SP 80. Body, bonnet, external stuffing box and wedge are to be of bronze ASTM B-62. Stems shall be of dezincification-resistant silicon bronze ASTM B-371 or low-zinc alloy B-99, non-asbestos packing and malleable or ductile iron handwheel. For buried service - Bronze Cross or Bronze handwheel required. Valve ends shall be threaded-type.
2. Cast Iron Isolation Gate Valve:
  - a. Resilient Wedge design: Valves shall be 200 psi CWP and USA manufactured, valves to basically meet AWWA C-509. Body and bonnet are to be of cast iron alloy ASTM A-126 Class B. Valve to be epoxy coated inside and outside. Two upper o-ring stem seals. Sealed counter sunk body bonnet bolts providing no exposure of bonnet bolts. Stems to be stainless steel. Resilient rubber encapsulated wedge. Cast iron 2" square operating nut. Valve ends shall be IPS PVC push-on joint.
3. Electric Valve
  - a. The valve shall be available in a globe configuration with 1- inch Female National Pipe Thread (FNPT) inlet and outlet. The valve shall be equipped with a flow control mechanism with removable handle that will regulate flow from full on to completely off.
  - b. The body and bonnet shall be molded of non-corrodible, glass-reinforced nylon, rated to 220 PSI (15 bars, 1500 kPa). The body of the valve shall have brass inserts, with through-holes, which will accept the bonnet bolts. The bonnet bolts shall be serviceable with a



slotted screwdriver, Phillips screwdriver, or a hex wrench, and shall be held captive in the bonnet when the bonnet is removed from the valve body. The diaphragm assembly shall be of molded construction, reinforced with nylon fabric and have a thermoplastic elastomer seating material. The valve shall be equipped with an internal filter as well as a self-cleaning metering rod, so only clean water can enter the solenoid chamber. An optional filter cleaning system, that cleans a stainless steel filter each time the valve opens and closes, shall be available. All metal parts internal to the valve shall be manufactured from corrosion-resistant stainless steel.

- c. The valve shall be available with an optional adjustable pressure regulating device with a calibrated dial for setting of the outlet pressure. (The regulator shall be capable of adjusting the outlet pressure from between 20 and 100 PSI (1.4 to 7.0 bars; 138 to 689 kPa) when inlet pressure is 15 PSI (1.0 bars; 103 kPa) or greater than regulated outlet pressure.) The regulated downstream pressure shall remain constant regardless of variations in upstream pressure. The regulation shall be maintained when valve is manually operated with use of internal bleed valve. The regulator should be capable of regulating upstream pressures from 35 psi to 220 psi.
- d. The standard solenoid shall be a 24 VAC unit with a 370mA inrush current and 190mA holding current at 60 cycles and a 475 mA inrush current and 230 mA holding current at 50 cycles. The solenoid shall be an encapsulated, one-piece unit with captive plunger. It shall be equipped with manual internal bleed capability to release the upper chamber water to the downstream piping, allowing the valve to open.
- e. The valve shall carry a five-year, exchange warranty (not prorated).
- f. The valve, Model number ICV-100G-FS-AS shall be manufactured by Hunter Industries Incorporated, San Marcos, California or approved equal.

#### 4. Valve Access Boxes:

- a. Valve access boxes shall be tapered enclosures of rigid plastic material comprised of fibrous components, chemically inert and unaffected by moisture corrosion and temperature changes. Provide lid of same material, green in color.
  - 1) Valve access boxes for electric valve assemblies shall be 12" deep with 10" X 15" rectangular cover.
  - 2) Valve access boxes for the cast iron gate valves shall be manufactured specifically for cast iron gate valves which are in three pieces, base section, adjustable riser section and a cast iron lid.
  - 3) All valve boxes shall be supplied by the same manufacturer.

#### D. Sprinklers

##### 1. MP Rotor

- a. The sprinkler shall be of the viscous fluid brake rotary type and be a multi-stream, multi-trajectory rotating stream sprinkler.
- b. In full or part circle mode the sprinkler shall be capable of covering a 30 foot radius at 40 psi pressure with an equivalent full circle discharge rate of 3.64 gpm. Side Strip sprinklers shall be capable of irrigating a rectangular area of 5 feet x 30feet at 40 psi. Left strip and

right strip sprinklers shall be capable of irrigating a rectangular area of 5feet x 15feet at 40 psi.

- c. The sprinkler shall produce and maintain a matched precipitation rate no greater than 0.6" per hour throughout the arc adjustment range and radius adjustment range, (up to 25% of radius reduction), when spaced at 50% of wetted diameter.
- d. The part circle sprinkler shall have an infinitely adjustable arc from 45° to 105°, 90° to 210° or between 210° to 270° depending on the model selected. The full circle sprinkler shall irrigate a full 360°. The 45° to 105° model shall not require coverage from adjacent sprinklers closer than 3' from the head.
- e. Full or part circle sprinklers shall be capable of up to 25% radius reduction using a stainless steel radius adjustment screw. The radius reduction screw shall have a slip clutch mechanism to prevent internal damage if turned past the minimum or maximum radius settings. The radius reduction screw shall reduce the pressure and flow upstream of the adjustable orifice thereby maintaining stream integrity.
- f. Part circle sprinklers shall have arc adjustment capabilities using a stainless steel ring. The adjustment ring shall be effective only while the sprinkler is popped up and shall be ineffective while the sprinkler is popped down. When turned past the minimum or maximum arc limits the adjustment mechanism shall have a ratcheting action to prevent internal damage.
- g. This same ratcheting action shall allow the orientation of the left edge of the variable arc when installed on a fixed riser or in a popup body. This is independent of and in addition to any ratchet that may exist in a popup body.
- h. The sprinkler itself shall pop-up at approximately 15 psi of water pressure. Upon cessation of water pressure, the sprinkler itself shall retract. When installed in a pop-up body the sprinkler itself shall pop-up after the body stem is almost fully extended. Upon decreasing pressure the sprinkler itself shall pop-down before the pop-down of the body stem is complete.
- i. The sprinklers adjustable orifice shall be manufactured from polyurethane and acetyl plastic materials for durability.
- j. The sprinkler shall be fitted with a detachable filter.
- k. Sprinkler Assembly models MP Corner, MP Side Strip, MP Left Strip, MP Right Strip, MP3000 shall be able to be installed in popup bodies having a 5/8-27 UNS male threaded stem, at all common popup heights. Sprinkler Assembly shall also be able to be attached to a 1/2 FIPT x 5/8-27 UNS male threaded adapter for use on fixed pipe risers. Models MP Corner HT, MP Side Strip HT, MP Left Strip HT, MP Right Strip HT, MP1000HT, shall be able to be installed in popup spray head bodies having a 5/8-28 UNS female threaded stem, at all common popup heights. Sprinkler Assembly shall also be able to be attached to a 1/2 FIPT x 5/8-28 UNS female threaded adapter for use on fixed pipe risers.
- l. The sprinkler shall be manufactured by Hunter Industries, Incorporated, San Marcos, California.

## 2. Mp Rotor Body

- a. The sprinkler shall be available with a 4-, 6-, or 12-inch (10-, 15-, or 30-cm) pop-up stroke, depending on the body specified, to bring the nozzle into a clean environment. The sprinkler

shall have the option of either a factory-installed or field-installed drain check valve capable of checking up to 14 feet (4.3 m) in elevation change. The sprinkler shall come with a gray body cap to indicate the MPR40 product line for easy identification in the field except for conditions as when reclaimed water units are ordered. The sprinkler shall have available an optional, snap-on cap, molded in purple, a replacement body cap, molded in purple to indicate the use of reclaimed water, or a pre-installed molded purple body cap to indicate the use of reclaimed water.

- b. The sprinkler shall have a standard pressure-regulating device as an integral part of the pop-up riser. This regulator will provide optimal distribution uniformity of the MP Rotator by maintaining a constant outlet pressure of 40 PSI with inlet pressures of up to 100 PSI, regardless of the rotator installed.
- c. The body of the sprinkler shall be constructed of corrosion and UV-resistant, heavy-duty A.B.S. The riser of the sprinkler shall be constructed of abrasion and UV-resistant A.B.S. and shall be adjustable for pattern alignment. The riser shall be compatible with female threaded nozzles and shall have a stainless steel spring for positive retraction when irrigation is complete.
- d. The sprinkler shall have a pressure-activated, multi-function, UV stable wiper seal that will clean debris from the pop-up stem while it retracts. The seal shall be molded around a rigid plastic ring to prevent seal deformation. This seal shall prevent the sprinkler from sticking in the up position and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures. The seal shall be removable from the cap for easy service and shall be replaceable.
- e. The sprinkler shall have a factory-installed, removable flush cap with a pull-up tab that shall prevent debris from entering the sprinkler during installation and allow the system to be flushed before installing the nozzle. The flush cap shall have a directional flushing action that allows the water to escape only in one direction. The flush cap shall open as the stem extends and completely close when the stem is in the retracted position.
- f. The sprinkler shall have an exposed surface diameter after installation of 2-1/4 inches (6 cm). The sprinkler shall have a 1/2-inch Female National Pipe Thread (FNPT) bottom inlet. In addition, the 6-inch (15 cm) and 12-inch (30 cm) sprinklers shall be available with a 1/2-inch FNPT side inlet. When specified with a factory-installed check valve, the 6-inch (15 cm) and 12-inch (30 cm) sprinklers will be supplied without the side inlet.
- g. The sprinkler shall carry a five-year, exchange warranty (not prorated).
- h. The sprinkler shall be manufactured by Hunter Industries Incorporated, San Marcos, California. The sprinkler shall be model # PROS-04-PRS40-CV manufactured by Hunter Industries Incorporated, San Marcos, California.

E. Electrical Control Wire:

1. Electrical control and common wire from the controller to the electric valves shall be type UF, 600 volt, PE coated direct burial single strand solid copper wire, sized at 14 gauge for zone wire and 14 gauge for the common wire. The color for zone wire shall be red and the color for the common wire shall be white.
2. All wire within the building shall be installed in electrical conduit. Conduit shall be of steel construction.

## 2.3 ACCESSORIES

- A. Drainage fill shall be 1/2" to 3/4" crushed stone.
- B. Fill shall be clean soil free of stones larger than 2" diameter, foreign matter, organic material and debris.
  - 1. Provide imported fill material as required to complete the work. Obtain rights and pay all costs for imported materials.
  - 2. Suitable excavated materials removed to accommodate the irrigation system work may be used as fill material subject to the Landscape Architect's review and acceptance.
- C. Wire connectors for 24 volt control wiring shall be as manufactured by Scotch, Model No. DBY or DBR.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Examine final grades and installation conditions. Do not start irrigation system work until unsatisfactory conditions are corrected.

### 3.2 PREPARATION

- A. Layout and stake the location of each pipe run and all valves. Obtain Landscape Architect's acceptance of layout prior to excavating.
- B. All sleeves required for the installation of the irrigation system are to be installed by this contractor. Wires are to be installed in separate sleeves.

### 3.3 INSTALLATION

#### A. Excavation And Backfill:

- 1. Excavation shall include all materials encountered.
- 2. Excavate trenches of sufficient depth and width to permit proper handling and installation of pipe and fittings.
- 3. Excavate to depths required to provide 2" depth of earth fill or sand bedding for piping when rock or other unsuitable bearing material is encountered.
- 4. Fill to match adjacent grade elevations with approved earth fill material. Backfilling will be done by hand placing soil under, around and above pipe so that it is hand tamped to a point 6" above the pipe. Special care shall be taken to insure that this layer is completely free of stones and other deleterious material. The remainder of the trench may be machine filled with appropriate available soil. Machine placed backfill shall be compacted to a suitable density by machine tamping and approved rolling to prevent settlement in trench.
  - a. If within one (1) year from the date of final acceptance, settlement due to improper compaction occurs and an adjustment in pipes, valves and sprinkler heads, turf or paving is necessary to bring the system, turf or paving to the proper level of the permanent grades, the Contractor, as part of the work under this contract, shall make said adjustments without extra cost to the Owner.

5. Except as indicated, install irrigation mains outside of the building with a minimum cover of 18" based on finish grades, unless otherwise noted. Install irrigation laterals with a minimum cover of 14" based on finish grades.
6. Excavate trenches and install piping and fill during the same working day. Do not leave open trenches or partially filled trenches open overnight.
7. Where it is necessary to cross-existing sidewalks, pipe shall be installed by boring under the walkways. Proper boring equipment shall be used so that undermining of the walkways does not occur.
8. Pipe shall be installed strictly in accordance with the printed recommendations of the manufacturer, including bedding of pipe in the bottom of trench and securely thrusting of any main line fittings at changes in direction of the pipe.
9. All main line piping shall be located outside the primary playing areas. All valve boxes shall be located 12"-18" from inside the fence line and set flush to grade.
10. Where pipe is to be installed through walls, core drill wall of sufficient diameter to install pipe and conduit. Once pipe and conduit is installed, seal opening around pipe with non-shrinking grout. Openings shall be watertight.
11. Existing plant material and turf shall be protected during installation. If excavation is necessary in turf areas, remove and replace sod. Any existing planting material and turf damaged during the installation shall be repaired and or replaced at Contractor's expense.

B. Plastic Pipe:

1. Pipe lines shall be installed of the size shown on the drawings and/or specifications and of the materials and workmanship herein specified.
2. All main line piping outside of buildings to be installed in trenches as per the provisions of Section 3.3.A. Lateral piping will be installed in trenches as above.
3. Pipe shall be installed strictly in accordance with the printed recommendations of the manufacturer, including bedding of pipe in the bottom of trench.

C. Fittings, Valves And Accessories:

1. Install fittings, valves and accessories in accordance with manufacturer's instructions, except as otherwise indicated.
2. All control wiring shall be supplied and installed by this contractor. All wiring shall be performed in accordance with all applicable codes.
3. Install valve access boxes on a suitable base of gravel to provide a level foundation at proper grade and to provide drainage of the access box. Gravel shall extend from the bottom of the valve to 3" below the bottom of the valve box. Valve box locations to be located on "As Built" drawing with measurements from two permanent markers to each valve box.
4. Seal all threaded connections with approved joint compound. Teflon tape shall not be used. Do not over tighten threaded connections.

