

BID DOCUMENTS
FOR
**2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX
& RECREATION PARK**



CITY OF LAKELAND, TN
April, 2021

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STANDARD
ADVERTISEMENT FOR BIDS
FOR

2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX & RECREATION PARK

FOR
CITY OF LAKELAND
LAKELAND, TENNESSEE

Notice is hereby given, pursuant to Tennessee Statute Section 16-19-104, the City of Lakeland, Tennessee, will receive sealed bids until 2:00 p.m., Thursday, May 6, 2021 for the following:

2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX & RECREATION PARK

This project is funded in part by a Local Parks and Recreation Fund Grant administered by the Tennessee Department of Environment and Conservation Recreation Educational Services Division.

Bids must be in one sealed envelope with statement thereon "**BID ENCLOSED: 2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX & RECREATION PARK**" and be submitted to the receptionist at the City of Lakeland, Tennessee 10001 U.S. Highway 70, at or before the above stated time. Bids will be opened publicly, read aloud, and tabulated by the City Manager, or his or her Designee, at the above stated time and place, unless an alternative site is designated in writing prior to the time of Bid Opening. No bid may be withdrawn for a period of thirty (30) days after the date set for opening thereof. The City of Lakeland, Tennessee reserves the right to reject any or all bids and to waive any informalities or technicalities in the bidding; provided, however, that any bid received after the time specified or without accompanying Bid Guaranty, as stated below, will not be considered.

Bidding Documents, including specifications, are currently available from the City of Lakeland Tennessee, 10001 U.S. Highway No. 70, Lakeland Tennessee or at www.lakelandtn.gov.

In accordance with federal Executive Order 11625 dated October 13, 1971, and Executive Order 12138 dated May 18, 1979, the City of Lakeland encourages all Bidders must make a good faith effort to include participation from small, minority, and women's businesses in sub-contract awards. Goals for participation are 7% minority and 1% women.


A Bid Guaranty in the form of a properly executed Bid Bond payable to the City in the amount of not less than 5% of the total base bid amount must accompany each bid. Pursuant to T.S. 12-4-201, in lieu of a Bid Bond, the following securities or cash may be substituted at the percentage rate required for such bond: United States treasury bond or general obligation bond or certificates of deposit irrevocably pledged from a state or national bank having its principle office in Tennessee or

a state or federal saving and loan association having its principal office in Tennessee, or any state or national banks or state or federal savings and loans associations that has its principal office located outside of Tennessee and that maintains a branch in this state, or a letter of credit or cash. The successful Bidder will be required to execute an Agreement with the City, in the form supplied in the bidding documents, within thirty (30) days after Notice of Award is issued. The Notice of Award shall serve as notice that the Agreement is ready for execution. The Bid Guaranty shall be forfeited as liquidated damages if the Bidder fails to execute the Agreement within thirty (30) days after such Notice is issued, or fails to provide proper Bond or other form of Guaranty, as approved. The Bid Guaranty, if a Bid Bond, shall be executed by a surety or guarantee company authorized to do business in Tennessee. The Attorney-in-Fact who executes the Bond on behalf of the surety shall affix a certified and current copy of its Power of Attorney from the surety. No other type of Bid Guaranty will be accepted. The City may proceed against a Bid Guaranty unless either: a) the Agreement has been executed by Contractor and Performance, and Labor and Material Payment Bonds have been furnished, as required; or, b) the specified time has elapsed so that Bids may be withdrawn; or, c) the Bid has been rejected.

Notice is hereby given that preference will be granted to Tennessee contractors, subcontractors, laborers, and materials, supplies, equipment, machinery, and provisions produced, manufactured, supplied, or grown in Tennessee, as required by Tennessee Statute Section 12-4-121 et seq.

A Pre-Bid Conference will be held at 11:00 a.m., Thursday, April 29, 2021, at Lakeland City Hall. A site tour may be held to review the Project following this conference. Contact for this Project is Patrick O'Mara, Parks and Recreation Director, at (901) 867-2717 or pomara@lakelandtn.org.

Attendance in the Pre-Bid Conference is not mandatory for Contractors who wish to be considered qualified and/or responsible.



Shane Horn
City Manager

Publish: 4/21/21 and 4/28/21

STANDARD
INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS.

1.1 Terms used in these Instructions to Bidders have the meanings assigned to them in the Standard General Conditions, as modified by the Supplementary Conditions unless otherwise stated herein.

1.2 Certain additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof.

A. Bidder: One who submits a bid directly to the City.

B. Successful Bidder and/or Contractor: This term means the qualified, responsible, and responsive Bidder, as determined by the City, who has submitted the lowest bid, and to whom the City has awarded the Contract.

C. Bid Documents: Prior to award of the contract, all documents in the Bid Package are considered "Bid Documents." This includes the Advertisement for Bid, Instructions to Bidders, Bid Forms, Bond Forms, Sample Agreement, Standard General Conditions, Supplementary Conditions, Technical Specifications, drawings, etc. Bid Documents also include any addenda issued prior to the opening of the bids.

D. Contract Documents: Following the award of the contract, contract documents shall include those documents listed above in "C." -- with the exception of the Advertisement for Bid, Bid Bond and the Instructions to Bidders; the executed performance and payment bonds; change orders; and, all written agreements and/or written documents executed between the City and Contractor.

2. COPIES OF BIDDING DOCUMENTS.

2.1 Complete sets of Bidding Documents, which include the Advertisement for Bids, these Instructions to Bidders, Bid Form, Bid Bond, Contract Documents, and Addenda, may be obtained from the City of Lakeland, Engineering Office, 10001, U.S. Highway 70, Lakeland, Tennessee 38002.

2.2 Complete sets of Bidding Documents must be used in preparing Bids; the City assumes no responsibility to Bidders for errors or misinterpretations, including those resulting from the use of incomplete sets of Bidding Documents.

2.3 The City, and/or its agent, in making copies of Bidding Documents available on the above terms, does so only for the purpose of obtaining Bids on the Work and does not confer a license or grant for any other use.

3. QUALIFICATIONS OF BIDDERS.

3.1 Pre-qualification Requirements: Attendance at the Pre-Bid Conference may be considered by the City in determining a Bidder's qualifications. Consult Section 5 below.

3.2 Post Bid Qualifications: To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five (5) days of Owner's request written evidence demonstrating Bidder's responsibility, including, but not limited to, matters such as financial data and previous experience. Each Bid will be considered a warrant of Bidder's qualification to do business in this state. Proof of such qualifications may be required upon five (5) days notice.

3.3 Bidding Preferences: Pursuant to T.S. 12-4-802 whenever the lowest responsible and responsive bidder on a public construction project in this state is a resident of another state which is contiguous to Tennessee and which allows a preference to a resident contractor of that state, a like reciprocal preference is allowed to the lowest responsible and responsive bidder on such project who is either a resident of this state or is a resident of another state which does not allow for a preference to a resident contractor of that state.

3.4 Responsible and Responsive Bidders: Pursuant to TS 12-4-801, a responsible bidder means a person who has the capacity in all respects to perform fully the contract requirements, and the integrity and reliability which will assure good faith performance and; and Responsive Bidder means a person who has submitted a bid which confirms in all material respects to all document, whether attached or incorporate by reference, utilized for soliciting bids.

4. PRE-BID CONFERENCE.

A Pre-bid Conference will be held at the time and place stated in the "Advertisement for Bid." Attendance at the Pre-bid Conference is not mandatory.

The purpose of the Conference is to review project requirements and provide bidders an opportunity to visit the project site to make their own determination of existing conditions.

Minutes will be taken of the Pre-bid Conference, and thereafter consulted as a bidding document.

5. EXAMINATION OF CONTRACT DOCUMENTS AND SITE.

5.1 Before submitting a Bid, each Bidder must do at least the following:

- A. Examine the Bidding Documents thoroughly;
- B. Visit the site to become familiar with local conditions that may in any manner affect cost progress, or performance of the Work;
- C. Become familiar with federal, state, and local laws, ordinances, rules, and regulations that may in any manner affect cost, progress, or performance of the work; and
- D. Study and carefully correlate Bidder's observations with the Bidding Documents.

5.2 Reference is made to the Supplementary Conditions, for the identification of those reports of investigations and tests of subsurface and latent physical conditions at the site or otherwise affecting cost, progress, or performance of the work which has/have been relied upon by Engineer in preparing the Drawings and Specifications. The City will provide copies of such reports for review to any Bidder requesting them (if applicable). These reports are not guaranteed as to accuracy or completeness. Before submitting a Bid each Bidder will, at its own expense, make such additional investigations and tests as the Bidder may deem necessary to determine the time, price, and other terms and conditions of the Contract Documents.

5.3 On request the City will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of his Bid. The City may require any Bidder desiring access to execute an appropriate release form.

5.4 The lands upon which the work is to be performed, right-of-way for access thereto and other lands designated for use by Contractor in performing the work are identified in the Supplementary Conditions, Special Provisions, and/or Drawings.

5.5 The submission of a Bid will constitute an incontrovertible representation by the Bidder that: Bidder has read and understands the Bidding Documents and the Bid is made in accordance therewith; Bidder has visited the site and become familiar with the local conditions under which the work is to be performed; Bidder assumes responsibility for estimating properly the difficulties and costs of successfully performing the work; Bidder has complied with every requirement of these instructions; and that the Bidding Documents are sufficient in scope and detail to indicate and convey an understanding of all terms and conditions for performance of the Work.