D. Wire:

1. All wiring located outside buildings is to be installed in the piping trenches wherever possible. Approved wire ties shall be utilized approximately every 20' on wire runs installed in main line trenches or wire trenches.
2. All wires to be spliced to requirements of local and minimum regulations, or to the following specification. All splices shall be made by baring a minimum of 3/4" of copper conductor twisted together, connected and sealed with an approved splice kit. Procedures recommended by manufacturer shall be strictly followed. At splice location, slack shall allow the splice to be raised a minimum of 24" for inspection. Any underground splices not located at control valve sites shall be housed in a valve box for access.
3. Wire shall be installed with at least 1% slack and have expansion loops at end of 250' runs. Wire shall not be yanked, stretched, or excessively pulled during installation. Wire shall be laid on a firm, even bed in the trench which shall support the entire length. The Contractor shall take strict precautions to insure that wires are not cut, scraped, or nicked during installation. Wire shall be laid above and to one side of the main line pipe, never directly over the pipe. Wherever possible, wire shall be laid on the same side of the trench throughout the entire job. All wiring shall be installed with a minimum depth of cover of 12".
4. All wiring shall be installed in accordance with all local, State and National codes.

E. Sleeves:

1. All sleeves for installation of the irrigation system are to be installed by this contractor. All wire shall be installed in separate sleeves.

F. Testing:

1. The Contractor shall be responsible for all hydraulic pressure testing of main lines and lateral lines. The testing shall be on a continuous basis commencing when the first section of the installation is complete and available for testing and prior to the installation of the pipe insulation. Final testing of the whole system under full operating conditions to be done following complete installation of all main and lateral piping, valves and sprinklers.
2. Prior to testing of the main line pipe, pipe shall be backfilled. Testing for all main line pipe and interior lateral pipe shall consist of a continuous application of water at a pressure of 100 PSI to the piping for a one hour period without visual evidence of leaks. If a leak is discovered within this period, the Contractor shall immediately repair the break and the system then retested for the period described above in this section. Testing of lateral lines located outside of building shall be done on a zone by zone operating basis with any leaks or breaks repaired when evidenced.

G. Adjusting The System:

1. Adjustment of the sprinklers, remote control valves, and automatic equipment will be done by the Contractor upon completion of the installation to provide optimum performance and balance throughout the irrigation system.

H. Service:

1. The Contractor shall winterize the system after initial testing. Drain all water from the system and blow out the system with compressed air.

3.4 DISPOSAL OF WASTE MATERIAL

- A. Transport unsuitable excavated material, including rock, to designated disposal areas. Stockpile or spread as directed. Remove from site and legally dispose of trash and debris.

3.5 ACCEPTANCE

- A. Upon acceptance, the Owner will assume operation of the system.

3.6 CLEANING

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from irrigation system installation.

END OF SECTION





## SECTION 329120 PROCESSED SAND

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. General Work Outline

1. The Contractor shall strip the sod from the identified playing court area.
2. The Contractor shall revise the grade of the stripped area using the existing topsoil materials to mirror the slope of the proposed finished grade.
  - a. This revised (preliminary) grade of the existing topsoil material may closely match the proposed final finish elevation or be several inches below the final proposed finish grade for each site.
  - b. This difference in the preliminary finish grade and the final finish grade shall be made up with new sand.
3. The sand shall be spread evenly onto the graded field.
4. The amount of sand added to each court area shall be performed so that the proposed finish grade for that field shall be met.

#### 1.2 WORK INCLUDED

A. Provide all equipment and materials, and do work necessary to complete the sand volleyball court system, as indicated on the drawings and as specified herein. Work shall include but not be limited to;

1. Playing Field Requirements
  - a. Processed Sand
  - b. Laser grading
  - c. Maintenance only until turnover to Owner.

#### 1.3 RELATED WORK

A. Examine the Contract Documents for requirements that affect the work of this section.

#### 1.4 REFERENCES

- A. Comply with applicable requirements of standards relating to the work of this section. Should the standards conflict with other specified requirements, the most restrictive requirement shall govern.
1. American Society of Testing and Materials (ASTM).
    - a. C 136 Sieve Analysis of Fine and Course Aggregates
    - b. D 422 Particle-Size Analysis of Soils

2. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).

#### 1.5 SUBMITTALS

- A. Manufacturer's Product Data: Provide Certifications stating that the materials used to comprise the system comply with the requirements.
- B. The Contractor shall furnish manufacturer's catalog cut, specifications and installation instructions for the complete underdrain installation.
- C. Supplier List: Submit list of procured and contracted suppliers of all materials required for the construction of the playing surface.
- D. Material Certifications: Manufacturer's or vendor's certified analysis for:
  1. Processed sand.
- E. Product Data: Submit manufacturer's product data and samples as noted for the following:
  1. Processed sand.
- F. Samples: Submit samples of each of the following materials for review and approval prior to delivery to site:
  1. Processed Sand – 1-gallon (1 per 500 CY)
- G. Submit the Contractor's Qualifications as required in Section 1.8A.

#### 1.6 QUALITY ASSURANCE

- A. A. Contractor Qualifications
  1. The Contractor shall have been in business under the present company name for a minimum of five years
  2. The Contractor shall have completed at least five sand field projects greater than 40,000 sf in the past five years.
  3. The Contractor's Superintendent shall have at least five years of experience as a Superintendent on projects of similar scope and complexity.
  4. The Contractor must be a member of the American Sports Builder Association and be a "Certified Field Builder".
  5. The Contractor must be a licensed contractor in the State of South Carolina.

#### 1.7 QUALITY CONTROL

- A. Processed Sand:
  1. A minimum of one gallon sample for every 500 tons of sand shall be tested by the Contractor's Testing Laboratory for compliance with the specifications.

## 1.8 PRODUCT DELIVERY

- A. All materials shall be delivered and stored within the Contractor's work limits or in an area approved by the Owner.
- B. Sand Batches:
  - 1. Deliver tested and approved lots in clean, washed and covered trucks to eliminate contamination during transportation. Place directly on playing court area. Do not stockpile on site.

## 1.9 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 Architect/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 as appropriate to each field site:
  - 1. Drainage system installed.
  - 2. Processed sand installed.
- C. Substantial Completion: Contractor shall notify the Architect/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. Submit (5) copies of all certified surveys performed during construction for Quality Control.
  - 4. Dense, green, consistent grass void of any bare or patchy areas
  - 5. Level playing surface to grading tolerances.
  - 6. Written warranties/guarantees.
  - 7. Upon completion, Contractor shall provide Owner with project as-built/record drawings.

## 1.10 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. Installer Guarantee: Provide a guarantee for repair or replacement including both materials and workmanship for the following period of time:
  - I. One year after date of Substantial Completion.
- C. 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.

PART 2 - PRODUCTS

2.1 UNDERDRAINS

A. Underdrain Pipe

- 1. Perforated pipe shall be double wall high-density polyethylene pipe (HDPE) as manufactured by Advanced Drainage Systems (ADS), or approved equal, 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 and larger diameters..
- 2. HDPE pipe shall be class 2 slotted perforated where indicated.
- 3. Provide 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.
- 4. Pipe and fittings shall be made of polyethylene compounds which conform to the physical requirements of Type III, Category 3,4 or 5 P23, P33, or P34, Class C per ASTM D-1248 with the applicable requirements defined in ASTM D-1248.
- 5. The piping shall be wrapped with a "sock".

2.2 PROCESSED SAND

- A. The sand shall be uniform coarse sand screened and washed meeting the following criteria:

Fraction Size/Name	U.S. Standard Sieve	Diameter of Sieve (mm)	Allowable Range % Retained on Sieve
Fine Gravel	10	2.00	0-2%
Very Coarse Sand	18	1.00	0-15% Combined with gravel
Coarse Sand	35	0.50	40-50%
Medium Sand	60	0.25	35-45%
Fine Sand	100	0.15	3-5%
Very Fine Sand	270	0.05	5% maximum
Silt		0.002	3% max. allowable combined
Clay		<0.002	

1. Mineral: Quartz, min 99% SiO<sub>2</sub>
2. Must be clean naturally occurring silica sand, washed and screened, not produced from crushed aggregate plant, round to sub-angular sands only.
3. Clean silica sand must be free of rocks, shells and/or other debris.
4. Must drain adequately, 15-20 in/hr. minimum.

### PART 3 - EXECUTION

#### 3.1 STRIPPING OF THE EXISTING GRASS AND RELATED DEMOLITION

##### A. General

1. Grass shall be stripped and removed from the area indicated for each court.
2. Contractor shall take care to remove as little soil with the sod as possible and it is suggested that specialty equipment is used for this operation.

#### 3.2 UNDERDRAIN INSTALLATION

- A. After preliminary elevation has been performed and approved, excavate trenches for the drainage system.
- B. Install geotextile fabric in bottom, sides and 12 inches to either side of trench on subgrade. Fabric may be folded over top of trenches during construction to eliminate chance of erosion or contamination from soils into the sand trench. Prior to installation of sand blanket, the fabric shall be opened so that the top of the trench sand is exposed directly to the sand blanket layer.
- C. Place a 3" level bed of sand drainage material, just prior to placement of under drain pipe.
- D. Install the collector piping with sock wrapping.
- E. Connect collector drain pipe to existing drain inlets where shown. Cap or modify drain inlet lids as noted.
- F. After pipe installation has been inspected by Engineer, sand drainage material shall be placed around and over the pipe and compacted. This material shall be the same as that used for the processed sand and shall be installed to the final finished field surface.

#### 3.3 PROCESSED SAND INSTALLATION

- A. Prior to placing any sand batches, the individual batches and materials shall be tested and approved by the Testing Agent.
- B. Drainage systems shall be in place prior to this operation.
- C. The sand shall be evenly spread over the entirety of the area being modified and at a depth that shall bring the final finish grade to match those shown for each field on the drawings. The

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Contractor shall utilize equipment and machinery that will not damage, compact or displace the new or existing materials.

- D. Final Finish grade shall be performed within a tolerance of 1 - inch in 25 feet in any direction. The final finish grade slope shall conform exactly to the preliminary topsoil slope. The field shall be compacted, settled and firmed uniformly. Operate the irrigation system as necessary to settle and compact the mix. Re-grade or add materials as necessary. Rolling shall not be utilized as method of filling in or correcting depressions or humps.
- E. Finish grades shall be verified using survey instruments with a tolerance of +/- 1/2 inch. A survey of the finished spot grades is to be developed by a State licensed surveyor over the entire surface in the form of a grid at 25 foot spacing in two directions. Contours shall be provided on this document. Submit certified/signed survey to Engineer for review and approval. Survey to include surveyor's certification that the grades shown on the survey are within the specified tolerances.

#### 3.4 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove waste materials, including materials not allowed for fill, backfill or site grading as specified within, trash, and debris, and dispose of it properly off Owner's property at Contractor's expense.
- B. Leave the site in a clean, satisfactory condition ready to receive subsequent operations.

END OF SECTION 329120

## SECTION 329222

### TREE PROTECTION AND MAINTENANCE

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION OF WORK

- A. Tree removal, protection, and maintenance of trees where shown on drawings.
- B. Landscape Architect to flag all trees to be removed before proceeding with clearing.

##### 1.2 TREE PROTECTION BARRIER

- A. A tree protection barrier, as shown in the plans, shall be constructed around the existing trees to remain. Each barrier shall be constructed immediately after the demolition and hand removal of pavement within ten feet of the tree and BEFORE any additional demolition- or construction-related activities occur.
- B. The established protected perimeter around the tree shall be based on one foot in radius per one inch of tree diameter as measured 4.5 feet above grade (e.g. a seven-inch diameter tree will have a protected area with a seven-foot radius and 14-foot diameter around the tree) unless shown otherwise on the plans.
- C. No materials, equipment, trailers, spoil, waste or washout water may be deposited, stored or parked within tree protection areas. All underground utilities, drains, and irrigation lines shall be routed outside the tree protection zone. If lines must traverse the tree protection zone, they shall be tunneled or bored under the tree.
- D. Any herbicides placed under paving materials or in planting beds must be safe for use around trees and labeled for that use. Any pesticides used on site must be tree-safe and not easily transported by water.

##### 1.3 OBSERVATION

- A. Any demolition, grading, or construction work that is expected to encounter tree roots shall be monitored by the Landscape Architect or consulting arborist.

## PART 2 - TREE MAINTENANCE

### 2.1 PRUNING

- A. Pre-construction tree pruning shall be performed to clean the crown of dead, diseased, crossing and/or weak wood, and to provide adequate clearance for equipment and construction. All pruning shall be performed by a qualified arborist certified by the International Society of Arboriculture, and shall be in accordance with the International Society of Arboriculture's Tree Pruning Guidelines (1995) and/or the ANSI A300 Pruning Standard (1995). In most cases no more than 20 percent of the live foliage should be removed from the tree. Brush can be chipped and spread under the tree for mulch to help protect against soil compaction, to ameliorate soil temperatures, and to conserve soil moisture.
- B. All trees within the project area shall be pruned to:
  - 1. clear the crown of diseased, crossing, weak and dead wood to a minimum of 1.5 inches in diameter;
  - 2. remove stubs, cutting outside the wound-wood tissue that has formed around the branch;
  - 3. reduce end weight on heavy, horizontal branches by selectively removing small diameter branches no greater than 2-3 inches, near the ends of the scaffolds.
- C. Where temporary clearance is needed for access, branches shall be tied back to hold them out of the clearance zone.
- D. Interior branches shall not be stripped out (i.e. no "lion-tailing").
- E. Pruning cuts larger than 4 inches in diameter, except for dead wood, shall be avoided unless absolutely necessary.
- F. Pruning cuts that expose heartwood shall be avoided whenever possible.
- G. No more than 20% of live foliage shall be removed within the tree.
- H. While in the tree, the arborist shall perform an aerial inspection to identify defects that require treatment. Any additional work needed shall be reported to the Owner.

### 2.2 FERTILIZATION

- A. No fertilizer should be applied to trees in the project area prior to construction.



## PART 3 - EXECUTION

### 3.1 TREE REMOVAL AND DEMOLITION ACTIVITIES

- A. The demolition contractor shall meet with the Landscape Architect at the site prior to beginning work to review all work procedures, access, haul routes, and tree protection measures.
- B. The limits of all tree protection measures shall be staked in the field.
- C. Trees to be removed that have branches extending into the canopy of trees to remain must be removed by a qualified arborist and not by demolition or construction contractors. The qualified arborist shall remove the tree in a manner that causes no damage to the trees and under-story to remain.
- D. Any brush clearing required within the tree protection zones shall be accomplished with hand-operated equipment.
- E. Trees to be removed shall be felled so as to fall away from tree protection zones and to avoid pulling and breaking of roots of trees to remain. If roots are entwined, the landscape architect may require first severing the major woody root mass before extracting the trees. This may be accomplished by cutting through the roots by hand, with a vibrating knife, rock saw, narrow trencher with sharp blades, or other approved root-pruning equipment.
- F. Trees to be removed from within a tree protection zone shall be removed by a qualified arborist. The trees shall be cut near ground level and the stump ground out.
- G. All downed brush and trees shall be removed from the tree protection zone either by hand or with equipment sitting outside the tree protection zone. Extraction shall occur by lifting the material out, not by skidding it across the ground.
- H. Brush shall be chipped and placed in the tree protection zone to a depth of 6 inches.
- I. Structures and underground features to be removed within tree protection zones shall use the smallest equipment possible and operate from outside the tree protection zone. The Landscape Architect shall be on site during all operations within the tree protection zone to monitor activity.
- J. All trees shall be pruned in accordance with the guidelines in this Section.

#### **TREE PROTECTION AND MAINTENANCE**

- K. Any damage to trees due to demolition activities shall be reported to the Owner within 6 hours so that remedial action may be taken. Timeliness is critical to tree health.
- L. If temporary haul or access roads must pass over the root area of trees to be retained, a road bed of 6" of mulch shall be created to protect the soil from compaction. The road bed shall be replenished as necessary to maintain a 6" depth.

### 3.2 METHODS OF EXCAVATION NEAR ROOTS

- A. Air Spade. Soil excavation near tree roots and/or to determine location of tree roots in the areas outlined below shall be conducted with a model 2000 Air Spade equipped with a 225 scfm (6.2m<sup>3</sup>/min.) nozzle. Further specifications for this spade and ordering information are available upon request.
- B. Compressor. The Air Spade and nozzle combination listed above requires a 250 scfm or greater air compressor. Air compressors with less pressure will overheat during use and cause poor tool performance.
- C. Sewer Vacuum. A sewer vacuum can be used to remove the soil dislodged by the Air Spade if it cannot be easily blown clear of the hole or trench.
- D. Interval Exploratory or Test Trenches shall be dug with the Air Spade to determine the location of roots before any digging within the established protected perimeter area around the tree based on a radius equal to one foot per one inch of tree diameter as measured 4.5 feet above grade.
- E. Test trenches shall be eight inches deep and four to six inches wide.

### 3.3 ROOT CONFLICTS

- A. Within excavation areas, roots should first be pruned to sever them cleanly. Only those roots that will be affected should be pruned. Root pruning is most efficiently accomplished with equipment specifically designed for that purpose. Large circular saws used to cut concrete, and rock saws are also effective. The saws must cut through the woody roots to the depth of the required excavation. Root pruning equipment designed primarily for curb and sidewalk repair may only cut 8-12 inches deep.
- B. Stake the edge of the excavation.

- C. Cut with root pruning equipment 6-12 inches outside the staked line toward the tree. If root pruning equipment cannot be used, dig a trench along the staked line. Equipment such as backhoe can be used until roots larger than 1 inch in diameter are encountered. The roots shall be exposed by hand excavation or Air Spade.
- D. When a root is encountered expose it by removing soil by hand and cut it cleanly with a saw at the outside edge of the trench (toward the tree). Cut to a lateral root when possible. Roots smaller than two inches in diameter that must be severed shall be cut with a hand pruning saw.
- E. Paints and wound treatments shall not be used on any cut surfaces.
- F. Replace soil in the trench. Use of sandy/loam soils is encouraged.
- G. When roots have been excavated, but not cut, they shall not remain uncovered for more than two days.
- H. Roots that have necessarily been pruned shall be recovered with soil within one hour.

#### 3.4 AVOIDING TREE TRUNK AND BRANCH DAMAGE

- A. Mechanical. Care shall be taken not to contact the canopy when operating large equipment or vehicles in the proximity of any protected trees.
- B. Heat. Equipment and trucks shall not be operated or left idling under the canopy of any protected trees, so that no damage occurs from radiant heat or exhaust. Paving equipment is particularly damaging and shall not be operated under the tree canopies any longer than is required to pave the area.

### PART 4 - INSTALLATION OF UTILITIES NEAR TREES

#### 4.1 GENERAL

- A. For the installation of utility lines the contractor shall consult with the Landscape Architect prior to trenching to establish an acceptable method for excavation. The method of excavation shall be approved by the Landscape Architect and shall be one of the methods described in this section. Boring under tree roots shall be an acceptable method for the installation of utilities in order to avoid cutting roots. Bores shall be at a minimum depth of 30".

- B. Buried Wiring and Plumbing Near Trees. Wiring for the street lights or traffic lights, communication conduits, or plumbing for irrigation which is in conflict with roots two inches or greater in diameter, or is closer than the established protected perimeter area around a tree (see Section 1.1 above) shall be installed in a trench dug by an air spade and the conduit and/or plumbing fitted around the tree roots.
- C. Sewer Service Lines. Where sewer lines are identified to run in areas with roots two inches or greater in diameter, or are closer than the established protected perimeter area around a tree, the Landscape Architect shall be consulted before digging begins to discuss possible alternatives to avoid damaging tree roots.
- D. Water Service Lines. When possible, water service lines shall be placed in the same trenches that are used for sewer services. If a separate trench is needed and the trench is located in an area with roots two inches or greater in diameter or is closer than the established protected perimeter area around a tree (see Section 1.1 above), digging shall be done with an Air Spade and the pipes installed beneath the tree roots.

## PART 4 – TREE PLANTING & STABILIZATION

### 4.1 METHODS

- A. Reducing root ball depth. In the event that the depth of a root ball must be reduced to accommodate planting over duct banks or other infrastructure, the Landscape Architect shall be present to supervise.
- B. Stake trees as necessary with traditional guying methods, but ensure that wires are not used around tree trunks. Provide rubber hosing at wire or use polypropylene webbing. See plans for details.

END OF SECTION

## SECTION 329223

### LANDSCAPE WORK

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION OF WORK:

- A. Work included: Work under this Section includes installation of all trees, shrubs, ground cover, annuals, sod and related work required for completion of the project as shown on the Drawings and specified herein.
  - 1. Included hereunder are the furnishing of all equipment, materials and labor necessary to furnish and/or install soil treatment, sodding, planting and mulching of trees, shrubs and vines, protection, maintenance, guarantee and replacement of plants and all work related to the above as specified.

##### 1.2 QUALITY ASSURANCE:

- A. Contract landscape work to a single firm specializing in landscape work.

##### 1.3 SOURCE QUALITY CONTROL:

- A. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
- B. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Landscape Architect, together with proposal for use of equivalent material.
- C. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

#### PART 2 - PRODUCTS

##### 2.1 TOPSOIL

- A. Topsoil will be placed (spread) and rough graded by the General Contractor.

Utilize any stockpiled topsoil, cleaned and screened, for re-use in Landscape Work. The contractor shall provide additional topsoil as required to complete Landscape Work. Landscape Contractor will be responsible for fine grading of areas to be planted and sodded. Areas to receive sod and/or plantings shall receive 4" minimum topsoil. Topsoil required shall be furnished as follows:

Obtain topsoil only from naturally well-drained sites having similar soil characteristics to that found at Project Site and where topsoil occurs at a depth of not less than 4". Do not obtain from bogs or marshes.

1. Topsoil shall not contain subsoil, debris, lumps or rocks larger than 1" in diameter, or weed seed.
2. Topsoil shall be classified as loam, silt loam, clay loam or any combination thereof. Classifications are as determined by the Bureau of Plant Industry, Soils and Agricultural Engineering USDA Triangular Soil Texture Chart.
3. Topsoil shall contain not less than 3 percent and not more than 10 percent, by weight of organic matter, as determined by weight loss upon ignition of oven-dried samples.

## 2.2 SOIL AMENDMENTS:

- A. The Landscape Contractor shall furnish the Landscape Architect soil analysis and reports as performed by the Agricultural Extension Service or commercial testing laboratory for all area to receive planting. The Landscape Contractor shall incorporate necessary additives in proper quantities as recommended in the soil analysis, or as necessary to bring the soils up to acceptable standards. The Landscape Contractor shall include in his bid and shall pay for all tests required.
- B. Commercial fertilizer shall be complete slow release fertilizer as specified by soil analysis and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free-flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted.
- C. Fertilizer Tablets or Packets. Fertilizer planting tablets or packets shall contain prolonged-release nitrogen, derived from Urea-formaldehyde. Tablets or packets shall be at least a strength of 16-8-5. The amount of available nitrogen, phosphorus or potash may be increased slightly to meet the standard manufactured products available. This fertilizer shall conform to the applicable state fertilizer laws and shall be delivered to the

site in the original unopened containers, each bearing the manufacturer's guaranteed analysis.

- D. Herbicide shall be an approved commercial grade pre-emergent herbicide used in soil preparation. The particular type of herbicide shall be certified safe for the plants specified in the Plant List or for the plants around which the herbicide shall be used.
- E. Lime shall be ground limestone (Dolomite) containing not less than eighty-five (85) percent of total carbonates and shall be ground to a fineness that fifty (50) percent will pass through a 100-mesh sieve and ninety (90) percent will pass through a 20-mesh sieve. Courser material shall be acceptable provided that specified rates of application are increased proportionally on the basis of quantities passing the 100-mesh sieve.
- F. Peat shall be a domestic product consisting of partially decomposed vegetable matter of natural occurrence. It shall be brown, clean, and low in content of mineral and woody materials, mildly acid and granulated or shredded.
- G. Ammonium nitrate shall be a commercially available agricultural chemical and shall be furnished under the manufacturer's guaranteed statement of analysis giving percentage of active ingredients.
- H. Water. The Owner shall supply, at no expense, an adequate supply of water to meet the needs of this Contract. The contractor shall furnish all necessary hose, equipment, attachments and accessories for the adequate irrigation of planted areas as may be required to complete the work as specified.

### 2.3 STAKING:

- A. Material for Staking and Guying:
  - 1. Material for staking and guying must be 2 1/2" x 2 1/2" x 8' long solid oak stake.
  - 2. Wire for fastening trees to stakes shall be No. 10 gauge pliable, galvanized iron. All wires to be placed with brightly colored uniform flagging for easy sighting.
  - 3. Hose to encase wire used for fastening trees to stakes shall be new or used two-ply reinforced rubber garden hose, black or green in color. Only one color shall be used throughout the project.

### 2.4 GRASSING

- A. Sod shall be well-rooted, Cynodon Dactylon 'Tifway 419' hybrid Bermuda sod completely free of noxious weeds and grasses. It shall be mowed to a height not to exceed 2" before lifting and shall be of uniform thickness, with not over 1-1/4" or less than 1" of soil and shall be approved by the Landscape Architect before planting.
- B. Sprigs shall be healthy living stems (stolons or rhizomes) with attached roots, harvested without adhering soil and obtained from approved sources where sod is heavy and thickly matted. The presence of Johnson grass, Nutgrass or other objectionable grasses, weeds, or other detrimental materials will be cause for rejection. Not more than 24 hours shall elapse between harvesting and planting of sprigs, except that when weather or other uncontrollable conditions interrupt the work, a time extension may be granted, providing sprigs are still moist and viable. Sprigs that have heated in stockpiles, become frozen, allowed to become dry or otherwise seriously damaged will be rejected and shall be disposed of as directed by the Landscape Architect.
- C. Grass seed shall be clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide seed mixtures composed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified. Seed shall conform to all State laws and requirements and regulations of the SC Department of Agriculture. The Owner reserves the right to test, reject, or approve all seed.

2.5 MULCH:

- A. Shredded and double hammered Hardwood Mulch shall be fresh, clean, and free from sticks and debris.
- B. Samples of materials as listed below shall be submitted for inspection, on the site or as otherwise determined by the Landscape Architect. Upon approval of samples by the Landscape Architect, delivery of materials may begin.

MATERIALS	SAMPLE
Shredded and Double Hammered Hardwood Mulch	1 Gallon
Plants	1 of each
Sod	1 Roll

Typical samples shall be furnished from each separate source of supply. Approved samples shall be stored on the site and protected until furnishing of materials is complete. Plant samples may be planted in permanent positions, but labeled as samples.



## 2.6 PLANT MATERIALS (See Plant List):

- A. Nomenclature. The names of plants required under this Contract conform to those given in Standardized Plant Names, 1942 Edition, prepared by the American Joint Committee on Horticultural Nomenclature. Names of varieties not included therein conform generally with names accepted in the nursery trade.
- B. Quantities. Provide quantities necessary to complete the planting as shown on the drawings. Contractor must check quantities and differences shall be brought to the attention of the Landscape Architect.
- C. Quality and Size. Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous and free from insect pests, plant diseases and injuries. All plants shall equal or exceed the measurements specified in the Plant List which are minimum acceptable sizes. They shall be measured before pruning with branches in normal position. Any necessary pruning shall be done at the time of planting. Requirements for the measurement, branching, grading, quality, balling and burlapping of plants in the Plant List generally follow or exceed the Code of Standards currently recommended by the American Association of Nurserymen, Inc. in the American Standard for Nursery Stock.
- D. Substitutions will be permitted after Award of Contract only upon submission of proof in writing that a plant is not obtainable and authorization by the Landscape Architect for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics. Should this substitution result in the use of a smaller or less valuable plant, a change order will be issued with an equitable adjustment in contract price.
- E. Type of Protection to Roots:
  - 1. Balled and Burlapped Plants. Plants shall be balled and burlapped unless otherwise noted on the Drawings. They shall be dug with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant and of minimum sizes shown on the Plant List. Balls shall be firmly wrapped with untreated burlap or similar material and bound with twine, cord or wire mesh. Where necessary to prevent breaking or cracking of the ball during the process of planting, the ball may be secured to a platform.
  - 2. Container-grown plants designated in the Plant List shall have been grown in a container such as pots, cans, tubs or boxes and have sufficient roots to hold earth together intact after removal without being root bound. Container size shall be in proportion to

plant size and in accordance with AAN Standards. The Landscape Architect shall have the option to reject container-grown material if the growing media is too porous to hold adequate water for the plant's survival without watering more than once a week.