6. AVAILABILITY OF LANDS.

6.1 Access to private property required by Contractor for staging areas, temporary facilities or other uses in addition to those identified in the Bidding or Contract Documents shall be obtained and paid for by Contractor. Such costs are to be considered incidental to the Contract and merged with Bid Items described and are to be provided without additional compensation to Contractor.

7. INTERPRETATIONS.

All questions about the meaning or intent of the Bidding Documents shall be submitted to Engineer in writing. Replies will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten (10) days prior to the date for opening the Bids will not be answered. Only questions answered by formal written Addenda will be binding. Oral interpretations, clarifications, or comments are not binding upon the City, and do not serve to amend, modify, or in any way change the basic Bidding Documents, and shall be relied upon by Bidder at his own risk.

8. BID GUARANTY.

8.1 A Bid Guaranty in the form of a properly executed Bid Bond payable to the City in the amount of not less than 5% of the total base bid amount must accompany each bid. Pursuant to T.S. 12-4-201, in lieu of a Bid Bond, the following securities or cash may be substituted at the percentage rate required for such bond: United States treasury bond or general obligation bond or certificates of deposit irrevocably pledged from a state or national bank having its principle office in Tennessee or a state or federal saving and loan association having its principal office in Tennessee, or any state or national banks or state or federal savings and loans associations that has its principal office located outside of Tennessee and that maintains a branch in this state, or a letter of credit or cash. The successful Bidder will be required to execute an Agreement with the City, in the form supplied in the bidding documents, within thirty (30) days after Notice of Award is issued. The Notice of Award shall serve as notice that the Agreement is ready for execution. The Bid Guaranty shall be forfeited as liquidated damages if the Bidder fails to execute the Agreement within thirty (30) days after such Notice is issued, or fails to provide proper Bond or other form of Guaranty, as approved. The Bid Guaranty, if a Bid Bond, shall be executed by a surety or guarantee company authorized to do business in Tennessee. The Attorney-in-Fact who executes the Bond on behalf of the surety shall affix a certified and current copy of its Power of Attorney from the surety. No other type of Bid Guaranty will be accepted. The City may proceed against a Bid Guaranty unless either: a) the Agreement has been executed by Contractor and Performance, and Labor and Material Payment Bonds have been furnished, as required; or, b) the specified time has elapsed so that Bids may be withdrawn; or, c) the Bid has been rejected. .

8.2 The Bid Guaranty of the Successful Bidder will not be released unless and until such Bidder has executed the Agreement and furnished the required contract Bond(s). If the successful Bidder fails to execute and deliver the Agreement and furnish the required Contract Bonds within thirty (30) days of the Notice of Award, or fails to proceed with the performance of the Contract, the City may annul the Notice of Award and the Bid Guaranty of that Bidder will be forfeited as liquidated damages, it being agreed that exact damages are difficult or impossible to calculate, and the Bid Guaranty amount is the best estimate.

9. CONTRACT TIME.

The number of days within which, or the date by which, the Work is to be completed (the Contract Time) is set forth in the Bid Form and will be included in the Agreement.

10. LIQUIDATED DAMAGES.

Provisions for liquidated damages are to be set forth in the Agreement.

11. MATERIAL AND EQUIPMENT.

11.1 The materials, products, and equipment described in the Bidding Documents establish a standard or required function, dimension, appearance, and quality to be met by any proposed substitution.

11.2 Materials containing asbestos will not be accepted.

11.3 No substitution will be considered unless written request for approval has been submitted by the Bidder on an appropriate form, and has been received by the Engineer or the City's designated agent at least TEN (10) DAYS prior to the date for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data, and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment, or work that incorporation of the substitute would require, shall be included. The burden of proof of the merit and adequacy of a proposed substitute is upon the Bidder. The decision of approval or disapproval of a proposed substitution by the Engineer or the City's designated agent will be final.

If any proposed substitution is approved, such approval will be described in an addendum. Bidders shall not rely upon approvals made in any other manner.

11.4 When generic parameters for performance and/or appearance are specified, those materials which comply with specifics as delineated do not require a written request for approval. They must be capable of withstanding specification comparison, however, at the time of product data and shop drawing submittal.

12.5 Pursuant to T.S. 12-4-121, "Preference is hereby given to materials, supplies, equipment, machinery, and provisions produced, manufactured, supplied or grown in Tennessee, quality being equal to articles offered by the competitors outside of the State."

12. SUBCONTRACTORS, ETC.

12.1 If required by the City, the identity of certain Subcontractors and other persons and organizations shall be submitted to the City in advance of the Notice of Award. The apparent Successful Bidder, and any other Bidder so requested by the City, will within seven (7) days after the day of the Bid opening, submit to the City a list of names and addresses of all Subcontractors and other persons and organizations whom Bidder proposes will furnish material and/or equipment for the Work. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualification for each Subcontractor, person, and organization if requested by the City. If the City or Engineer after due investigation has reasonable objection to any proposed Subcontractor, or other person, or organization, the City may, before giving the Notice of Award, request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price. If the apparent Successful Bidder declines to make any such substitution and the Agreement is not awarded to such Bidder for that reason, the Bidder's refusal will not constitute grounds for forfeiting the Bid Guaranty. Any Subcontractor, other person, or organization so listed and to whom the City or Engineer does not make written objections prior to giving of the Notice of Award will be deemed acceptable to the Owner and Engineer.

13. BID FORM

13.1 The Bid Form is included with the Bidding Documents. Bidders shall bid all schedules and alternates (if any) as set forth in the Bid Form.

13.2 Bid Forms must be completed in ink or by typewriter. Corrections must be initialed by the Bidder. The Bid price of each item on the form must be stated in words and numerals; in case of a conflict, words will take precedence.

13.3 Bids by corporations or limited liability companies must be executed in the business entity's name by the president or a vice-president (or other officer or member accompanied by evidence of authority to sign), and the signature attested to by an authorized officer or member. The business entity's address and state of incorporation shall be shown below the signature.

13.4 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature. The official address of the partnership must be shown below the signature.

13.5 All names must be typed or printed below the signature.

13.6 The bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form). Failure to acknowledge receipt of Addenda shall not constitute an adjustment of the Contract Price provided on the Bid Form.

13.7 The address to which communications regarding the Bid are to be directed must be shown.

13.8 All items which are not specifically referred to in the Bid Form but are included in the plans or specifications are to be considered incidental to the performance of the major work described and shall be constructed as indicated on the plans or called for in the specifications without additional remuneration.

14. SUBMISSION OF BIDS.

14.1 Bids shall be submitted not later than the time and at the place indicated in the Advertisement for Bids and shall be included in an opaque sealed envelope, marked with the Project title and name and address of the Bidder and accompanied by the Bid Guaranty and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face thereof. All bidding information shall be included in the sealed envelope.

14.2 Contractors' Licenses, Bids Contractors and electrical, plumbing, and HVAC subcontractors who do jobs costing \$25,000 or more must be licensed by the state (T.C.A. § 62-6-102, T.C.A. § 62-6-111). Officials issuing a permit or work order to an unlicensed contractor are guilty of a Class A misdemeanor (T.C.A. § 62-6-120). The name, license number, license expiration date, and classification of contractors applying to bid on jobs must appear on the bid envelope when the bid is more than \$25,000. If the bid is less than \$25,000, only the name of the contractor must appear on the outside of the envelope. Upon opening the envelope, if the bid exceeds \$25,000, the bid is automatically disqualified (T.C.A. § 62-6-119(b)). The name of a prime contractor who does electrical, plumbing, heating, ventilation, and air conditioning must appear on the outside of the envelope. Failure of a bidder to comply voids the bid, and it may not be opened. It is a Class A misdemeanor for any person to disregard the above requirements. Municipalities may not impose additional licensing requirements on state-licensed contractors (T.C.A. § 62-6-111(i)(2)(c)). T.C.A. § 62-6-137, however, allows municipalities to require a permit bond for contractors to ensure that the contractor complies with applicable laws and ordinances. Approving the permit bond program requires a two-thirds vote of the governing body.

15. MODIFICATION AND WITHDRAWAL OF BIDS.

15.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the same manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

15.2 If, within twenty-four (24) hours after Bids are opened, any bidder files a duly signed written notice with the City and promptly thereafter demonstrates to the satisfaction of the City that there was a material and substantial mistake in the preparation of his Bid, that Bidder may withdraw its Bid and the Bid Guaranty will be returned. Thereafter, that Bidder will be disqualified from further bidding on the Work.

16. OPENING OF BIDS.

Bids will be opened publicly and read aloud. An abstract of the bid schedule will be made available after the opening of Bids.

17. BIDS TO REMAIN EFFECTIVE.

All Bids not modified or withdrawn as provided in Section 16, shall remain effective for thirty (30) days after the day of the Bid opening, but the Owner may, in its sole discretion, release any Bid and return the Bid Guaranty prior to that date.

18. AWARD OF CONTRACT.

18.1 The City reserves the right to reject any and all Bids; to waive any and all irregularities or informalities; to negotiate specific contract terms not inconsistent with the Advertisement for Bids, with the Successful Bidder; and to disregard all nonconforming, nonresponsive, unbalanced, or conditional Bids. Discrepancies between words and numerals will be resolved in favor of words. Discrepancies between the indicated sum of any column of numerals and the correct sum thereof will be resolved in favor of the correct sum.