- F. Protection after Delivery. The balls of plants which cannot be planted immediately upon delivery shall be covered with moist soil or mulch or provided with other protection from drying winds and sun. All plants shall be watered as necessary until planted.

## PART 3 - EXECUTION

### 3.1 PLANTING METHODS:

- A. Time of Planting. Planting operations shall be conducted under favorable weather conditions preferably during the period from October 1 to April 1. The Landscape Contractor has the option and assumes full responsibility for planting during unseasonable conditions. Trees should be dug and heeled in or in container and placed in a well watered holding area provided by the nursery or Landscape Contractor until the time of planting. Landscape Contractor to be responsible for the welfare of the tree until project is completed, when the owner will assume responsibility.
- B. Plants to Remain. The Landscape Contractor shall take all necessary precautions to preserve and protect all existing plants that are to remain on the site. This shall include, but is not limited to, hand excavation of planting pits in close proximity to existing shrubs or within the spread of branches of larger trees, watering of existing materials adjacent to plant pits, trimming or pruning to permit installation of new plants or to repair damaged existing plants.
- C. Obstructions Below Ground or Overhead:
  - 1. It is not contemplated that planting shall be done where the depth of soil over underground construction, obstructions or rock, is insufficient to accommodate the roots or where pockets in rock or impervious soil will require drainage. Where such conditions are encountered in excavation of planting areas and where the stone, boulders or other obstructions cannot be broken and removed by hand methods in the course of digging plant pits of the usual size and where trees to be planted are found to be under overhead wires, other locations for the planting may be designated by the Landscape Architect.
  - 2. Removal of rock or other underground obstruction, relocation of construction and provisions of drainage for planting areas shall be done only as directed by the Landscape Architect.

3. Should the Landscape Contractor encounter unsatisfactory surface or subsurface drainage conditions, soil depth, latent soils, hard pan, steam or other utility lines or any other conditions that will jeopardize the health and vigor of the plantings, he must advise the Landscape Architect in writing of the conditions prior to installing the plants. Otherwise, the Landscape Contractor warrants that the planting areas are suitable for proper growth and development of the plants to be installed.

D. Lawns

1. See Planting Plans for location of areas to be sodded.
2. Fine Grading Areas to be sodded shall be brought to within the thickness of the sod of the finished grade. Allowance for settlement shall be made. Fine grading for all areas will be performed by the Landscape Contractor prior to any planting or sodding.
3. Soil Improvements:
  - a. Ground limestone shall be applied at the rate recommended by the testing laboratory.
  - b. Fertilizer shall be applied at the rate recommended by the testing laboratory.
  - c. Application. Limestone shall be thoroughly mixed into the topsoil and as far ahead of sodding as possible, to prevent interfering with other grading operations.

E. Laying of Sod

1. Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Fertilizer spread shall be raked in. Sod shall be laid so that no voids occur, tamped or rolled and then watered thoroughly. The completed sodded surface shall be true to finished grade, even and firm at all points.
2. Sod on slopes steeper than 2 1/2 to 1 shall be held in place by wooden pins about 1" square and about 6" long, driven through the sod into the soil until they are flush with the top of the sod or by other approved methods for holding the sod in place. Stakes shall be spaced along the center-line of a strip of sod at intervals of approximately 3'.
3. During dry periods, sod must be watered as it is laid.

F. Sprigging

1. Sprigs shall be applied at a rate no less than 17.5 bushels per 1,000 square feet (750 bushels per acre). Sprigging shall not be done during windy weather, or when the ground is excessively wet, frozen, or otherwise unillable. If the soil is not sufficiently moist

when sprigs are being set, water shall be applied until the soil contains sufficient moisture. Sprigs shall be broadcast by hand or by suitable equipment in a uniform layer over the prepared surface with spacing between sprigs not to exceed 8 inches. The sprigs shall then be forced into the soil to a depth of 2 to 3 inches with a disk harrow or other satisfactory tool set to cover the sprigs to the required depth. A portion of the sprig foliage should be left exposed at the soil surface. After the planting of sprigs and prior to compaction, the surface shall be cleared of stone larger than 2-1/2", large clods, roots, and other litter brought to the surface during sprigging. The sprigged areas shall be compacted within 24 hours from the time sprigging has been completed, weather and soil conditions permitting, by cultipackers, rollers, or other suitable equipment. Compaction shall not be done when the soil is in such condition that it is being picked up by the equipment, nor shall clay soils be compacted. Ensure adequate moisture to all sprigged areas during initial establishment period. A second application of fertilizer shall be applied after plants have become established, applied in a dry form as directed by soil testing results.

2. Acceptance. Sprigged areas shall achieve a 90% rate of coverage after 8 weeks, and 100% coverage at the end of the growing season. Coverage will be determined on a square yard basis.

#### G. Seeding

1. Areas to be seeded shall be uniform and shall conform to the finished grade as shown on the plans. The seedbed shall be loosened to a minimum depth of 3 inches before agricultural lime, fertilizer or seed is applied. Areas to be seeded shall be cleared of stones larger than 2.5 inches in any dimension, roots and other debris. At areas to be grassed where the existing seed bed has little or no topsoil, the Contractor shall furnish and place topsoil in order to ensure a good stand of grass.
2. Lime and/or fertilizer shall be spread uniformly over the designated areas and shall be thoroughly mixed with the soil to a depth of 2 inches. Lime and fertilizer shall be applied at the rate specified by the soil test report. Lime and fertilizer may be applied by approved mechanical spreaders or by hydraulic methods as a mix of fertilizer and seed.
3. Within 24 hours following the covering of the seed, straw or hay mulch material shall be spread at the rate of 2 tons per acre. Mulch shall be held in place by an approved tacking agent applied at the manufacturer's recommended rate. Hydroseeding may be performed using 1500 pounds per acre wood, cellulose, or a wood/cellulose mix hydroseeding mulch with the manufacturer's recommended rate of an approved tacking agent.

4. The Contractor shall obtain a satisfactory stand of perennial vegetation whose root system shall be developed sufficiently to survive dry periods and winter weather, and be capable of re-establishment in the spring. The perennial vegetative cover shall have a minimum coverage density of 70% for the seeded areas.

H. New Plantings:

1. Layout. New planting shall be located where shown on the Drawings except where obstructions below ground or overhead are encountered or where changes have been made in the construction. Necessary adjustments shall be made only after approval by the Landscape Architect. No planting, with the exception of ground cover, espalier plants and hedge, shall be placed closer than 2' to pavement or structures. The Landscape Contractor shall be responsible for staking and layout of plantings on this project. The Landscape Architect shall be advised when stakes are in place and ready for inspection on various planting areas. All layout work shall be inspected and approved by the Landscape Architect prior to opening any plant pits.
2. Planting Pits. Reasonable care shall be exercised to have pits dug and soil prepared prior to moving plants to their respective locations for planting to insure that they will not be unnecessarily exposed to drying elements or to physical damage. However, no open holes shall be left overnight or unmarked or unattended.
  - a. Circular pits with vertical sides shall be excavated for all plants in beds or trenches. See Planting Plan for more detailed information regarding preparation of planting areas. Diameter of pits for trees and shrubs shall be at least 2' greater than the diameter of the ball or spread of roots. The depth of pits for trees, shrubs and vines shall be enough to accommodate the ball or roots when the plant is set to finished grade allowing for 6" of compacted topsoil or prepared soil in the bottom of the pit.
  - b. Before planting any area, fill a representative sample of the excavated planting pits and beds with water to a depth 6" or more as required to verify if the subsoil is permeable enough to percolate satisfactorily and drain adequately after plants are installed. Advise the Landscape Architect in writing if any problems are anticipated regarding excessive ground water or unsuitable percolation.

I. Soil Preparation for Planting Trees and Shrubs:

1. Soil used in planting shall be existing soil and/or re-spread topsoil. The prepared soil mix in tree pits as herein before specified shall

be thoroughly mixed with one part compost to three parts of existing soil.

2. Fertilizer tablets or packets shall be placed in each tree or shrub plant pit at a depth of 6" to 8" when the plant is set in place. The exact quantity and distribution of tablets or packets shall be in strict accordance with the manufacturer's recommendation for the sizes of material specified.
3. Excess excavated soil shall be disposed of off site by the Landscape Contractor unless specific permission is obtained from the owner to dispose of excess material on the site.

J. Soil Preparation for Planting Ground Cover and Annuals:

1. Loosen subgrade of lawn areas to a minimum depth of 6". Remove stones over 1 1/2" in any dimension, sticks, roots, rubbish, and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
2. Soil used in planting shall be existing soil as herein before specified and shall be thoroughly mixed with one part compost to three parts of existing soil.
3. Add specified soil amendments as per soil analysis and mix thoroughly into upper 4" of topsoil.
4. Excess excavated soil shall be disposed of off site by the Landscape Contractor unless specific permission is obtained from the Owner to dispose of excess material on the site.

K. Setting Plants. Unless otherwise specified, all plants shall be planted in pits, centered and set on 6" of compacted soil or prepared soil to such a depth that the finished grade level at the plant after settlement will be the same as that at which the plant was grown. Prior to setting container-grown plants, make four to five cuts 1/2" - 1" deep, top to bottom on root-bound mass to loosen roots. Plants shall be planted upright and faced to give the best appearance or relationship to adjacent structures. No burlap shall be pulled out from under balls. Plant forms, wires and surplus binding from top and sides of the balls shall be removed. All broken or frayed roots shall be cut off cleanly. Prepared soil shall be placed and compacted carefully to avoid injury to roots and to fill all voids. When the hole is nearly filled, add water as necessary and allow it to soak away. Fill the holes to finished grade. After the ground settles, additional soil shall be filled in, to the level of the finished grade.

L. Guying and Staking. Trees shall be supported immediately after planting. All trees shall be staked as detailed and shown on the Plans. Wires shall be encased in hose to prevent direct contact with the bark of the tree and shall be placed around the trunk in a single loop. Wires shall be tightened and kept taut by the use of turnbuckles. Stakes shall be equally

spaced about each tree and shall be driven vertically into the ground to a depth of about 2' in such a manner as not to injure the ball or roots. Trees shall be fastened to each stake at a height where substantial branching will hold encased wire in place. Wire shall be doubled and twisted taut. Stakes shall be uniform in length and placed according to the type, size and location of the tree.

- M. **Herbicide Treatment.** All tree saucers, shrub and ground cover beds shall be treated after plants have been installed with an approved pre-emergent herbicide recommended by the manufacturer. Plants installed during the fall planting season shall be treated with the approved herbicide during the first week of April of the following year. Plants installed in the spring shall be treated with the approved herbicide immediately after installation. Herbicide shall be cleared by the manufacturer as safe for use around plants itemized in the Plant List.
- N. **Shredded Hardwood Mulching.** Tree and shrub beds shall be mulched with 2" of shredded hardwood mulch. This mulch shall cover the entire bed area and shall have a neat and well-defined edge between lawn area and shrub bed. Trees in lawn areas with individual saucers shall be mulched with 2" of shredded hardwood mulch.
- O. **Pruning and Repair.** All pruning and repair work must be completed within a ten day period after planting. The amount of pruning included under the work of this Section shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations.
  - 1. Trees and some shrubs will be pruned back after planting to maintain a balance between the reduced root system and the branches. Care will be taken in this work to insure that the plants preserve their natural form.
  - 2. The natural form of newly planted trees and shrubs will be preserved in pruning by the removal of branches and/or part of branches at different lengths in accord with standard horticulture practices and as directed by the Landscape Architect. Pruning will always be done with a clean cut in living wood without bruising or tearing of bark and without leaving any stubs which would prevent the wound from healing over. Horizontal cuts may cause rot and will be avoided.

### 3.2 CLEAN-UP:

- A. **Clean-up.** Any soil, bark, peat or similar material which has been brought onto paved areas within or outside the construction area by hauling operations or otherwise shall be removed promptly, keeping these areas clean

at all times. Upon completion of the planting, all excess soil, stones and debris which have not been cleaned up shall be removed from the site or disposed of as directed by the Landscape Architect. All planting areas shall be prepared for final inspection.

- B. Other Work. The Landscape Contractor shall be responsible for the repair of any damage caused by his activities or those of his subcontractors within or outside the construction area such as the storage of topsoil or other materials, operation of equipment and other usage. Such repair operations shall include any regrading, sodding or other work necessary to restore damaged work or areas to an acceptable condition.

### 3.3 MAINTENANCE:

- A. Maintenance shall begin immediately following the last operation of installation for each portion for each plant and shall continue until installation of planting is complete and the planting is formally accepted. Maintenance shall include mowing, watering, weeding, cultivating, mulching, tightening and repairing of guys, removal of dead material, resetting plants to proper grades or upright positions, restoration of the planting saucer and other necessary operations. Any damage resulting from planting operations shall be repaired promptly.
- B. The Owner shall be responsible for all required maintenance after the planting is formally accepted (final acceptance).
- C. Maintenance Instructions - Landscape Work. The Landscape Contractor shall submit to the Owner three (3) copies of typewritten instructions recommending the monthly procedures to be established by Owner for the maintenance of landscape work during the one-year guarantee period. Submit prior to the final inspection for acceptance.

### 3.4 INSPECTION FOR ACCEPTANCE:

- A. Inspection of the work of this Section to determine completion of the Landscape Contractor's work, exclusive of the possible guarantee replacement of plants, shall be made by the Landscape Architect upon receipt of written notice requesting such inspection submitted by the Landscape Contractor at least ten (10) days prior to the anticipated date of inspection.
- B. Acceptance. After inspection, the Landscape Contractor will be notified in writing by the Landscape Architect of acceptance of all work of this Section, exclusive of the possible replacement of plants subject to guarantee or the Landscape Contractor will be notified in writing if there are any deficiencies from the requirements for completion of the work. Replace-



ments, maintenance and repair work remaining to be done shall be subject to re-inspection before acceptance.