18.2 A Bidder shall bid all schedules and alternates (if any) as set forth in the Bid Form. The City reserves the right in awarding the Agreement to consider the competency, responsibility, and suitability of the Bidder, as well as the amounts of the various bids. The Work, therefore, may not necessarily be awarded to the low bidder.

18.3 In evaluating Bids, the Owner reserves the right to limit the scope of the project to the monies available for the project.

18.4 The Owner may consider, among other things, the qualifications and experience of Subcontractors and other persons and organizations who are proposed to furnish material or equipment for the Work; operating costs; maintenance considerations; performance data; and guarantees of materials and equipment.

18.5 The Owner may conduct such investigations as it deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualification, and financial ability of the Bidders, proposed Subcontractors, and other persons and organizations proposed to do the Work in accordance with the Bidding Documents.

18.6 If the Agreement is to be awarded, it will be to the lowest Bidder who is determined qualified and responsible in the sole discretion and best interest of the City. The low bid shall be determined based upon an evaluation of the Total Base Bid. The City reserves the right to accept or reject alternates in any order or combination; and to accept or reject any schedule or all schedules.

If the low bid is to be awarded in any other manner, applicable laws must be consulted and the above paragraphs must be modified.

18.7 If the Agreement is to be awarded, the Owner will give the Successful Bidder a Notice of Award within thirty (30) Days after the day of the Bid opening.

19. PERFORMANCE AND PAYMENT BONDS AND INSURANCE CERTIFICATES.

The General and Supplementary Conditions set forth the City's requirements as to Performance and Payment Bonds and Insurance Certificate(s). When the Successful Bidder delivers the executed Agreement to the Owner, it shall be accompanied by the required Bonds and Insurance Certificate(s).

19.1 Pursuant to T.S. 12-4-201, no contract shall be let for any public work in this state, by any city, county or state authority, until the contractor shall have first executed a good and solvent bond to the effect that the contractor will pay for all the labors and materials used by the contractor, or any immediate or remote subcontractor under the contractor, in such contract, in lawful money of the United States. The bond to be so given shall be for twenty-five (25%) of the contract price on all contracts in excess of one hundred thousand dollars (\$100,000). Where advertisement is made, the condition of the bond shall be stated in advertisement; provided that T.S. 12-4-201 shall not apply to contracts of one hundred thousand dollars (\$100,000) or less.

20. SIGNING OF AGREEMENT.

When the City gives a Notice of Award to the Successful Bidder, it will be accompanied by one (1) unsigned counterpart of the Agreement and the Performance and Payment Bonds. Within thirty (30) days thereafter, Contractor shall comply with the conditions precedent in the Notice of Award. Within ten (10) days thereafter, the City will deliver one (1) fully signed counterpart to Contractor. The City will deliver one signed copy of the Agreement within the project manual.

Notes:

Revised 10.11.09 paragraph 14.1 and 14.2

EXHIBIT "A"
STANDARD
BID FORM

PROJECT IDENTIFICATION: City of Lakeland, Tennessee
Project Description: **2018 LPRF PROJECT-LAKELAND
ATHLETIC COMPLEX & RECREATION PARK**

THIS BID SUBMITTED TO: City of Lakeland, Tennessee
10001 U.S. Highway 70
Lakeland, Tennessee 38002

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with the City in the form included in the Bidding Documents and to complete all Work as specified or indicated in the Bidding Documents for the Contract Price _____, and completed and ready for final payment not later than September 1, 2021, in accordance with the Bidding Documents.
2. Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid Guaranty. This Bid will remain effective for thirty (30) days after the day of Bid opening. Bidder will sign the Agreement and submit the Bonds and other documents required by the Bidding Documents within thirty (30) days after the date of the City's Notice of Award.
3. Notice that preferences will be granted pursuant to Tennessee Statutes is hereby acknowledged.
4. In submitting this Bid, Bidder represents, as more fully set forth in the Bidding Documents, that:
 - A. Bidder has examined copies of all the Bidding Documents and of the following addenda (receipt of all which is hereby acknowledged):

Addendum No. _____	Dated _____
Addendum No. _____	Dated _____
 - B. Bidder has examined the site and locality where the work is to be performed, the federal, state, and local Laws and Regulations, and the conditions affecting cost, progress, or performance of the work and has made such independent investigations as Bidder deems necessary;

- C. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, corporation, or other business entity. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid. Bidder has not solicited or induced any person, firm, or a corporation to refrain from bidding. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or against the City.

- D. Each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to Tennessee Statute 12-12-106

- 5. Bidder is bidding all schedules, alternates, if any, and will complete the Work for unit price(s) stated on the attached bid schedule based on materials actually furnished and installed and services actually provided. The Bid is summarized below on the basis of estimated quantities:

TOTAL BASE BID, IN NUMERALS: \$ _____

TOTAL BASE BID, IN WORDS: _____ DOLLARS.

- 7. Bidder agrees that the work for the City will be as provided above.

- 8. Bidder accepts the provisions of the Bidding Documents as to liquidated damages in the event of failure to complete the work on time, unless otherwise stated as provided below. Bidder agrees that such liquidated damages are not a penalty and that the amount provided is as close an estimate as possible to actual damages. Any exceptions or objections to this provision are stated in writing and attached hereto by Bidder.

- 9. The following documents are attached to and made a condition of this Bid:
 - A. Required Bid Guaranty in the form of a Bid Bond. (Unless otherwise provided by the City.)

 - B. Itemized Bid Schedule.

10. Communications concerning this Bid shall be addressed to:

Address of Bidder: _____

11. The terms used in this Bid are defined in and have the meanings assigned to them in the General Conditions, except as provided in the Supplementary Conditions and Bidding Documents.

Submitted on _____, 2021.

Bidder is bidding as a _____ (Insert Resident or Non-Resident)

IF BIDDER IS:

AN INDIVIDUAL

By: _____ (seal)
(Individual's Name)

doing business as: _____

Business Address: _____

Phone Number: _____

A PARTNERSHIP

By: _____ (seal)
(Firm's Name)

(General Partner)

Business Address: _____

Phone Number: _____

A CORPORATION OR LIMITED LIABILITY COMPANY

By: _____ (seal)
(Corporation's or Limited Liability Company's Name)

(State of Incorporation or Organization)

By: _____ (seal)

(Title)

(Seal)

Attest: _____

Business Address: _____

Phone Number: _____

A JOINT VENTURE

By: _____ (seal)
(Name)

(Address)

By: _____ (seal)
(Name)

(Address)

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

BID SCHEDULE
2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX & RECREATION PARK

BID DATE: _____

COMPANY NAME: _____

ADDRESS: _____

Contractor shall furnish and install items as shown on the Drawings or called for in the Specifications. All costs not included in the schedule that are necessary to provide a complete, functional project as depicted in the Drawings and Specifications are to be considered incidental and merged with costs of other related bid items.

LS = Lump Sum LF = Linear Feet SY = Square Yard CY = Cubic Yard EA = Each
 AC = Acre

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
1	Mobilization (Max. 5% of Base Bid)	LS	1		
2	Clearing & Grubbing	LS	1		
3	Demolition	LS	1		
4	Asphalt Paving	SY	467		
5	Gravel Driveway/Parking	SY	4615		
6	Gravel Access Road	SY	1485		
7	Concrete Sidewalk	SY	480		
8	Concrete Paving	SY	106		
9	Concrete Curb	LF	775		
10	Striping & Marking	LS	1		
11	Wood Rail Fence	LF	1570		
12	26' Metal Double Bar Gate	EA	2		
13	12' Metal Single Bar Gate	EA	2		
14	16' Metal Single Bar Gate	EA	1		
15	Concrete Wheel Stops	EA	92		
16	Pipe Bollard	EA	2		
17	Aluminum Bleachers	EA	2		
18	Signage	LS	1		
19	Site Furnishings	LS	1		
20	Earthwork	LS	1		
21	Topsoil – Multipurpose Fields	CY	2425		
22	Sand – Multipurpose Fields	CY	485		
23	Topsoil – Other Areas	CY	1300		
24	Undercut	CY	100		
25	Multipurpose Field Laser Grading	SF	156,800		

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL COST
26	Silt Fence Installation, Maintenance, & Removal	LF	4150		
27	Concrete Washout	EA	1		
28	Outlet Protection	EA	6		
29	Construction Exit	EA	1		
30	Stone Filter Ring	EA	3		
31	Inlet Protection	EA	4		
32	Diversion Berm	LF	850		
33	Tree Protection Fence	LF	4950		
34	3070 Inlet w/ Concrete Apron	EA	4		
35	3' Concrete Swale	LF	1420		
36	15" AASHTO M252/M294 HDPE Drainage Pipe	LF	516		
37	15" CLASS III RCP Drainage Pipe	LF	33		
38	18" AASHTO M252/M294 HDPE Drainage Pipe	LF	53		
39	30" CLASS III RCP Drainage Pipe	LF	24		
40	34"X53" CLASS III ELLIPTICAL RCP Drainage Pipe	LF	20		
41	Type 'D' Headwall	EA	9		
42	Site Electric & Lighting	LS	1		
43	Site Water Service	LS	1		
44	Drinking Fountain	EA	1		
45	Field Irrigation	LS	1		
46	Sod	SY	18200		
47	Seeding	AC	3		
48	Landscaping	LS	1		
				Total Bid Schedule A	

Total Base Bid: _____

_____ Dollars (\$ _____).

STANDARD
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as Principal, and _____ as Surety, are hereby held and firmly bound, unto the City of Lakeland, Tennessee a Municipal Corporation as OWNER, in the penal sum of _____ Dollar(s) (\$ _____) for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns, which represents five percent (5%) of the Principal's Total Base Bid.