### 3.5 PLANT GUARANTEE AND REPLACEMENT:

- A. Guarantee. This guarantee shall be provided to the owner by the contractor responsible for planting and irrigation. Plants shall be guaranteed for the duration of one (1) full year after the formal acceptance of the planting by the Owner and shall be alive and in satisfactory growth at the end of the guarantee period. The Owner shall be responsible for all maintenance necessary to keep the plants alive and healthy between the time the plantings are accepted and the end of the guarantee period. The basic needs of the plants during this period are for adequate water and protection from insects and other similar pests. Plants severely damaged by vandals are not subject to replacement by this Landscape Contractor.
- B. Sodded lawn areas are not subject to a one year guarantee.
- C. Should the Landscape Contractor find the plant material is not receiving the proper maintenance at any time prior to the end of the guarantee period, he should advise the Landscape Architect and the Owner immediately in writing so corrective measures may be initiated.
- D. Replacement. At the end of the guarantee period, inspection will be made by the Owner and the Landscape Architect upon written notice requesting such inspection submitted by the Landscape Contractor at least ten (10) days prior to the anticipated date. Any plant installed under this Contract that is dead or not satisfactory in growth as determined by the Landscape Architect shall be removed from the site. These, and any plants missing due to the Landscape Contractor's negligence, shall be replaced as soon as conditions permit but during the normal planting season.
  - 1. Any plant that has die-back or otherwise loses 30% or more of its branches, excluding branches removed by trimming and pruning, as existing and living prior to removal from the nursery field shall be rejected. In case of any question, the Landscape Contractor may elect to allow such plant to remain through another complete growing season at which time the rejected plant, if found to be dead or in an unhealthy or badly impaired condition, shall be replaced.
  - 2. The Landscape Contractor shall be responsible for removing dead or diseased plants from the site during the guarantee period upon notification by the Owner or Landscape Architect. Dead plants may be removed by the Owner during the guarantee period provided they keep a photographic record of all plants removed. Pho-

tographs should show plant to such a degree that is clearly evident the plant is dead. Replacements shall be made only at the end of the guarantee period as described herein.

3. The Landscape Architect shall inspect replaced plants when all replacements have been made. Any plant that is not alive and in a healthy vigorous condition shall be replaced again by the Landscape Contractor.
- E. Materials and Operations. All replacements shall be plants of the same kind and size as specified in the Plant List. They shall be furnished and planted as specified under "New Planting", the cost of which shall be borne by the Landscape Contractor.
  - F. Replaced plants are not subject to a full one (1) year guarantee, but replacements must be alive and vigorous when inspected after planting and must leaf out fully in spring, if replacements are made while the plant is dormant.

END OF SECTION

## SECTION 329643 TRANSPLANTING TREES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes removal and placement of existing trees, as shown on the drawing and as specified herein.
- B. Trees shall be moved in early Spring or late Fall when deciduous trees are leaf less.

#### 1.2 QUALITY ASSURANCE

- A. All transplanting work shall be performed by one (1) contractor, with proven experience in the field.

#### 1.3 PROJECT REQUIREMENTS

- A. Transplant trees when weather and soil are suitable in accordance with locally accepted practice.

### PART 2 - PRODUCTS

- A. Pre-selected existing trees.
- B. Guying and staking material.
  - 1. Stakes - Construction grade cedar-2-inch square by eight (8) feet.
  - 2. Guying Wires - Annealed, galvanized iron or steel 10 gauge wire.
  - 3. Hose - New two (2) ply reinforced rubber, 3/4 inch diameter.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Stake out plant placement in the field for approval by engineer or landscape architect.
- B. Dig plant hole of appropriate size for each tree ball.
- C. Each plant shall be treated with an anti-desiccant prior to removal.
- D. Spade existing tree out at the proportion of one (1) foot diameter ball size for every one (1) inch tree trunk diameter.
- E. The plants shall be dug and immediately replanted in the new plant pits without removing plants from machine.
- F. Gently insert tree ball in predug hole after sides of hole are loosened.

### 3.2 STAKING

- A. Place stakes at the outer edge of the ball in line with the prevailing winds at a 10° angle to the tree.

END OF SECTION

## SECTION 330500 COMMON WORK RESULT FOR UTILITIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section includes the installation of buried piping.

#### 1.2 REFERENCES

- A. American Society of Testing and Materials (ASTM).
- B. American National Standards Institute (ANSI).
- C. American Water Works Association (AWWA).
- D. Uni-Bell Plastic Pipe Association.

#### 1.3 SUBMITTALS

- A. Submit for approval a schedule for all proposed testing. Include proposed testing procedures indicating the sequence in which pipe sections will be tested and description of methods and equipment to be used.
- B. Field Test Reports: Submit results of field testing directly to Engineer with copy to Contractor

#### 1.4 STORAGE, AND HANDLING

- A. Deliver and store materials within the Contract limits, as approved by Engineer.
- B. Handle materials carefully with approved handling devices in accordance with manufacturer's recommendations. Special care shall be exercised during delivery and storage to avoid damage to the materials.
- C. Do not drop or roll products off trucks. Products are not to be otherwise dragged, rolled, or skidded.
- D. Materials shall be stored on heavy wood blocking or platforms in accordance with the manufacturer's instructions and recommendations. Materials shall not be in contact with the ground and their interiors shall be maintained free from dirt and other foreign matter.
- E. Products cracked, gouged, chipped, dented, or otherwise damaged will not be approved and are to be removed and replaced at the Contractor's expense, unless the product can be repaired in a manner acceptable to the manufacturer and the Engineer. All repairs shall be at the Contractor's expense.

#### 1.5 COORDINATION

- A. Contractor shall be responsible for coordinating site utility work with other trades to ensure building service connection locations are verified and coordinated prior to commencing site installation.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Conform to individual pipe specification(s).
- B. Pipe transition fittings: Shall be as indicated on the drawings. If not specifically indicated selection shall be based on pressure requirements of the system and types of materials being joined. Product selection shall be approved by the engineer.
- C. Grout
  - 1. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
    - a. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
    - b. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
    - c. Packaging: Premixed and factory packaged.
- D. Flowable Fill
  - 1. Description: Low-strength-concrete, flowable-slurry mix.
    - a. Cement: ASTM C 150, Type I, portland.
    - b. Density: 115- to 145-lb/cu. ft. (1840- to 2325-kg/cu. m)
    - c. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
    - d. Aggregates: ASTM C 33, natural sand, fine.
    - e. Admixture: ASTM C 618, fly-ash mineral.
    - f. Water: Comply with ASTM C 94/C 94M.
    - g. Strength: 100 to 200 psig (690 to 1380 kPa) at 28 days.

## PART 3 - EXECUTION

### 3.1 UTILITY DEMOLITION

- A. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
  - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
  - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

## 3.2 BURIED PIPE INSTALLATION

### A. General:

1. Installation of all pipe, fittings, valves, specials and appurtenances shall be subject to the review and/or approval of the Engineer.
2. Install piping valves and fittings as shown, specified and as recommended by the manufacturer and in conformance with referenced standards, and approved Shop Drawings.
3. Request instructions from Engineer before proceeding if there is a conflict between the manufacturer's recommendations and the Drawings or Specifications.
4. All piping and appurtenances shall be inspected by the Engineer prior to installation. Engineer's inspection will not relieve Contractor or manufacturer from responsibility for damaged products.
5. Present all conflicts between piping systems and equipment, structures or facilities to Engineer for determination of corrective measures before proceeding.
6. Take field measurements prior to installation to ensure proper fitting of Work. Uncover the existing pipelines sufficiently in advance of the proposed Work in order that the type and location of the existing pipes and joints and other information required to fabricate the proposed piping can be determined. Obtain whatever information is required to complete the connections of the proposed pipelines to the existing pipelines.
7. Carefully examine all piping for cracks, damage or other defects before installation. Immediately remove defective materials from the site, unless the defective materials can be repaired in a manner acceptable to the manufacturer and Engineer. Remove, replace or repair at the Contractor's expense piping found to be broken or defective.
8. Inspect interior of all piping and mating surfaces and remove all dirt, gravel, sand, debris or other foreign material before installation. Maintain the interior of all piping clean until acceptance of the completed Work. Prevent foreign matter from entering joint space.
9. Install buried piping accurately to line and grade shown, specified or directed, unless otherwise approved by the Engineer. Use accurate means of determining and checking the alignment and grade subject to the approval of the Engineer. Remove and relay piping that is incorrectly installed at Contractor's expense.
10. Do not lay piping in water, unless approved by the Engineer. Ensure that the water level in the trench is at least 6 inches below the bottom of piping. Maintain a dry trench until jointing and backfilling are complete, unless otherwise specified in these Specifications or approved by the Engineer.
11. Pipe laying work shall be conducted so that trenching operations are not advanced too far ahead of the pipe laying operation resulting in excessive lengths of open trench. In general, open trench ahead of pipe laying shall not exceed 50 feet.
12. Start laying piping at lowest point and proceed toward the higher elevations, unless otherwise approved by the Engineer. Slope piping uniformly between elevations shown on the Drawings or as otherwise provided by the Engineer.
13. Where pipe crossings occur, the lower pipe shall be laid first and all backfill thoroughly compacted to the level of the higher pipe before the higher pipe is installed. Backfill

material under such conditions may be earth, broken stone, or 2500 psi concrete.

14. Install piping so that the barrel of the piping and not the joints receives the bearing pressure from the trench bottom, or other bedding condition.
15. No piping shall be brought into position until the preceding length, valve, fitting, or special has been bedded and secured in place.
16. Whenever pipe laying is not actively in progress, the open ends of the piping shall be closed by a temporary plug or cap to prevent soil, water and other foreign matter from entering the piping.
17. Where required for inserting valves, fittings, special appurtenances, and closures, shall be made with a machine specially designed for cutting piping and in accordance with the manufacturer's instructions for field cutting of pipe. Make cuts carefully, without damage to piping, so as to leave a smooth end at right angles to the axis of the piping. Taper cut ends and file off sharp edges until smooth. Flame cutting will not be permitted. Replace and repair damaged piping.
18. Blocking under piping will not be permitted unless specifically approved by Engineer for special conditions.
19. Touch up protective and linings and coatings prior to installation.
20. Rotate piping to place outlets in proper position.

B. Bedding and Backfilling:

1. Bedded and installed piping in conformance with Section "Trenching and Backfilling" and as shown, except as otherwise specified.
2. No piping shall be laid until Engineer approves the bedding condition.
3. Excavation in excess of that required as shown on the Drawings or specified, which is not authorized by the Engineer, shall be at the Contractor's expense. Backfilling and compaction of the overexcavated areas shall be at the Contractor's expense.
4. Carefully and thoroughly compact all pipe bedding and fill up to the pipe centerline with hand-held pneumatic compactors.

C. Restraints, Supports, and Thrust Blocks:

1. Install restrained joints as shown, specified, required, and as recommended by manufacturer. Assembly of restrained joints shall be in strict accordance with manufacturer's recommendations.
2. Provide concrete and metal cradles, collars, and blocks as shown on the Drawings or otherwise required by Engineer.
3. Thrust Blocks:
  - a. Provide concrete thrust blocking to resist test pressure on all plugs, caps, tees, bends and other fittings in pressure piping systems unless otherwise shown on the Drawings.



- b. Conform to the details for concrete thrust blocks and tie rods.
    - c. Concrete: 3000 psi, placed around the fittings to completely fill the space between the fittings and the undisturbed walls of the trench. Do not overlap any joint with concrete and place concrete so as not to interfere with removing or installing any of the jointing hardware.
  - 4. Retainer Glands (for water distribution [and sewer forcemain] piping):
    - a. Provide retainer glands for joint restraint of all fittings and valves.
    - b. Retainer glands shall be Megalug Series 1100 as manufactured by EBAA or approved equal.
- D. Transitions From One Type of Pipe to Another:
  - 1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- E. Work Affecting Existing Piping:
  - 1. Location of Existing Piping:
    - a. Locations of existing piping shown shall be considered approximate. Contractor shall perform all necessary subsurface investigation to verify actual locations in the field.
    - b. Determine exact location of existing piping to make connections, relocate, replace or which may be disturbed during earth moving operations, or which may be affected by work in any way.
    - c. Coordinate all excavations with utility companies, Owner and Engineer.
  - 2. Taking Existing Pipelines Out of Service:
    - a. Do not take pipelines out of service unless specifically approved by Engineer.
    - b. Notify Engineer at least 48 hours prior to taking any pipeline out of service.

### 3.3 SPECIFIC PIPE INSTALLATION

- A. Polyvinyl Chloride Pipe (PVC):
  - 1. Gravity Sewers: Install all PVC piping in accordance with ASTM D234 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications".
  - 2. Water Distribution/Pressure Sewers: Install all PVC pipe in accordance with AWWA Standard C605 "Underground Installation of PVC Pressure Pipe and Fittings for Water".
  - 3. Lay pipe with bell and spigot joints with bells upstream.
  - 4. Completely clean all jointing surfaces and adjacent areas prior to making joint.
  - 5. Field cut pipe for shorter than standard pipe lengths. Cut ends square and perpendicular to

the pipe axis. Remove and smoothly bevel ends. Field spigots shall be stop marked with a felt tip mark or wax crayon for proper length of assembly insertion. The angle and depth of field bevels, and lengths to stop marks, shall be comparable in quality to factory made spigots.

6. Assemble all joints in accordance with recommendations of the manufacturer. If a lubricant is required to facilitate assembly it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure.
7. Rotate the spigot by hand or with a strap wrench to verify proper jointing. If unusual joining resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, reclean the joint components and repeat the assembly steps.
8. Use a bar and wood blocking to properly seat pipe joints. **DO NOT USE BACKHOE BUCKET, OR SIMILAR MACHINERY, TO FORCE JOINT ASSEMBLY.**

B. High Density Polyethylene Pressure Pipe (HDPE):

1. Install HDPE in accordance with ASTM D-2774 “Standard Practice for Underground Installation of Thermoplastic Pressure Pipe”.
2. Install HDPE Water Piping in accordance with ASTM F-645 “Standard Guide for Selection Design and Installation of Thermoplastic Water – Pressure Piping Systems”.
3. All joints shall be butt fusion welded in accordance with ASTM F-2620 “Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings”, and the manufacturer’s recommendations. Guarantee the integrity of all fused joints for one year.
4. HDPE pipe can be jointed at ground level and lowered into the trench. Precautions shall be taken not to drop the pipe or to “kink” the pipe due to exceeding the minimum acceptable bending radius. Replace damaged pipe.
5. When pulling HDPE pipe is necessary, either a pulling head or a suitable wraparound sleeve with rubber protective cover shall be used to prevent the pulling cables from damaging the pipe.
6. Do not install HDPE piping above grade or within buildings.