The Condition of the above obligation is such that whereas the Principal has submitted to the City of Lakeland, Tennessee a certain BID, whereby it has offered to enter into an Agreement in writing with OWNER, for the **2018 LPRF PROJECT – LAKELAND ATHLETIC COMPLEX & RECREATION PARK.**

NOW, THEREFORE,

A. If said BID shall be rejected; or,

B. If said BID shall be accepted and the Principal shall execute and deliver the Agreement to OWNER within thirty (30) days after Notice of Award (which shall constitute presentation of the Agreement to the Principal for the purpose of execution) and shall furnish Guarantors as provided in the Bidding Documents for this Project for Principal's faithful performance of said Agreement and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall otherwise proceed with the performance of said Agreement, then this obligation shall be void, otherwise the same shall remain in full force and effect and OWNER may proceed against the BOND. It is expressly understood and agreed, however, that the liability of Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by an extension of the time within which the OWNER may accept such BID, to a maximum of ninety (90) days after its submission to OWNER; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, this ____ day of _____, 2021.

STANDARD FORM OF
AGREEMENT BETWEEN OWNER AND CONTRACTOR

THIS AGREEMENT is made between the City of Lakeland, hereinafter referred to as the "Owner," and _____ hereinafter referred to as the "Contractor."

WHEREAS, the City of Lakeland is desirous of street paving; and,

WHEREAS, _____ is able and willing to provide those services to the City of Lakeland, Tennessee.

NOW, THEREFORE, it is hereby agreed as follows:

ARTICLE 1. WORK.

Contractor shall perform all the work required by the Contract documents for **2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX & RECREATION PARK** Lakeland, Tennessee.

ARTICLE 2. ENGINEER.

The Project has been designed by the City of Lakeland Engineering Office, 10001 U.S. Highway 70, Lakeland, Tennessee, who is hereinafter referred to as the "Engineer" and who is to act as Owner's representative, assume all duties and responsibilities and have the rights and authority assigned to Engineer in the Contract documents in connection with completion of the Work in accordance with the Contract documents.

ARTICLE 3. CONTRACT TIME.

- 3.1 The Work will be substantially completed by **September 1, 2021** and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions by **September 15, 2021**.
- 3.2 Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not substantially completed by the time specified in Paragraph 3.1 above, plus any extension thereof allowed in accordance with Article 15 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not substantially completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner Five-Hundred Dollars (\$500.00) for each day that expires after the time specified in Paragraph 3.1 for substantial completion. After Substantial Completion, if the Contractor shall neglect, refuse, or fail to complete the remaining work within

the time specified in paragraph 3.1 for completion and readiness for final payment or any proper extension thereof granted by Owner, Contractor shall pay Owner Five-Hundred Dollars (\$500.00) for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment. It is further agreed that such liquidated damages are not a penalty but represent the parties' best estimate of actual damages.

ARTICLE 4. CONTRACT PRICE.

In Consideration of the performance of the work in accordance with the Contract documents for this Unit Price Contract, Owner shall pay Contractor in current funds a not-to-exceed total contract price of _____, subject to additions and deductions by Change Order approved by the Owner. The contract fee shall be based on materials actually furnished and installed and services actually provided based on the unit prices contained in the Bid Form and Itemized Bid Schedule, included as Exhibit "A" (pages BF-1 -- BS-1) and by this reference made a part of this Agreement.

ARTICLE 5. PAYMENT PROCEDURES.

Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed through the Engineer as provided in the General Conditions.

- 5.1 Progress Payments. Owner shall make progress payments on the basis of Contractor's Applications for Payment as recommended by Engineer, on or about the 25th day of each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the Schedule of Values provided for in Paragraph 15 of the General Conditions, subject to the cutoff and submittal dates provided in the General Provisions.
 - 5.1.1 During the course of the Contract progress payments will be made in an amount equal to 95% of the Work completed, less in each case the aggregate of payments previously made.
 - 5.1.2 In the event the Contractor makes only one application for payment upon substantially completing the Work, progress payment will be made in an amount equal to 95% of the Work completed. Owner shall withhold five percent (5%) of the work completed as retainage, said retainage to be paid in accordance with the provisions of Paragraph 5.2, Final Payment.
- 5.2 Final Payment. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Engineer shall recommend payment and present Contractor's Final Application for Payment to the City in accordance with Tennessee Statutes 54-5-122. Before final acceptance of the project as having been finally completed, the contractor shall furnish evidence of payment in full for materials and labor to the City in accordance with Tennessee 54-5-122. When this is done, full settlement may be made with the contractor, but

not until thirty (30) day's notice is some newspaper published in the County where the work is done, if there is a newspaper there, and if not, in a newspaper in an adjoining county that settlement is about to be made and notifying all claimants to file notice of their claims with the officials and the period for filing shall not be less than thirty (30) days after the last published notice. In the event claims are filed, the officials shall withhold a sufficient sum to pay the claims in the same way and manner as is provided for claimants making claims against contractors dealing with the Department of Transportation in accordance with Statutes 54-5-123, and claimants may bring suits against contractors in the way and manner provided in 54-5-124, as suits are brought against contractors dealing with the department. Where claims are allowed by the Courts, Statutes 54-5-125 and 54-5-127 shall be applicable.

ARTICLE 6. WITHHELD FUNDS.

Pursuant to Tennessee Statutes Section 66-11-104 et seq., withheld percentages for Contracts exceeding \$500,000.00 will be retained in an account in the name of the Contractor (except when specifically waived in writing by Contractor) which has been assigned to the Owner until the Contract is completely, satisfactorily, and finally accepted by the Owner. Unless a depository is designated by the Contractor in a written attachment hereto, the Contractor's signature hereon shall act as authority for the Owner to designate a retainage depository on behalf of the Contractor, for the purposes specified in Tennessee Statutes Section 66-11-104. The Contractor's signature hereon shall act as an assignment of the depository account to the Owner, as provided by Tennessee Statutes Section 66-11-104 et seq., whether the depository is designated by the Contractor or by the Owner.

ARTICLE 7. CONTRACTOR'S REPRESENTATIONS.

In order to induce Owner to enter into this Agreement, Contractor makes the following representations:

- 7.1 Contractor has familiarized himself with the nature and extent of the Contract documents, Work, locality, and with all local conditions and federal, state, and local Laws and Regulations that in any manner may affect cost, progress, or performance of the Work.
- 7.2 Contractor has studied carefully all reports of investigations and test of subsurface and latent physical conditions at the site or otherwise affecting cost, progress, or performance of the Work which were relied upon by Engineer in the preparation of the Drawings and Specifications and which have been identified in the Supplementary Conditions.
- 7.3 Contractor has made or caused to be made examinations, investigations, and test and studies as he deems necessary for the performance of the Work at the Contract price, within the Contract Time, and in accordance with the other terms and conditions of the Contract documents; and no additional examinations, investigations, tests, reports, or similar data are or will be required by Contractor for such purposes.

- 7.4 Contractor has correlated the results of all such observations, examinations, investigations, tests, reports, and data with the terms and conditions of the Contract documents.
- 7.5 Contractor has given Engineer written notice of all conflicts, errors, or discrepancies that he has discovered in the Contract documents and the written resolution thereof by Engineer is acceptable to Contractor.

ARTICLE 8. CONTRACT DOCUMENTS.

The Contract documents which comprise the entire agreement between Owner and Contractor are attached to this Agreement, made a part hereof and consist of the following:

- 8.1 This Agreement (Pages SFA-1 to SFA-6, inclusive).
- 8.2 Exhibit "A" - Bid Form and Bid Schedule.
- 8.3 Affidavit of Drug Free Work Program
- 8.4 Addenda
- 8.5 Performance & Payment Bonds
- 8.6 Certificate of Contractor
- 8.7 Geotechnical Report
- 8.8 Project Sign
- 8.9 Certificates of Insurance, of Workers' Compensation Coverage, and of Unemployment Insurance Coverage.
- 8.10 2013 Standard General Conditions of the Construction Contract (Pages i to 65, inclusive).
- 8.11 Standard Supplementary Conditions (Pages SSC-1 to SSC-13, inclusive).
- 8.12 General Requirements, consisting of nine (9) sections
- 8.13 Technical Specifications consisting of nineteen (19) sections
- 8.14 Notice of Award.
- 8.15 Notice to Proceed.
- 8.16 Minutes of the Pre-Bid Conference, if any.

- 8.17 Shop Drawings and other Submittals furnished by Contractor during performance of the Work and accepted by the Owner.
- 8.18 Any modifications, amendments, and supplements, including Change Orders, issued pursuant to Article 11 of the General Conditions, on or after the effective date of this Agreement.
- 8.19 Notice of Substantial Completion.

ARTICLE 9. MISCELLANEOUS PROVISIONS.

9.1 The CONTRACTOR hereby agrees, warrants, and assures compliance with the provisions of Title VI and VII of the Civil Rights Act of 1964 and all other federal statutory laws which provide in whole or in part that no person shall be excluded from participation or be denied benefits of or be otherwise subjected to discrimination in the performance of this Contract or in the employment practices of the CONTRACTOR on the grounds of handicap and/or disability, age, race, color, religion, sex, national origin, or any other classification protected by federal, Tennessee State Constitutional or statutory law. The CONTRACTOR shall upon request show proof of such non-discrimination and shall post in conspicuous places available to all employees and applicants notices of non-discrimination.

Terms used in this Agreement, which are defined in the General Conditions, shall have the meanings designated in those conditions.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed in one (1) original copy on the day and year first above written.

APPROVED AS TO FORM:

 (PROJECT: _____)

DATED this _____ day of _____, 2021

CONTRACTOR:

ATTEST:

By: _____

By: _____

Title: _____

Title: _____

ATTEST:

By: _____
Debra Murrell
Title: City Recorder

OWNER:
CITY OF LAKELAND, TENNESSEE
A Municipal Corporation

By: _____
Shane Horn
Title: City Manager

PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

City of Lakeland
 10001 Highway 70, Lakeland, TN 38002

CONSTRUCTION CONTRACT

Effective Date of the Agreement: _____

Amount: _____

Description *(name and location):* **2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX & RECREATION PARK**

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form: None See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

 Contractor's Name and Corporate Seal *(seal)*

 Surety's Name and Corporate Seal *(seal)*

By: _____
 Signature

By: _____
 Signature *(attach power of attorney)*

 Print Name

 Print Name

 Title

 Title

Attest: _____
 Signature

Attest: _____
 Signature

 Title

 Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

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 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price 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 Owner or its heirs, executors, administrators, successors, and assigns.

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

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished,

the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner 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 Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

City of Lakeland
10001 Highway 70, Lakeland, TN 38002

CONTRACT

Effective Date of Agreement: _____

Amount: _____

**2018 LPRF PROJECT-LAKELAND ATHLETIC COMPLEX
& RECREATION PARK**

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. Reserved.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner 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.

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

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

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

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory 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.

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

15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of 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 Contractor and Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

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

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner’s Representative *(Engineer or other)*:

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____

COUNTY OF _____

The undersigned, principal officer of _____, an employer of five (5) or more employees contracting with _____ County government to provide construction services, hereby states under oath as follows:

1. The undersigned is a principal officer of _____ (hereinafter referred to as the "Company"), and is duly authorized to execute this Affidavit on behalf of the Company.
2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the *Tennessee Code Annotated*.
3. The Company is in compliance with T.C.A. § 50-9-113.

Further affiant saith not.

Principal Officer

STATE OF _____

COUNTY OF _____

Before me personally appeared _____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this _____ day of _____, 20_____.

Notary Public

My commission expires: _____

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
 1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
 1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

- A. Standards Specifications, Codes, Laws and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
- 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
 - 1. include at least the specific coverages provided in this Article.
 - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 - 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 Supervision and Superintendence

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 Services, Materials, and Equipment

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
 - C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
 - D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
 - E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
 - F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

- O. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.
3. With each submittal, Contractor shall give Engineer 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 set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- b. 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 required by Paragraph 7.16.D.

2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. 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.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 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 will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
 - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

- 1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
 - 2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

STANDARD
SUPPLEMENTARY CONDITIONS*

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as follows. All provisions which are not so amended or supplemented remain in full force and effect.

G.C. – 1.02.D

Delete the definition of "Defective," on Page 5 of the General Conditions, in its entirety, and insert the following:

"Defective - An adjective which when modifying the word "Work" refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or which has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05 , and the Work is damaged through no fault of the Contractor after Owner has assumed said responsibility)."

G.C. –1.01.28

Delete the definition of "Owner," on Page 3 of the General Conditions, in its entirety, and insert the following:

"Owner - i.e., City of Lakeland, Tennessee, a municipal corporation."

G.C. – 2.01

All bonds, including Bid Bond, Performance Bond, and Labor and Material Payment Bond, shall be submitted on the forms provided for such purpose by Owner.

G.C. - 2.02

Delete the first sentence of paragraph 2.02 of the General Conditions, and insert the following:

"Owner shall furnish Contractor two (2) sets of the Contract Documents."

* For Use with EJCDC C-700 (2013 Edition) Standard General Conditions Of The Construction Contract.

G.C. - 2.05.A

Add the following to paragraph 2.05.A of the General Conditions:

"This schedule shall be a bar chart, CPM, or PERT Schedule. This schedule shall be updated as required because of actual progress, or as requested by Owner."

G.C. - 3.02.A.1

Add the following to paragraph 3.02.A.1 of the General Conditions:

"In the event of any conflict between the provisions of the Contract Documents and any such referenced provisions, the language of the Contract Documents will take precedence over that of any standard specification, manual, or code."

G.C. - 4.03.A

Delete the following to paragraph 4.03.A of the General Conditions, in its entirety, and insert the following:

"Contractor shall provide construction surveying services to establish horizontal and vertical control and set appropriate bench marks for Contractor's use during construction. The Contractor shall be responsible for any additional surveying required for the construction of the project.

The Contractor shall protect all existing survey monuments, brass caps, property corner markers, right-of-way monuments, and reference points from damage during his operations. If it is necessary to remove any of these to accomplish the Work, the Contractor shall hire a Surveyor licensed to practice in the State of Tennessee to reference and reset such monuments.

All costs required by this Supplementary Condition shall be merged with the other bid items and the Contractor will not receive any additional compensation."

G.C. - 5.03.A

Add the following after paragraph 5.03.A.3 of the General Conditions:

"5.03.A.4 Copies of these reports and drawings that are not included with Bidding Documents may be examined at the Engineer's office during regular business hours. These reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which Contractor is entitled to rely, as provided in Paragraph 5.03.B of the General Conditions, are incorporated therein by reference."

G.C. - 6.01.A

Amend the first sentence of paragraph 6.01.A of the General Conditions to read as follows:

"Contractor shall furnish Performance and Payment Bonds, as required by Tennessee Statutes, each in an amount as specified as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents."

All bonds, including Bid Bond, Performance Bond, and Labor and Material Payment Bond, shall be submitted on the forms provided for such purpose by Owner.

G.C. -6.01.D

Amend paragraph 6.01.D of the General Conditions to read as follows:

"If the surety on any Bond furnished by Contractor is declared a bankrupt, becomes insolvent, or is no longer proper or sufficient, as provided by Tennessee Statutes, or its right to do business is terminated in Tennessee or it ceases to meet the requirements of Paragraph 6.01, Contractor shall within ten (10) days thereafter substitute another Bond and Surety, both of which must be acceptable to Owner."

G.C. - 6.03.A through 6.03.E

Delete paragraphs 5.04.A.1 through 5.04.A.6 of the General Conditions in their entirety and insert the following:

- 6.03.A A. Workmen's Compensation - Statutory Limit; and,
- B. Employer's Liability, with limits of \$500,000; on all employees.
- 6.03.B Comprehensive General Liability (IF USING ISO NEW OCCURRENCE FORM)

General Contractor:

- A. Bodily Injury: \$1,000,000 per claimant
 \$ 1,000,000 per occurrence
 \$ 2,000,000 aggregate
- B. Personal Injury: \$ 2,000,000 aggregate
- C. Property Damage: \$ 1,000,000 per claimant
 \$ 1,000,000 per occurrence
 \$ 2,000,000 aggregate

6.03.C Comprehensive General Liability (IF USING ISO NEW SIMPLIFIED CGL OCCURRENCE FORM)

CONTRACTOR:

- A. General Aggregate: \$2,000,000
- B. Products-Completed Operations Aggregate: \$2,000,000
- C. Personal and Advertising Injury: \$2,000,000
- D. Each Occurrence: \$2,000,000
- E. Fire Damage (any one fire): 1,000,000
- F. Medical Expense (any one person): \$5,000

6.03.D Automobile Liability:

- A. Bodily Injury: \$1,000,000 each person
\$1,000,000 per accident
- B. Property Damage: \$1,000,000 each occurrence

Independent CONTRACTORS: \$1,000,000

6.03.E Coverage General Contractor Only:

- A. Umbrella/Excess Policy Amount: \$2,000,000

G.C. 6.03.I

Add the following after paragraph 6.03.I.5 of the General Conditions:

6. Contractor shall require all subs to carry at least \$500,000 limits in ALL areas described above and provide proof of insurance if required by the Owner.
7. All policies must contain a minimum 30-day notice of cancellation to the Owner.
8. All policies referenced herein shall name the Owner, its agents and executive officers as additional insured.
9. All insurance shall be maintained continuously during the life of the Contract including warranty period, but the Contractor's liabilities under this Contract shall not be deemed limited in any way by the insurance coverage required.

10. The comprehensive general liability insurance shall include completed operations insurance.
11. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least thirty (30) days prior written notice has been given to Owner and Engineer by certified mail.
12. All such insurance shall remain in effect until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work. In addition, Contractor shall maintain such completed operations insurance for at least two (2) years after final payment and furnish owner with evidence of continuation of such insurance upon final payment and one (1) year thereafter. The Owner shall be named as an additional insured on the Contractor's general liability, automobile liability, and umbrella liability policies with respect to Contractor's and its Subcontractor's work under the Agreement. The insurance coverage described herein shall in no way limit or relieve Contractor from indemnifying and holding Owner harmless with respect to claims. Nothing herein shall be construed as a waiver of any immunities, defenses or tort liability limits that the City may have under the Tennessee Governmental Tort Liability Act or other applicable law.
13. Prior to commencement of work, Contractor shall procure and at all times thereafter maintain with an insurer acceptable to the Owner the above referenced minimum insurance protecting the Contractor and Owner against liability from damages because of injuries, including death, suffered by persons, including employees of the Owner, and liability from damages to property arising from or growing out of the Contractor's negligent operations in connection with the performance of this contract.