C. High Density Polyethylene Gravity Piping (HDPE):

1. Install in accordance with the pipe manufacturer’s specifications
2. Completely clean all jointing surfaces and adjacent areas prior to making joints.
3. Field cut pipe for shorter than standard pipe lengths. Cut ends square and perpendicular to the pipe axis. Remove and smoothly bevel ends.
4. Assemble all joints in accordance with recommendations of the manufacturer. If a lubricant is required to facilitate assembly, it shall have not detrimental affect on the gasket or on the pipe when subjected to prolonged exposure.

### 3.4 FIELD QUALITY CONTROL

A. General:

1. Notify Engineer at least 48 hours in advance of all testing.
  2. Provide all testing apparatus including pumps, hoses, gauges, fittings, temporary bulkheads, plugs, compressors and miscellaneous other required items.
  3. Provide temporary blocking and bracing or approved thrust and joint restraint to prevent joint separation and pipe movement during testing.
  4. Unless otherwise approved, conduct all tests in the presence of the Engineer and in the presence of local authorities having jurisdiction.
  5. Water Source:
    - a. Provide all water for testing, flushing and other water uses. The source of the water shall be subject to the approval of the Engineer.
    - b. The point of introduction of water for conducting tests shall be subject to the approval of the Engineer.
  6. All costs for tests shall be included in the Contractor's bid.
  7. Locate, and repair or replace, section of piping which fail the test and retest until acceptance.
- B. Required Tests for Waterlines and Force Mains:
1. Perform the following after the pipe has been installed and prior to final acceptance:
    - a. Pressure Test.
    - b. Leakage Test.
  2. Presumptive hydrostatic tests may be performed when the system is partially backfilled to "check" the work, but final acceptance shall be based on hydrostatic tests performed on the finished system after it is completely backfilled.
  3. Pressure Test:
    - a. Test piping to 1.5 times the pipe working pressure, or 150 psi, whichever is greater. Measure test pressures at the lowest point in the pipe section and correct to the elevation of the gauge.
    - b. Relieve trapped air at the section high points through hydrants, or taps installed for this purpose, provided temporary installations are removed and plugged after acceptance.
    - c. Maintain the test pressure for a period of two (2) hours. At the end of the test period, if the test pressure remains constant, the pipe section shall have passed the test. If the pressure has dropped, it shall be brought back to the test pressure by pumping a known volume of water (by pumping from a graduated container or by metering) back into the pipe. The volume of water thus used, representing leakage from the pipe, shall be recorded. If the leakage is less than the allowable leakage specified below, the pipe shall have passed the test. If the leakage exceeds the allowable leakage specified, the Contractor shall locate the leak, permanently repair the section of pipe where the leak is occurring to the satisfaction of the Engineer, and retest the pipe as specified above.

4. Leakage Test:
  - a. Conduct the leakage test concurrently with the pressure test.
  - b. The maximum allowed leakage is determined by the following formula:

$$L = \frac{N \times D \times P^{1/2}}{7400}$$

where L = allowable leakage, in gph  
where N = No. of joints in test section  
where D = nominal pipe diameter, in inches  
where P = average test pressure, in psig

5. Acceptance shall be determined on the basis of allowable leakage. If any pipe section discloses leakage greater than that specified, locate, repair and retest until the leakage is within the limits specified.
6. Make all visible leaks tight regardless of the amount of leakage, and if the lines do not meet the above leakage test, repair and retest as necessary until the leakage requirement is met. Repair or replace all defective work.

C. Disinfection of Potable Water Mains

1. Disinfect all potable water mains in accordance with the latest version of AWWA C651, except that the placement of chlorine powder or tablets inside the pipe during installation shall not be allowed. Disinfect water mains after the piping has passed the pressure and leakage testing.
2. Flush the pipe with water at a minimum velocity of 2.5 feet per second (fps) to clear all foreign material from the pipe.
3. Apply a chlorine solution with a concentration between 50 parts per million (ppm) and 100 ppm. The chlorine solution shall remain in the piping for a minimum of 24 hours. The concentration at the end of this period shall be at least 25 ppm in all sections of the main. Repeat the entire procedure if the residual is less than 25 ppm.
  - a. While the chlorinated water is being added, all appurtenances (valves, hydrants, etc.) shall be operated so as to completely disinfect the new work.
  - b. Position valves so that the chlorine solution in the section being disinfected will not flow into water mains in active service.
  - c. Chlorine residual samples shall be taken as directed by the Engineer.
4. After the twenty four (24) hour retention period, flush the main until residual testing indicates that the chlorine concentration is approximately that of the neighboring service area.
  - a. Dispose of heavily chlorinated water into sanitary sewer or tank truck.
  - b. The Owner and the owner of the sanitary sewer system shall be notified a minimum of twenty-four (24) hours prior to the discharge of any water to the sanitary sewer. Contractor shall submit to the Engineer written confirmation that the owner of sanitary sewer system has approved the discharge of water to its sanitary sewer.

- c. Under no circumstances will the emptying of water onto roadways, or into ditches, culverts, streams or wetlands be allowed.
5. After disinfection and final flushing, and prior to placing the lines in service, the Contractor shall collect bacteriological samples (both coliform and heterotrophic plate count) and submit samples to an approved testing laboratory. Two consecutive sets of samples shall be taken at least 24 hours apart in accordance with AWWA C651. The collection points shall be as directed by the Engineer and local authority having jurisdiction.
- a. The testing laboratory performing the bacteriological analysis shall be acceptable to the Engineer.
  - b. Submit three (3) copies of the laboratory analysis to the Engineer.
- a. Should safe results not occur after laboratory tests, the Contractor shall, at his expense, repeat the disinfection procedure until safe results are obtained. This includes a positive result for coliform or a measured heterotrophic plate count of greater than 500 colony-forming units per ML.
- b. Contractor shall pay for all testing required.
6. All precaution shall be taken to maintain dry and sanitary conditions and prevent contamination of any piping. If, in the opinion of the Engineer, contamination has occurred, the Contractor shall repeat the disinfection procedure and testing at his cost and expense.

D. Required Tests For Storm Sewers

- 1. Perform the following tests after the storm drainage pipe has been installed and prior to final acceptance:
  - a. Alignment Test, for all pipe
- 2. Based upon visual observations, the Engineer may order additional testing, including the following:
  - (1) Television Inspection, if required by the Engineer.
  - (2) Deflection Test, if required by the Engineer
- 3. Perform tests prior to placement of pavement, or other construction which may, in the opinion of the Engineer, be detrimentally effected by excavation required for repairs.
- 4. Submit details prior to making tests of proposed testing procedures with a description of methods and equipment to the Engineer for approval.
- 5. Alignment Test:
  - a. All storm drainage pipe will be subject to a visual inspection in order to identify proper alignment, grade and excessive deflection.
  - b. The Engineer may choose to perform an alignment test using the hand-lamp method, in which case the full diameter of the pipe shall be visible when viewed between consecutive structures.

6. Television Inspection:

- a. The Engineer will notify the Contractor in writing which completed sewers shall be inspected by closed-circuit television.
- b. The Contractor shall commence the television inspection within 15 days of the Engineer's written notification. The Contractor shall notify the Engineer at least 5 days prior to commencement of television inspection.
- c. No television inspection shall be performed without the Engineer or his representative present to witness the inspection.
- d. The Contractor shall provide the Engineer with three (3) copies of a report of the televising inspection of each section of completed sewer inspected. Show the exact location and extent of all cracks, loose joints, holes, vertical and horizontal, misalignment, faulty service connections, caved-in pipe, points of infiltration, obstructions, debris and all else detrimental to the proper functioning and service of the completed sewer. The Contractor shall provide the actual television inspection video with the report showing all the above conditions found, at all wyes, tees and laterals and as directed by the Engineer.
- e. The Engineer will review the report and will instruct the Contractor, to repair any conditions which, in the opinion of the Engineer, are detrimental to the proper function and service of the storm pipe.

7. Deflection Test:

- a. The Engineer will notify the Contractor in writing which completed sewers shall be tested by the deflection method.
- b. The Contractor shall commence the deflection test within 15 days of the Engineer's written notification. The Contractor shall notify the Engineer at least 5 days prior to commencement of television inspection.
- c. No Deflection testing shall be performed without the Engineer or his representative present to witness the test.
- d. The deflection test shall be performed on flexible drainage pipe with a "go/no-go" mandrel with a diameter equal to 95% of the inside diameter of the pipe being tested.
- e. The maximum pipe deflection shall be 5%.
- f. The Engineer will review the Deflection Test results and will instruct the Contractor, to repair any conditions which, in the opinion of the Engineer, are detrimental to the proper function and service of the storm pipe.

8. Visual Inspection: Prior to final acceptance, a visual inspection of all appurtenance structures, i.e. manholes, chambers, etc., will be required. Repair visual leaks, regardless of their magnitude.

END OF SECTION

## SECTION 330513 MANHOLES AND STRUCTURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section includes the following:
  - 1. Installation of manholes, catchbasins, precast concrete structures, frames, grates, covers, and piping connections as shown on the Drawings and as specified herein.
  - 2. Alteration of existing structures as shown on the Drawings and as specified herein.

#### 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. American Society of Testing and Materials (ASTM)
  - 2. American National Standards Institute (ANSI)
  - 3. Occupational Health and Safety Administration (OSHA)

#### 1.3 SUBMITTALS

- A. Shop Drawings: Submit the following for approval:
  - 1. Design and construction details of all precast concrete units.
  - 2. Fabrication, assembly and installation details for all castings and miscellaneous metal works.
- B. Product Data:
  - 1. Manufacturer's catalog cuts, specifications, and installation instructions.

#### 1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the site to prevent interruption of the Work.
- B. All materials shall be inspected by the Contractor upon delivery to the site. The Contractor shall notify the Engineer of any loss or damages. Replace loss or repair damage to new condition at the Contractor's expense.
- C. Store materials to allow easy access for inspection and identification.

### PART 2 - PRODUCTS

#### 2.1 DESIGN REQUIREMENTS

- A. Design: In accordance with ASTM C890 – Minimal Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- B. Loading: AASHTO HS20 with 30% impact and 130lb/cu-ft equivalent soil pressure.

## 2.2 PRECAST CONCRETE DRAINAGE STRUCTURES

- A. Drainage manholes shall conform to Section "Manholes."
- B. Catch basins with greater than 6 feet sidewall depth shall conform to Section "Manholes."
- C. Catch basins with less than or equal 6 feet sidewall depth shall be 2'-6" X 2'-6" square I.D. precast concrete catch basin units.
- D. Precast catch basin units shall conform to the dimensions shown on the Drawings and as detailed in Shop Drawings approved by the Engineer.
- E. Unless otherwise specified precast concrete units shall conform to ASTM C-478.
- F. A precast concrete slab, as necessary for proper frame and grate placement, shall be provided at the top of the catch basin unit. The slab shall be designed for an H-20.

## 2.3 PRECAST CONCRETE MANHOLES

- A. Precast manhole units shall conform to the dimensions shown on the Drawings and as detailed in Shop Drawings approved by the Engineer.
- B. Unless otherwise specified, manhole sections shall conform to ASTM C478.
- C. Precast structure bases shall be of the "base unit" type, with an integral base and barrel section. The barrels shall be constructed in increments of one (1) foot to provide the indicated height with the fewest joints. Openings for pipe connections will not be permitted closer than one (1) foot to the nearest joint. Mark the date of manufacture and name or trademark of manufacturer in the inside of each section.
- D. Manholes barrels, servicing pipes less than 27 inch diameter, shall be 48 inch diameter. Manholes barrels, servicing pipes 27 inch diameter and larger shall be 60 inch diameter. Larger diameter manholes barrels shall be provided as indicated on the Drawings or as specified herein.
- E. Joints shall be rubber and concrete using O-ring gaskets (ASTM C443) or butyl rubber gaskets (ASTM C443), or tongue and groove buttered with 1:2 cement mortar (ASTM C270, Type M).
- F. A precast eccentric cone, or precast slab where shown, shall be provided at the top of the manhole barrel to receive the frame and cover. The slab or cover shall be designed for an H-20 loading.

## 2.4 MANHOLE STEPS

- A. Manhole sections shall contain manhole steps at twelve (12) inches on center for all structures over 3 feet 6 inches in height. The steps shall be embedded in the concrete and accurately positioned both vertically and horizontally.
- B. Steps shall be capable of withstanding a 300-pound concentrated live load without permanent distortion, conforming to the requirements of ANSI A14.3, OSHA, and the details shown on the Drawings.
- C. Manhole rungs shall be steel reinforced copolymer polypropylene plastic. Rungs shall be 14 in. wide, M.A. Industries type PS2-PF, or equal. Copolymer polypropylene shall be type II, grade 16906 meeting ASTM Specification D4101. Steel reinforcing shall be 3/8 in. diameter, grade 60 conforming to ASTM Specification A615 and shall be continuous throughout the rung. The portion of the legs to be embedded in the precast section shall have fins and be tapered to insure a secure bond.



## 2.5 FRAMES AND COVERS/GRATES

- A. Frames and covers/grates shall be cast iron, ASTM A48, Class 30, free from flaws or unsightly defects.
- B. Frames and covers shall conform to the details on the Drawings and have "STORM SEWER" cast on every cover.
- C. Frames and covers/grates shall be designed for an H-20 loading, and be machined to ensure correct fit and even bearing.
- D. Frames and covers/grates: shall be as shown on the on the drawings. Otherwise, conform to the standard detail of the regulatory authorities having jurisdiction for the project (if applicable).

## 2.6 GRADE ADJUSTMENTS

- A. Grade Rings: Reinforced-concrete rings, 3- to 12-inch (75- to 300-mm) total thickness, to match diameter of manhole frame and cover.

## 2.7 GROUT

- A. Description: ASTM C 1107, Grade B. nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## 2.8 DROP INLET

- A. Drop inlets for manholes shall be constructed where shown on the Drawings and shall conform with the details shown on the Drawings.
- B. Pipe and fittings shall be the same type and class as the sewer pipe beings installed.
- C. Concrete for pipe encasement shall be 3,000 psi.

## PART 3 - EXECUTION

### 3.1 EARTHWORK

- A. Earthwork shall be in accordance with Section "Trenching and Backfilling" or Section "Earth Moving".

### 3.2 PRECAST MANHOLE SECTIONS

- A. Base units shall be placed on a minimum 12-inch foundation of pipe zone bedding material, and be set at the proper elevation, carefully leveled, and aligned.
- B. Barrel units shall be set vertical with steps and sections in proper alignment. All joints shall be sealed with cement mortar inside and out, and troweled smooth to the contour of the wall surface. Joints shall be installed in accordance with manufacturer's recommendations.