G.C. -6.04.A

Delete paragraph 6.04.A of the General Conditions in its entirety and insert the following:

“6.04.A Owner shall be responsible for purchasing and maintaining Owner's own liability insurance as it desires, and, at Owner's option, it may purchase and maintain such insurance as will protect Owner against claims which may arise from its operations under the Contract Documents.”

G.C. -6.05.A

Delete paragraph 6.05.A of the General Conditions in its entirety and insert the following:

“6.05.A Contractor shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof. This insurance shall:”

G.C. - 6.05.A.1

Delete paragraph 6.05.A.1 of the General Conditions in their entirety and insert the following:

“6.05.A.1 Owner shall not be responsible for purchasing and maintaining any property insurance to protect the interests of Contractor, Subcontractors, or others in the Work. Risk of loss will be borne by Contractor, Subcontractor, or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.”

G.C. – 6.06.A through 6.06.D

Delete paragraphs 6.06.A through 6.06.D of the General Conditions in their entirety.

G.C. -6.07.A through 6.07.B

Delete paragraph 6.07.A and 6.07B of the General Conditions in its entirety and insert the following:

“6.07.A Any insured loss under the policies of insurance required by Paragraphs 6.05 will be adjusted with Contractor and Owner and the proceeds made payable to Contractor and Owner.”

“6.07.B Such proceeds shall be held by Owner and Owner shall serve as trustee for the insureds, as their interests may appear. Owner shall distribute the proceeds in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the monies so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.”

G.C. - 7.04.C

Delete the first sentence of paragraph 7.04.C of the General Conditions and insert the following:

“The Contractor shall supply the Engineer with three (3) copies of all information and supporting data on each proposal or submittal made pursuant to Paragraphs 7.04.A.2 and 7.04.B, not less than ten (10) days prior to the bid opening date. If approved, the Engineer will approve such request in writing by Addendum.”

G.C. – 7.12.C

Add the following to paragraph 7.12.C of the General Conditions:

“It is the Owner's policy to provide contractors performing work at/on Owner–owned facilities with a list of hazardous chemicals on site, and labeled containers of which are reasonably anticipated to be contained in unlabeled pipes, confined space, or other areas of hazardous chemical exposures, together with related Material Safety Data Sheets. It is the responsibility of the Contractor to properly

and adequately train their employees with respect to hazards presented by such chemicals and remedial measures to be taken in case of exposure."

G.C. - 9.06.A

Delete paragraph 9.06.A of the General Conditions in its entirety.

G.C. - 10.08.B through 10.08.C

Add the following to the end of both paragraphs 10.08.B and 10.08.C of the General Conditions:

"...except to the extent such is in conflict with the Contract Documents or applicable law, known to Engineer, and not disclosed to Owner upon discovery by Engineer."

G.C. - 10.08.D through 10.08.E

Delete paragraph 10.08.D through 10.08.E of the General Conditions in its entirety.

G.C. - 13.01.B.1

Add the following to the end of paragraph 13.01.A.1 of the General Conditions to read as follows:

"The expenses of performing Work after regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner and which are incurred consistent with provisions of Tennessee Statutes."

G.C. - 13.01.B.5.c

Delete paragraph 13.01.B.5.c of the General Conditions in its entirety and insert the following:

"13.01.B.5.c Equipment. For any machinery or special equipment (other than small tools) including fuel and lubricants, plus transportation costs, the use of which has been authorized by the Engineer, the Contractor shall receive payment in accordance with the latest approved edition of the Equipment Rental Rates and Construction Sign Rate Schedule of the Tennessee State Transportation Commission. In the event that any of the equipment to be used is not shown in said schedule, the rental rate for such equipment shall be agreed upon in writing before the Work is started.

13.01.B.5.c.1 Rental of equipment will be measured by time in hours of actual working time and necessary travel time within the limits of the Project. If special equipment ordered by the Engineer is to be used in connection with additional work, travel time to the Project will be measured for payment.

13.01.B.5.c.2 Payment will be made based on the number of hours as outlined above, the sum of which will have no percentage added thereto.

13.01.B.5.c.3 Standby time will be paid only on equipment ordered brought to the Project and/or ordered held on the Project by the Engineer. Equipment already on the Project to complete regular contract items will not be considered for payment for standby time.

13.01.B.5.c.4 No formal rate determination schedule will be required as stated in the "Equipment Rental Rates and Sign Rate Schedule;" however, the Contractor shall submit to the Engineer at the Pre-construction conference his proposed base and service rates schedule for each type, model, and size of equipment to be used on this Project. These rates must be approved by the Engineer and accepted by the Contractor before payment to the Contractor for utilization of these rental items is made.

13.01.B.5.c.5 Should there be no specific bid item for mobilization, mobilization for equipment, normally on the Project, that is involved in additional work shall be considered incidental to the payment provisions for mobilization made in the original Agreement."

G.C. – 13.03.E

Delete paragraph 13.03.E of the General Conditions in its entirety and insert the following:

"13.03.E Adjustments in unit prices for increased or decreased quantities of major pay items will be governed as follows:

13.03.E.1 If the quantity of any major pay item of Work required to complete the project varies from the original contract quantity by 25% or less, payment will be made at the contract unit price.

13.03.E.2 Should the original contract quantity of any major pay item of Work be increased or decreased by more than 25%, either party to the Agreement may demand in writing within fifteen (15) days that a Change Order be negotiated with an adjustment of contract unit prices satisfactory to both parties.

Where the original contract quantity of a major pay item is increased, the adjusted contract price will apply only to that portion of the pay item which is in excess of 125% of the original contract quantity. The adjusted contract unit price for the quantity of the major pay item which is in excess of 125% of the original contract quantity will be negotiated on the basis of the actual cost of the entire item, complete, in place, plus a negotiated allowance for profit and applicable overhead costs.

In the case where a major pay item is decreased by more than 25% from the original contract quantity, the adjusted contract unit price will apply to the quantity measured and accepted for payment. At the request of the

Contractor, adjustment of the contract unit price for the quantity of a pay item which is less than 75% of the original contract quantity will be considered, insofar as it justifies an increase in the pro rata share of the fixed expense chargeable to such pay item because of the decreased quantity of the item. However, total payment for the pay item shall not exceed that amount which would be paid for 75% of the original contract quantity for the pay item at the original contract unit price.

- 13.03.E.3 If neither party demands in writing, an adjustment of unit prices for major pay items of Work, within fifteen (15) days of proposed quantity adjustment, then the contract unit prices will govern.
- 13.03.E.4 No contract unit price adjustment as provided for herein will be made for any major pay item of Work for which the total amount of the adjustment is less than \$1,000.00.
- 13.03.E.5 For the purpose of this Supplementary Condition, major pay items are defined as any contract pay items having an original amount bid in excess of 5% of the total original Contract Price."

G.C. - 14.02.C

Add the following to paragraph 14.02.C of the General Conditions:

"The Contractor shall be responsible for payment of all costs associated with pressure– leakage testing, material testing, asphalt and concrete mix designs, and for direct payment to the testing laboratory for all retests due to failing test results. These retesting costs must be paid before Final Payment."

G.C. - 14.07.A

Amend the first sentence of paragraph 14.07.A of the General Conditions to read as follows:

"If within one (1) year after the date of Final Payment, or such longer period of time as may be prescribed by Laws or Regulations..."

G.C. - 15.01.B.1

Amend the first sentence of paragraph 15.01.B.1 of the General Conditions to read as follows:

"By the date established for each progress payment (but not more often than once a month), Contractor shall prepare and submit to Engineer for review, an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents."

G.C. - 15.01.C.2.d

Add the following to paragraph 15.01.C.2.d of the General Conditions:

“In fulfilling his or her obligations under Tennessee Statute, Owner's representative may rely upon the recommendations of Engineer.”

G.C. - 15.01.C.2.e

Add the following to paragraph 15.01.C.2.e of the General Conditions:

“Owner shall make the progress payment as defined in the Agreement, provided the Application is in order and is approved.”

G.C. - 15.05.A

Add the following after paragraph 15.05.A of the General Conditions:

"15.05.A.1 Correction of Work Before Final Payment. The Contractor shall promptly remove from the premises all materials condemned by the Owner as failing to conform to the Agreement, whether incorporated in the Work or not, and where materials and/or Work have been condemned by the Owner, the Contractor shall promptly replace and re-execute his Work in accordance with the Contract Documents and without expense to the Owner, and shall bear the expense of all retests and making good all Work of other contractors destroyed or damaged by such removal or replacement or re-execution of the Work. Correction of any such condemned Work shall be a condition precedent to any further payment under the Agreement.

15.05.A.2 Deductions for Uncorrected Work. If the Owner deems it inexpedient to correct Work which has been damaged or which has not been done in accordance with the Contract Documents, the difference in value, together with a fair allowance for damage, as determined by the Owner, shall be deducted from the sum agreed to be paid the Contractor for the performance of the Contract."

G.C. - 15.06.A.3

Amend the last sentence of paragraph 15.06.A.3 of the General Conditions to read as follows:

"If any Subcontractor or Supplier fails to furnish a release or receipt in full, and to the extent permissible pursuant to Tennessee Statutes. Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify Owner against any Lien."

G.C. - 15.06.D.1

Delete paragraph 15.06.D.1 of the General Conditions in its entirety and insert the following:

"15.06.D.1 The Owner shall not be required to make Final Payment to the Contractor until such time as the provisions of Tennessee Statute Sections 66-11-205, have been fulfilled, the retained percentage will be paid within fifteen (15) days of the expiration thereof.

15.06.D.2 Should any liens or claims be filed, retainage equal to the amount of the lien or claim will be held until a satisfactory agreement is reached between the Owner, Contractor, and Contractor's surety.

15.06.D.3 All warranties and guarantees from the Contractor, Subcontractors, Suppliers, etc., shall be delivered to the Owner and be of acceptable form and content as determined by the Owner before Final Payment is made."

G.C. - 15.07.A. through 15.07.B

Amend paragraph 15.07.A of the General Conditions to read as follows:

"A waiver of all claims by Owner against Contractor, except claims arising from unsettled claims for labor and materials, from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06 or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by Owner of any rights in respect of Contractor's continuing obligations under the Contract Documents; and,"

Amend paragraph 15.07.B of the General Conditions to read as follows:

"A waiver of all claims by Contractor against Owner other than those previously made known to Owner in writing and still unsettled."

G.S. – 16.02.D

Delete paragraph 16.02.D in its entirety.

G.C. - 16.02.E

Add the following immediately after paragraph 16.02.E of the General Conditions:

"16.02.E.1 Should an act of God result in substantial damage to all or a portion of the Work, or should the Owner's convenience necessitate termination in the sole discretion of the Owner, the Owner shall have the option of terminating the Agreement. If the Owner exercises the option to terminate, a Notice of Termination so providing will be issued. Such Notice of Termination may provide for the Contractor to perform any Work deemed by the OWNER as necessary to put the project in satisfactory condition for the termination of all Work. Payment to the Contractor shall be made in accordance with the

Agreement. Upon the issuance of Notice of Termination, the Contractor shall be relieved of further responsibilities for damage to the Work (excluding materials not already incorporated into the Work) and will not be required to perform any further Work other than that specified in the Notice of Termination.

- 16.02.E.2 When the Owner determines that the Work specified in the Notice of Termination has been completed, the Owner shall accept the Project, and immediately upon such acceptance, the Contractor will not be required to perform any further Work thereon, and shall be relieved of his responsibility for injuries to persons or property.
- 16.02.E.3 After acceptance of the Work, pursuant to the General Conditions, the Contractor will be paid for the Work done prior to termination. The Owner will determine the value of the partially completed Work as follows: The Contractor will be paid for all Work to date. This amount shall be computed by determining the percentage of Work completed prior to termination and multiplying that percentage against the Total Contract Price. The amount to be paid shall not exceed the amounts previously paid or due. The Contractor shall not be entitled to his anticipated profits for the Work which would have been performed, but for termination.
- 16.02.E.4 If, prior to such termination, the Contractor has placed an order for materials specially manufactured for the Project, which materials are not suitable for use in other projects of the Owner or sale to others in the ordinary course of the vendor's business, the Contractor will be paid the actual cost of the materials to the Contractor or the cancellation charges, if any, assessed by the vendor. The determination of whether the order shall be completed or canceled shall be made by the Owner. Any materials approved for payment by the Owner and Contractor shall become the property of the Owner and the actual cost of any further handling will be paid for by the Owner.
- 16.02.E.4 No payment will be made for materials which have been damaged and are not acceptable for incorporation in the Work in accordance with the requirements of the Agreement. The Contractor shall reimburse the OWNER for any amounts previously paid by the Owner for such unacceptable material, and agrees that the Owner may deduct the amount of such previous payment made by the Owner for any monies due or which may become due the Contractor. If the Owner has paid for acceptable materials not incorporated into the Work under the General Conditions, the Owner will have the option of taking title to all or any portion of such materials, or of receiving reimbursement from the Contractor for any amounts previously paid to the Contractor. The Contractor agrees to pay to the Owner upon demand any amounts previously paid for such materials, and agrees that the Owner may

deduct the amount of such previous payments from any monies due or which become due the Contractor.

G.C.- 16.02.G

Add the following paragraphs immediately after paragraph 16.02.G of the General Conditions:

“16.02.G Contractor's Responsibility on Receipt of Notice of Termination.

Upon receipt of Notice of Termination from the Owner, whether for default, convenience of the Owner, or otherwise, the Contractor shall:

1. Stop all Work under the Agreement on the date of, and to the extent specified in, the Notice of Termination.
2. Place no further orders or subcontracts for materials, equipment, or services except as may be necessary for completion of such portions of the Work specified in the Notice of Termination.
3. Cancel or terminate all orders of subcontracts to the extent that they relate to the performance of Work specified in the Notice of Termination; and,
4. Comply with all other requirements of the Owner as may be specified in the Notice of Termination.

16.02.H Subcontract Provision.

The Contractor shall insert in all subcontracts a provision that the Subcontractor shall stop all Work on the date of, or to the extent specified in, a Notice of Termination from the Owner and shall require the Subcontractors to insert the same provision in their subcontracts.

16.02.I Duty to Notify Subcontractors.

The Contractor shall immediately, upon receipt, communicate any Notice of Termination issued by the Owner to all affected Subcontractors."

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
RECREATION EDUCATIONAL SERVICES
William R. Snodgrass TN Tower, 312 Rosa L. Parks Avenue, 2nd Floor, Nashville, TN 37243
PH: 615-532-0748 FAX: 615-532-0732

**CERTIFICATION OF CONTRACTOR
REGARDING CONFLICTS OF INTEREST,
LOBBYING, NONDISCRIMINATION, PUBLIC ACCOUNTABILITY,
AND PUBLIC NOTICE**

This certification is required by the agency that has funded, in part, by: **(check one)**

- Local Park & Recreation Fund (LPRF)** **Land & Water Conservation Fund (LWCF)**
 Recreation Trail Program (RTP) **Other** _____

The Contractor, _____, by signing and submitting this Certification, acknowledges the following: This Certification will be incorporated into the Agreement executed between: _____ (*the Grantee*) and the Contractor.

By signing and submitting this Certification, the Contractor certifies that neither it, its principals nor affiliates has violated the following:

1. Conflicts of Interest: The Contractor warrants that no part of the total contract award shall be paid directly or indirectly to an employee or official of the State of Tennessee as wages, compensation, or gifts in exchange for acting as an officer, agent, employee, subcontractor, or consultant to the Grantee in connection with any work contemplated or performed relative to this project or the Grant.
2. Lobbying: The Contractor certifies to the best of its knowledge and belief that:
 - a. No federally appropriated funds have been paid or will be paid, by or on behalf of the Contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, and entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than federally appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this grant, loan, or cooperative agreement, the Contractor shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
 - c. The Grantee shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-grants, subcontracts, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients of federally appropriated funds shall certify and disclose accordingly.
3. Nondiscrimination: The Contractor hereby agrees, warrants, and assures that no person shall be excluded from participation in, be denied benefits of, or be otherwise subjected to discrimination in the performance of this grant or in the employment practices of the Contractor on the grounds of disability, age, race, color, religion, sex, national origin, or any other classification protected by Federal, Tennessee State constitutional, or statutory law. The Contractor shall, upon request, show proof of such nondiscrimination and shall post in conspicuous places, available to all employees and applicants, notices of nondiscrimination.

4. Public Accountability: If this Grant involves the provision of services to citizens by the Grantee on behalf of the State, the Grantee agrees to establish a system through which recipients of services may present grievances about the operation of the service program, and the Grantee agrees to display a sign stating:

“NOTICE: This Grantee is a recipient of taxpayer funding. If you observe an employee engaging in any activity which you consider to be illegal or improper, please call the State Comptroller's toll free hot line: 1-800-232-5454.”

Said sign shall be displayed in a prominent place, located near the passageway(s) through which the public enters in order to receive Grant supported services.

- 5, Public Notice: All notices, informational pamphlets, press releases, research reports, signs, and similar public notices prepared and released by the Grantee shall include the statement, “This project is funded under an agreement with the Tennessee Department of Environment and Conservation.” Any such notices by the Grantee shall be approved by the State.

**Grantee's Authorized Representative:
(Usually Mayor)**

Signature

Print Name

Title

Date

Contractor

Signature

Print Name

Title

Date



GEOTECHNOLOGY **INC**

FROM THE GROUND UP

**GEOTECHNICAL EXPLORATION
LAKELAND ATHLETIC COMPLEX
LAKELAND, TENNESSEE**

Prepared for:
**BARGE DESIGN
MEMPHIS, TENNESSEE**

Prepared by:
**GEOTECHNOLOGY, INC.
MEMPHIS, TENNESSEE**

Date:
MARCH 5, 2020

Geotechnology Project No.:
J032791.01

SAFETY
QUALITY
INTEGRITY
PARTNERSHIP
OPPORTUNITY
RESPONSIVENESS



March 5, 2020

Mr. Russ Brasfield, P.E.
Barge Design
60 Germantown Court, Suite 100
Memphis, Tennessee 38108

Re: Geotechnical Exploration
Lakeland Athletic Complex
Lakeland, Tennessee
Geotechnology Project No. J032791.01

Dear Mr. Brasfield:

Presented in this report are the results of the geotechnical exploration performed by Geotechnology, Inc. for the proposed athletic complex. The report includes our understanding of the project, observed site conditions, conclusions and/or recommendations, and support data as listed in the Table of Contents.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions regarding this report, or if we can be of any additional service to you, please do not hesitate to contact us.