- C. Lifting holes shall be sealed tight with a tapered solid rubber plug driven into the hole and the remaining void filled with mortar on the outside only.

### 3.3 GRADE RINGS

- A. Grade rings placed upon the eccentric cone or slab shall be used for all manholes to provide the potential for future adjustment.
- B. Grade rings shall be placed in a combined thickness of at least 4 inches but not more than 12 inches, in order to bring the manhole frame to proper grade.
- C. Consecutive grade ring layers shall be laid on an even mortar bed.

### 3.4 PIPE CONNECTIONS

- A. Pipe connections to manholes shall be installed true to line and grade as shown on the Drawings. Wall fittings shall be watertight, compatible with the sewer pipe joint. Connections shall conform to the details shown on the Drawings.

### 3.5 INVERT CHANNEL AND BENCH WALLS

- A. An invert channel and bench walls shall be constructed as shown on the Drawings to provide a smooth transition in flow through the manhole. The invert channel and bench wall shall be constructed of 3,000 psi concrete. Benches shall be built-up to the height called for on the Drawings, or as directed by the Engineer, and given a steel trowel finish. Care shall be taken to slope all benches for proper drainage to the invert channel.

### 3.6 FRAMES

- A. Frames shall be firmly set and bonded at the proper grade to conform with the finished grade shown on the Drawings.
- B. Frames for manholes in unpaved areas shall be set at an elevation higher than finished grade as shown on the Drawings, or as directed by the Engineer.

### 3.7 WATERTIGHTNESS

- A. All manholes shall be free of visible leakage. Each manhole shall be inspected, and all leaks shall be repaired in a manner approved by the Engineer.

### 3.8 CONNECTION TO EXISTING STRUCTURES

- A. The Contractor shall make connections to existing manholes as shown on the Drawings or as specified herein.
- B. For connections to precast or cast-in-place concrete manholes, the Contractor shall core drill a hole one (1) inch larger than the O.D. of the sewer pipe into the existing manhole at the location and elevation shown on the Drawings.
- C. For connections to masonry manholes, the Contractor shall open the sidewall of the existing manhole by removing masonry units no more than necessary to accommodate the sewer pipe.
- D. Connection methods shall be in accordance with the details shown on the Drawings. Any open spaces around the new pipe entry shall be sealed with non-shrink grout to prevent leakage.

- E. The existing bench and channel shall be removed and reconstructed to permit flow through the manhole as it now exists and also for the new sewer pipe. Bench and channel reconstruction shall conform with the details on the Drawings, or as directed by the Engineer.
- F. The Contractor shall be responsible for diverting flow through the manhole in order to allow bench and channel construction.

### 3.9 CHANGING ELEVATIONS OF EXISTING STRUCTURES

- A. Lower existing frames of manholes by the removal of appropriate masonry courses, to the elevations shown on the Drawings or as directed by the Engineer.
- B. Raise the existing frames of manholes by the addition appropriate grade rings to the elevations shown on the Drawings or as directed by the Engineer.
- C. Where the manhole frames cannot be lowered by removal of masonry courses, such as may be the case with precast concrete manholes, the upper barrel section shall be removed and/or replaced with a section of less depth, to permit the necessary adjustment of the frame.
- D. Frames and covers damaged during the Work shall be replaced at the Contractor's expense.

END OF SECTION



SECTION 331120 WATER SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes provisions for the installation of water services.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's catalog cuts, specifications and installation instructions.

1.3 REFERENCES

- A. American Society of Testing and Materials (ASTM).
- B. American Waterworks Association (AWWA)
- C. American National Standards Institute (ANSI)

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Materials in contact with potable water shall be made from copper alloy no. C83600 in accordance with ASTM B62 and ASTM B584.

B. Pipe and Fittings:

- 1. Pipe: Type K copper tubing, ASTM B88.
- 2. Fittings: Wrought copper, compression end, ANSI B16.22

C. Valves and Valve Boxes:

i. Corporation Valve/Stop:

3/4" and 1"	Mueller Co.	H-15008/Ground Key
	Ford Meter Box Co.	F 1000/Ground Key
1-1/2" and 2"	Mueller Co.	B-25008/Ball Corp.
	Ford Meter Box Co.	FB 1000/Ball Corp.

2. Curb Valve/Stop: Quarter turn plug, bronze with compression ends

3/4" and 2"	Mueller Co.	H-15209
3/4" and 1"	Ford Meter Box Co.	Z-44

- 3. Curb Box: Extension type with stationary rod and arch pattern base:
- 4. Lid: Cast iron removable brass pentagon head plug. "Water" shall be cast into lid
- 5. Valve Keys: Two (2) keys, designed to fit curb stop.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Trenching, backfilling and compaction conforming to Section "Trenching, Backfilling, and Compaction."
- B. Pipe installation conforming to Section "Common Work Results for Utilities."

3.2 INSPECTION

- A. Inspect all pipe and fittings prior to laying in the trench. Remove all defective pipe and fittings from the site.
- B. Do not backfill until inspection by the Engineer, unless otherwise approved by the Engineer.

END OF SECTION

## SECTION 333813 GATE VALVES AND VALVE BOXES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the installation of gate valves and valve boxes of the sizes and types as shown on the Drawings and as specified herein.

#### 1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
  - 1. American Water Works Association (AWWA)
  - 2. American National Standards Institute (ANSI)
  - 3. American Society of Testing and Materials (ASTM)
- B. Regulatory Requirements: Valves shall conform to the specifications, regulations and requirements of all Agencies (Federal, State and Local), Codes, and Associations having jurisdiction governing construction, sizing, application and location of same.
- C. Certifications: Valves and Indicator posts for fireline service shall be UL or FM approved and shall bear visible body markings indicating such approval.

#### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions.
- B. Quality Control Submittals:
  - 1. Certificates:
    - a. Statement of compliance with ANSI/AWWA Specifications.
    - b. Gate valve shall be shop tested in accordance with AWWA C500 and three (3) copies of the certified shop tests shall be submitted.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT

- A. Gate Valves:
  - 1. Gate Valves, 3 inch and larger, shall be iron body, bronze mounted, double disc with parallel seats conforming to AWWA C500. Gland bolts shall be zinc coated steel.
  - 2. All valves shall have a minimum operating pressure of 200 psi OWG, factory tested at 400 psi.
  - 3. All valves shall have mechanical joint ends conforming to ANSI A21.11.
  - 4. Valves shall open left (counter clockwise) with a standard 2 inch square operating nut with arrow cast on it showing the direction of opening.

5. Each valve shall be furnished complete with necessary nuts, bolts, studs, and gaskets.
  6. Mueller "AWWA," Kennedy "AWWA," or equal.
- B. Resilient Wedge Valves (R/W):
1. Valves, 3" and larger shall be iron body, bronze mounted, resilient seated conforming to AWWA C509. Gland bolts shall be zinc coated steel.
  2. All valves shall have a minimum operating pressure of 200 psi OWG, factory tested at 400 psi.
  3. All valves shall have mechanical joint ends conforming to ANSI A21.11.
  4. Valves shall open right (clockwise) with a standard 2 inch square operating nut with arrow cast on it showing the direction of opening.
  5. Each valve shall be furnished complete with necessary nuts, bolts, studs, and gaskets, for installation.
  6. Valves shall be Waterous "Series 500" Resilient Wedge type Valves, or equal.
- C. Valve Boxes:
1. All valve boxes shall be of cast-iron, sliding telescopic type, at least five and one-quarter inch (5-1/4") in diameter. Valve boxes shall be two (2) piece and shall be furnished to match the specific valve dimensions and trench depth as shown on the drawings.
  2. All valve boxes shall be furnished with a cast-iron cover, drop style, with both the word "WATER" and an arrow indicating the direction of valve opening (open left) cast on the cover in raised characters.
  3. Furnish one (1) steel socket key for each five (5) valves of the same size or less. The length shall be compatible with valve with the greatest depth of bury.

## 2.2 COMPONENTS

- A. Indicator Posts:
1. Valves shall be fitted with bonnet flange of the diameter required for bolting to the indicator post.
  2. Posts shall have a large plexiglass window with aluminum target plates and the words "OPEN" and "CLOSED" cast in large letters directly behind the window in such a position that the appropriate word appears as the valve is operated.
  3. Posts shall be of the locking device wrench type with bronze lock and keys.
  4. Stems, indicators and all working parts shall be fully protected by a weatherproof enclosure.
  5. UL/FM approved.



## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Valves shall be installed in accordance with AWWA C600, "Installation of Ductile-Iron Water Mains and Appurtenances."
- B. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper operation, and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the Owner.
- C. Buried valves shall be cleaned and manually operated before installation. All buried valves shall be set vertically and the Contractor shall take careful measures to ensure that valves are kept in the closed position.
- D. Valve boxes shall be set carefully, truly vertical and accurately centered over the valve with top at finished grade elevation, it shall be set so as not to transmit traffic loads to the valve.
- E. Gate valve and valve box installation shall conform to the details shown on the Drawings. All hydrant leads shall incorporate a gate valve which in general, shall be located as far from the hydrant and as close to the main as possible. Gate valves at main line junctions shall be located 4 feet away measured center of the valve to center of the junction or fitting. Gate valves on cast or ductile iron water services shall generally be located on the street line or property line. All gate valve locations shall be reviewed by the Engineer prior to valve installation. Tops of valve boxes shall be set flush with grade in paved areas and set 1-inch above grade in grassed areas.

### 3.2 FIELD QUALITY CONTROL

- A. Tests: The various pipe lines in which the valves and appurtenances are to be installed are specified to be field tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer.

END OF SECTION



SECTION 334100  
STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide storm drainage sewer as shown on the drawings, specified herein, and needed for a complete and proper installation.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
  - 2. Section 02220 – Excavating, Backfilling for Structures.
  - 3. Section 02221 - Trenching, Backfilling for Utilities.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. All materials in this Section are to be manufactured in the United States.
- C. Contractor to be certified by the manufacturer for installation of HDPE pipe.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within fifteen (15) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
  - 1. Materials list of items proposed to be provided under this Section.
  - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

1.5 ORDER AND ACCEPTANCE OF WORK

- A. Engineer shall direct on what line or street the Contractor shall work and the order thereof.
  - 1. Generally, work shall commence at the lower end of a system and proceed upgrade.

1.6 PROTECTION OF OTHER UTILITIES

- A. Location:
  - 1. Approximate location of certain known underground lines is shown.

2. Existing small lines not shown.
  3. Locate small and other possible utility lines using electronic pipe finder, or other approved method.
  4. Excavate and expose existing underground utilities ahead of trenching operations.
- B. Repair or replace any damaged utility line or structure at no additional cost to Owner.

## 1.7 CONFLICTING UTILITIES

- A. Remove and/or relay conflicting utilities, when so directed by the Engineer, at the expense of the Owner.
- B. Where alterations to existing utilities are shown to avoid conflicts, make alterations at no cost to Owner.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Pipe shall be subject to Engineer's observation, at plant, trench or other point of delivery, for culling and rejecting pipe, independent of laboratory tests, not conforming to specifications.
- B. Rejected pipe will be marked by the Engineer and Contractor shall remove it from project site.

### 2.2 PIPE AND MATERIALS

- A. Reinforced concrete pipe (RCP)
1. Pipe to comply with ASTM C-76 for Class III, Wall B (unless higher class is indicated on the drawings).
  2. Furnish pipe with joints designed for flexible watertight gaskets.
  3. Provide integral bell and spigot joints.
  4. Provide gaskets on all pipe:
    - a. O-ring rubber complying with ASTM C-443; or
    - b. Preformed plastic gaskets complying with AASHTO Designation M-198 or Type B, Flexible Plastic Gasket.
- B. High density polyethylene pipe (HDPE):
1. Manufacture from High Density Polyethylene (HDPE) virgin compounds conforming to cell classifications as listed in AASHTO M-252 and M-294, Type S, MP7-97 (Type D and DP).
  2. Form with annular corrugation, conforming to AASHTO M-294.
    - a. Furnish a Certificate of Compliance to the Engineer for each type of plastic pipe furnished.
    - b. Provide integrated bell and spigot joints with ASTM F-477 rubber gasket on spigot end.

### 2.3 DRAINAGE STRUCTURES

- A. Use precast concrete or built-in-place masonry units.
- B. Precast drop inlets, catch basins, curb inlets, etc. shall be as manufactured by Tindall Concrete Products, Inc. or equal units by others.

- C. All other precast structures (i.e., headwalls, flared end sections, etc.) shall be approved by Engineer prior to installation.
- D. Inlet Castings.
  - 1. Provide gray iron castings, complying with ASTM A-48, Class 35B iron and AASHTO M-306.
  - 2. Provide a minimum recycled material content of 75 consisting of post-consumer material.
  - 3. Provide uniform quality, free from sand holes, gas holes, shrinkage, cracks and other surface defects.
  - 4. Grind smooth and clean by shot blasting.
  - 5. Cast or machine bearing surfaces between grates and frames with such precision to prevent rocking.
  - 6. Casting dimensional tolerances shall be +/- 1/16" per foot.
  - 7. All published casting weights may vary no more than +/- 5%.
  - 8. Conduct a first article proof load test and provide the results of that proof load upon request.
    - a. Conduct in accordance with the method and procedure that is outlined in AASHTO M-306.
    - b. Test on a suitable and calibrated load testing machine. Casting shall hold a 40,000 pound proof load for one minute without experiencing any cracks or detrimental permanent deformation.
    - c. Test results for each lot of castings be maintained Foundry to for a minimum of seven years. Make available upon request.
  - 9. Inspect in accordance with AASHTO M-306.
  - 10. Furnish a foundry certification stating that samples representing each lot have been tested, inspected, and are in accordance with this specification.
  - 11. Each casting shall be identifiable and show, at a minimum, the following: name of the producing foundry, country of manufacture, ASTM material designation, recycle symbol, individual part number, cast or heat date.
  - 12. Castings shall include all lettering as shown on the specification drawings.
  - 13. Patterns and weights shall be as indicated on the Contract Drawings.
  - 14. Coat frames and covers with two (2) shop coats of water based bitumastic paint, MC4 MPFC by Molecular Coating Specialist of Cedar Hill, Texas or approved equal.
  - 15. All castings are to be manufactured in the United States.

## 2.4 MANHOLES

- A. Use precast manholes:
  - 1. Provide reinforced precast concrete ring and eccentric cone sections complying with ASTM C-478 and the following.
  - 2. Use portland cement complying with ASTM C-150, Type II.
  - 3. Cast ladder rungs into the units.
  - 4. Provide tongue and groove or o-ring rubber gasketed joints.
  - 5. Use vulcanized butyl rubber sealant with tongue and groove joints.
  - 6. Provide flat slab tops where manhole depth is less than 4'0".
- B. Steps:
  - 1. Provide polypropylene plastic steps reinforced with 3/8" diameter steel rod, M.S.A. Industries, Inc. Model PS-K, or equal.
  - 2. Provide steps having non-skid top surfaces, safety slope at each end, minimum width of 10" and not less than 5" projection from wall.

C. Frames and covers:

1. Provide gray iron castings, complying with ASTM A 48, Class 35B iron and AASHTO M-306.
2. Provide a minimum recycled material content of 75 consisting of post-consumer material.
3. Castings shall be of uniform quality, free from sand holes, gas holes, shrinkage, cracks and other surface defects ground smooth and clean by shot blasting.
4. Cast or machine bearing surfaces between rings and covers with such precision to prevent rocking.
5. Casting dimensional tolerances shall be +/- 1/16" per foot.
6. Conduct a first article proof load test and make the results of that proof load available upon request.
  - a. Conduct in accordance with the method and procedure outlined in AASHTO M-306.
  - b. Test casting on a suitable and calibrated load testing machine. Casting shall hold a 40,000 pound proof load for one minute without experiencing any cracks or detrimental permanent deformation.
  - c. Maintain test results for each lot of castings by the foundry for a minimum of seven years. Make available upon request.
7. Provide inspections in accordance with AASHTO M-306 and furnish results of these tests upon request.
8. Furnish a foundry certification stating that samples representing each lot have been tested, inspected, and are in accordance with this specification.
9. Each casting shall be identifiable and show, at a minimum, the following: name of the producing foundry, country of manufacturer, ASTM material designation, recycle symbol, individual part number, cast or heat date.
10. Provide frames and covers weighing not less than 285 lbs. with inside opening between 22" and 24".
11. Provide circular cover with two "pick" holes, one 1" diameter vent hole, and weighing not less than 130 lbs.
12. Covers to have the words "STORM SEWER" cast in the metal.
13. Coat frames and covers with two (2) shop coats of water based bitumastic paint, MC4 MPFC by Molecular Coating Specialist of Cedar Hill, Texas or approved equal.
14. All castings are to be manufactured in the United States.
15. Provide East Jordan Iron Works, Inc. Model V-1384 or approved equal.

2.5 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 LAYING OUT WORK

- A. Provide all materials, labor, instruments, etc. required to lay out Work.
- B. Prepare "cut sheets" under direct supervision of the Engineer.
- C. Exercise proper precaution to verify figures on the drawings prior to laying out Work. Contractor will be held responsible for any errors therein that otherwise might have been avoided.

- D. Promptly inform Engineer of errors or discrepancies found, in order that proper corrections may be made.

### 3.2 INSTALLATION

- A. Trench, backfill and compact for the work of this Section in strict accordance with pertinent provisions of Section 02220 and Section 02221 of these specifications, and the following requirements:

1. Maximum trench widths, depths and bedding methods.
  - a. Install all sewers complying with tables for depths of cut and class of bedding included hereinafter.
  - b. Where trenches are excavated beyond specified widths, or trench walls collapse, lay sewer complying with requirements of the next better class of bedding at no additional cost to the Owner.
  - c. Include cost of special bedding and tamping in unit prices bid for sewer.
2. Reinforced concrete pipe (RCP) - Type III:

		MAXIMUM DEPTHS IN FEET			
		CLASS OF BEDDING			
		D	C	B	A
Pipe Size	Max. Trench Width	Flat Bottom Trench	Type 1 or Type 2	Special Earth Bedding	Special Concrete Bedding
12"	2'-6"	7.5	11.5	20	30

3. High density polyethylene pipe (HDPE) to be installed per ASTM D2321 and AASHTO Section 30 requirements.
4. High density polyethylene pipe (HDPE):

		MAXIMUM DEPTHS IN FEET			
		CLASS OF BEDDING			
		D	C	B	A
Pipe Size	Min. Trench Width	Flat Bottom Trench	Type 1 or Type 2	Type 1 or Type 2* Bedding	Special Concrete Bedding
12"	3'0"	**	**	30	**
*		Class B Bedding (Type 2) shall extend to the top of the pipe.			
**		Do not use this Class of bedding for this pipe size and trench width.			

- B. Bedding and tamping requirements for the various classes of bedding shall comply with the following specifications:

1. Class A Bedding - Excavate trench to one-fourth of nominal pipe diameter below pipe grade; lay pipe to grade on concrete blocking; place 2500 psi concrete around pipe for full width of trench up to one-fourth nominal pipe diameter above the invert.

2. Class B (Type 1) Bedding - Shape bottom of trench to a level two inches below bottom of pipe; bring bed to proper level by spreading and thoroughly tamping fine granulated moist earth and sand to conform accurately to one-fourth circumference of pipe barrel; provide suitable material if not available from trench excavation; lay pipe, backfill and hand tamp in thin layers to height three-fourths of pipe diameter, using material same as bedding material; complete trench backfill complying with Section 02221.
  - a. Bring trenches excavated to excess depths to grade with stone or gravel bedding at the Contractor's expense.
  - b. Exercise care to avoid disturbing pipe grade, alignment or joints at all times.
  - c. In lieu of this class bedding, Contractor may elect to use Class B (Type 2) bedding.
3. Class B (Type 2) Bedding - Undercut 4" below pipe barrel, full width of trench; bring to grade with crushed stone complying with SCDOT Aggregate No. 5; except for HDPE, use SCDOT Aggregate No. 57.
  - a. For RCP pipe, place stone in 6" layers to mid-point of pipe, compacting by slicing with shovel.
  - b. For HDPE pipe, place stone (Aggregate No. 57) in 6" layers to the top of the pipe, compacting by slicing with shovel.
  - c. Complete trench backfill complying with Section 02221.
4. Class C (Type 1) bedding - Shape trench bottom by hand to conform accurately to bottom one-quarter of pipe barrel circumference.
  - a. Use Class C (Type 2) bedding if unable to properly shape trench bottom.
  - b. If shaping is not performed accurately, the Contractor will be required to use Class C (Type 2) bedding.
5. Class C (Type 2) Bedding - Undercut 4" below bottom of pipe barrel; full width of trench; bring to grade with compacted crushed stone complying with SCDOT Aggregate No. 5; lay pipe; place stone in six-inch layers to quarter-point of pipe, compacting by slicing with shovel; complete backfill complying with Section 02221.
6. Class D Bedding:
  - a. For RCP - Excavate bell holes in flat bottomed trench; lay pipe; backfill complying with Section 02221.
7. Where piping is installed under roadways, use controlled density fill for trench backfill to a distance of two (2) feet beyond edge of pavement.

C. Pipe laying:

1. General:
  - a. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
  - b. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in direction of flow.
  - c. Lay each pipe accurately to the indicated line and grade, aligning so the sewer has a uniform invert.
  - d. Continually clear interior of the pipe free from foreign material.
  - e. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.
  - f. Use gasket lubricants or joint primers as recommended by the pipe manufacturer.
  - g. Place, fit, join and adjust the joints to obtain the degree of water tightness required.
2. Reinforced concrete pipe (RCP):
  - a. Select proper bedding class from preceding table as determined by pipe size and depth of cut.
  - b. Provide uniform and continuous support of pipe barrel between bell holes when utilizing Class D bedding.



- c. Joints:
  - 1) O-ring gaskets: Lubricate and install gaskets in accordance with manufacturer's recommendations.
    - a) Align the pipe with previously installed pipe, and push the joint together. Using feeler gage, determine that gasket is properly fitted.
  - 2) Preformed plastic gaskets:
    - a) Apply primer to clean, dry joint surfaces and allow to dry.
    - b) Attach plastic strips end to end to the leading edge of the tongue, forming a continuous gasket around the entire circumference of the joint.
    - c) Align pipe with previously laid joint and push the joint together. Sufficient pressure shall be applied to assure the joint is home and slight squeeze out of the gasket materials occurs.
- 3. High density polyethylene pipe (HDPE):
  - a. Provide proper equipment for hoisting and lowering pipe into the trench without damaging the pipe or disturbing the bedding and the sides of the trench.
  - b. Remove shipping collars prior to placing pipe in trench.
  - c. Lay pipe with the green stripe up.
  - d. Align the joint and push the spigot home.
  - e. Use a bar and wood block on larger diameters when necessary making sure the block protects the pipe end from the bar.
  - f. When pushing the joint home, make sure the bedding material is not pulled into the bell by the spigot.
  - g. Take up and re-lay any pipe which is not in alignment or which shows any undue settlement after laying, without additional compensation.

### 3.3 MANHOLES AND PRECAST STRUCTURES

- A. Set bases level so that walls will be plumb.
- B. Apply joint sealer, or ring gasket to wall section(s), set firmly in place to assure watertight joints.
- C. Form manhole invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1" per foot nor more than 2" per foot.
  - 1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.
  - 2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.
  - 3. Make changes in size and grade of channels smoothly and evenly.
  - 4. Slope invert uniformly from invert of inlet to invert of outlet.

### 3.4 BUILT-IN-PLACE STRUCTURES

- A. Construct bottom of all structures using 3000 psi concrete complying with Section 03300, to dimensions indicated on the Contract Drawings.
- B. Set frames and tops to grades indicated, mortar into place.

### 3.5 OBSERVATIONS

#### A. General:

1. Clean and prepare for observation each block or section of sewer upon completion, or at such other time as the Engineer may direct.
2. Each section between manholes shall show a full circle of light when viewed from either end.
3. Repair all visible leaks.
4. Correct broken or cracked pipe, mislaid pipe and other defects.
5. All repairs, relaying of sewers, etc. required to bring the sewers to specified status shall be made at no additional cost to the Owner.

### 3.6 MEASUREMENT AND PAYMENT

- #### A.
- No separate measurement or direct payment will be made for the items under this Section and all costs for same shall be included in the price bid for the project.

END OF SECTION

## SECTION 334100-20 HIGH DENSITY POLYETHYLENE PIPE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the installation of polyethylene piping systems as shown on the Drawings and as specified herein.
- B. All piping, fittings, and appurtenances shall be new, clean and in accordance with material specifications. In no instance shall second- hand or damaged materials be acceptable.

#### 1.2 QUALITY ASSURANCE

- A. Reference Standards:
  - 1. The latest edition of the following standards, as referenced herein, shall be applicable.
    - a. "Standard Specifications, Construction and Materials, South Carolina Department of Transportation, Office of Engineering."
    - b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."
    - c. American Society of Testing and Materials (ASTM).

#### 1.3 SUBMITTALS

- A. Product Data:
  - 1. Submit manufacturer's catalog cuts, specifications and installation instructions, for both pipe and coupling system.
  - 2. Submit manufacturer's certification that product was manufactured, tested, and supplied in accordance with the standards specified herein.

#### 1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage:
  - 1. Pipe, fittings, specials, appurtenances and accessories shall be delivered to and stored within the Contractor's work limits as shown on the Drawings.
  - 2. Special care shall be exercised during delivery and storage to avoid damage to the products.
  - 3. Products shall be stored so as to avoid unnecessary handling and in locations where they will not interfere with the Owner's operations or public travel.
- B. Handling:
  - 1. Pipe, fittings, special appurtenances and accessories shall be handled carefully with approved handling devices in strict conformance with the manufacturer's recommendations.

2. Products shall not be dropped nor shall products be otherwise dragged, rolled or skidded.
- C. Products cracked, gouged, chipped, dented or otherwise damaged will not be approved and shall be removed and replaced at the Contractor's expense, unless the product can be repaired in a manner acceptable to the manufacturer and Engineer. All repairs shall be at the Contractor's expense.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. HDPE Soil Tight Pipe:

1. Pipe shall be ADS N-12 ST IB (per AASHTO) smooth interior with annular exterior corrugations and a Manning's "n" value of 0.012 high-density polyethylene pipe (HDPE) as manufactured by Advanced Drainage Systems (ADS), or approved equal. Pipe shall have an integral soil tight gasketed bell and spigot.
  - a. 4 inch through 11 inches conforming to AASHTO M252 Type S
  - b. 12 inches through 60 inches conforming to AASHTO M294 Type S or ASTM F2306.
2. Pipe shall be joined using a bell & spigot joint meeting AASHTO [M252] [M294] [ASTM F2306]. The joint shall be soil-tight and gasketed, and shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.
3. Fittings shall conform to ASTM F 2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F 2306.

#### B. HDPE Water Tight Pipe:

1. Pipe shall be ADS N-12 WT IB (per AASHTO) smooth interior with annular exterior corrugations and a Manning's "n" value of 0.012 high-density polyethylene pipe (HDPE) as manufactured by Advanced Drainage Systems (ADS), or approved equal. Pipe shall have an integral water tight gasketed bell and spigot, or approved equal.
  - a. 4 inch through 11 inches conforming to AASHTO M252 Type S
  - b. 12 inches through 60 inches conforming to AASHTO M294 Type S or ASTM F2306.
2. 4- through 60-inch (100 to 1500 mm) 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. 12- through 60-inch (300 to 1500 mm) diameters shall have a reinforced bell with a bell tolerance device. The bell tolerance device shall be installed by the manufacturer.
3. Fittings shall conform to ASTM F 2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the water-tight joint performance

requirements of ASTM F 2306.

C. Flared End Section:

1. Flared end sections shall be 1210 NP or 1810 NP HDPE end sections as manufactured by ADS, or equal.
2. End sections shall be fastened to the last corrugation of the pipe length using a high strength nylon cable tie supplied by the manufacturer through pre-drilled holes at the top of the end section collar.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect all pipe and fittings prior to laying in the trench. Remove defective pipe and fittings from the site.
- B. Do not backfill until inspection by the Engineer, unless otherwise approved by the Engineer.

3.2 INSTALLATION AND TESTING

- A. Trenching, backfilling and compaction shall conform to Section "Trenching and Backfilling."
- B. Pipe installation and testing shall conform to Section "Common Work Results for Utilities."

END OF SECTION