Respectfully submitted,

GEOTECHNOLOGY, INC.

Jacob Monroe, E.I.
Engineer

JDM/DMS/DBA:jdm

Copies submitted: Client (email/2 mail)

Dale M. Smith, P.E.
Geotechnical Manager

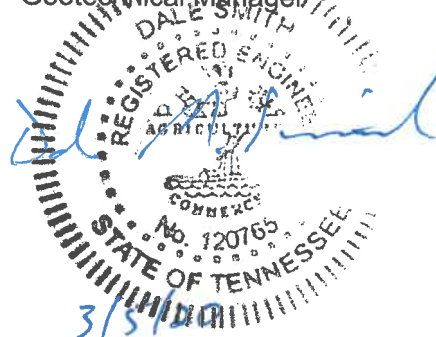




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**GEOTECHNICAL EXPLORATION
LAKELAND ATHLETIC COMPLEX
LAKELAND, TENNESSEE**

March 5, 2020 | Geotechnology Project No. J032791.01

1.0 INTRODUCTION

Geotechnology, Inc. has prepared this geotechnical exploration report for Barge Design Solutions (Barge) for the proposed athletic complex to be located in Lakeland, Tennessee. Our services were provided in general accordance with the scope of services described in our Proposal P032791.01, dated January 14, 2020. Our services documented in this report were authorized by Barge's signed subagreement for professional services by Mr. Russ Brasfield, of Barge, on March 4, 2020.

The purposes of the geotechnical exploration were to develop a general subsurface profile at the site and prepare recommendations for the geotechnical aspects of the design and construction of the project as defined in our proposal. Our scope of services included site reconnaissance, geotechnical borings, laboratory testing, engineering analyses, and preparation of this report.

A copy of "Important Information about This Geotechnical-Engineering Report," published by the Geotechnical Business Council of the Geoprofessional Business Association, is included in Appendix A for your review. The publication discusses report limitations and ways to manage risk associated with subsurface conditions.

2.0 SITE DESCRIPTION

The project site is located on the south side of Memphis Arlington Road in Lakeland, Tennessee as shown on Figure 1 (Site Location and Topography) in Appendix B. The site is essentially level and is heavily wooded with various ditches throughout the area and an underground sewer line running northwest to southeast on the western portion of the site in a clearing of the tree line. The site is bordered to the east, south, and west by dense woods and to the north by Memphis Arlington Road. Scotts Creek is located along the eastern border of the site.

3.0 PROJECT INFORMATION

The project consists of the development of an athletic complex consisting of two multi-purpose athletic fields, associated parking and drive areas, sidewalks, and bleachers. Based on the



provided preliminary site plan¹, the site ranges in elevation from El 275 to the northeast to El 287 to the southwest. We anticipate less than 10 feet of cut and fill will be required to achieve design grade. Geotechnical Exploration

The geotechnical exploration consisted of six borings, designated as Borings B-1 through -6, located in the proposed athletic fields and parking and drive areas. The borings were located in the field by a representative of Geotechnology. The boring locations shown on Figure 2 (Aerial Photograph of Site and Boring Locations) in Appendix B are approximate; if elevations or more specific boring locations are required, the client should retain a registered surveyor to establish boring locations and elevations.

The borings were drilled on February 28, 2020 with an ATV-mounted rotary drill rig (Diedrich D-50) advancing hollow-stem augers as indicated on the boring logs in Appendix C. Sampling of the soils was accomplished ahead of the augers at the depths indicated on the boring logs in Appendix C, using 2-inch-outside-diameter (O.D.) split-spoons or 3-inch-O.D., thin-walled Shelby tube samplers in general accordance with the procedures outlined by ASTM D1586 and ASTM D1587, respectively. Standard Penetration Tests (SPTs) were performed on the split-spoon samples using an automatic hammer to obtain the standard penetration resistance, or N-value², of the sampled material.

The drill crew kept a field log of the subsurface profile noting the soil types and stratifications, groundwater, SPT results, and other pertinent data. Observations for groundwater were made in the borings during drilling.

Representative portions of the split-spoon samples were placed in glass jars to preserve sample moisture. The Shelby tubes were capped and taped at their ends to preserve sample moisture and unit weight, and the tubes were transported and stored in an upright position. The glass jars and Shelby tubes were marked and labeled in the field for identification, then returned to our laboratory in Memphis.

4.0 LABORATORY REVIEW AND TESTING

Laboratory testing was performed on soil samples to assess engineering and index properties. The soil testing consisted of moisture contents (ASTM D2216) and Atterberg limits (ASTM D4318). Most of the laboratory test results are presented on the boring logs in Appendix C and the Atterberg limit test outputs are provided in Appendix D.

¹ Preliminary site plan, "Lakeland Athletic Complex", designed and provided electronically by Barge Design Solutions, not dated.

² The standard penetration resistance, or N-value, is defined as the number of blows required to drive the split-spoon sampler 12 inches with a 140-pound hammer falling 30 inches. Since the split spoon sampler is driven 18 inches or until refusal, the blows for the first 6 inches are for seating the sampler, and the number of blows for the final 12 inches is the N-value. Additionally, "refusal" of the split-spoon sampler occurs when the sampler is driven less than 6 inches with 50 blows of the hammer.



The boring logs were prepared by a project geotechnical engineer from the field logs, visual classification of the soil samples in the laboratory, and laboratory test results. Terms and symbols used on the boring logs are presented on the Boring Log: Terms and Symbols in Appendix C. Stratification lines on the boring logs indicate approximate changes in strata. The transition between strata could be abrupt or gradual.

5.0 SUBSURFACE CONDITIONS

5.1 Stratigraphy

The soil stratigraphy at the site generally consisted of predominately fine-grained soils at the surface and extending to the maximum depth of exploration of 10 feet. Soils classified as very soft to very stiff, low plasticity “lean” clay (CL), silty clay (CL-ML), and silt (ML) with varying amounts of sand were encountered at the surface in the borings, extending to the maximum depth of exploration of 10 feet. Moisture contents of the tested samples ranged from 16 to 32 percent. Atterberg limits performed on select samples yielded liquid limits (LL) of 25 to 30 percent and plasticity indices (PI) of 5 to 7 percent. SPT N-values measured in the fine-grained soils ranged from 0 to 17 blows per foot (bpf). More specific descriptions of the soil layers are provided on the boring logs in Appendix C.

5.2 Groundwater

Groundwater was not encountered during drilling operations. Groundwater levels vary over time due to the effects of seasonal variation in precipitation, proximity to Scotts Creek, or other factors not evident at the time of exploration.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Geotechnology has prepared the following conclusions and recommendations based on our understanding of the proposed enhancements to the park, the field and laboratory data presented in this report, engineering analyses, and our experience and judgement.

6.1 Site Preparation and Earthwork

We have assumed less than 10 feet of cut or fill will be required to achieve design grade. The following paragraphs outline site grading recommendations for the site.

Site Preparation. In general, cut areas and areas to receive new fill should be stripped of topsoil, vegetation, fill, soft soils, and other deleterious materials. Topsoil should be placed in landscape areas or disposed of off-site and vegetation and tree roots should be over-excavated. Contractors should account for the removal of tree roots in their estimates.

The exposed subgrade should be proof-rolled using a tandem-axle dump truck loaded to approximately 20,000 pounds per axle (or equivalent proof-rolling equipment). Soft areas that develop should be over-excavated and backfilled with soil compacted to the densities specified in subsequent paragraphs.



Fill Materials, Placement, and Compaction. Fill materials should consist of natural soils classifying as lean clay, silt, clayey sand, or silty sand (CL, ML, SC, or SM), have a maximum LL of 45 and a PI of no more than 20. Such materials should be free from organic matter, debris, or other deleterious material, and have a maximum particle size of 2 inches. The onsite soils generally meet these criteria.

Fill and backfill should be placed in level lifts, up to 8 inches in loose thickness. For soils that exhibit a well-defined moisture density relationship, each lift should be moisture-conditioned to within the acceptable moisture content range provided in Table 1, and compacted to at least the minimum compaction indicated in Table 1. Moisture-conditioning can include: aeration and drying of wetter soils; wetting of drier soils; and/or mixing drier and wetter soils into a uniform blend. For granular soils that do not exhibit a well-defined moisture density relationship, the soils should be compacted to at least the minimum relative densities indicated in Table 2. Thinner lifts should be used for lighter compaction equipment.

Table 1. Percent Compaction and Moisture-Conditioning Requirements for Fill and Backfill.

Area	Minimum Percent Compaction ^{a,b}	Acceptable Moisture Content Range ^c
Structural ^d	95%	±2%
Non-Structural	92%	±2%
Pavement Subgrades	98%	±2%

^a In reference to the standard Proctor maximum dry unit weight measured by ASTM D698.

^b For general soils that do not exhibit a well-defined moisture-density relationship, refer to Table 2 for minimum relative density requirements.

^c In reference to the optimum moisture content as measured by ASTM D698.

^d Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of structures is defined as the area below the footprint and 1V:1H outward and downward projections from the bearing elevation of the structure.

Table 2. Relative Density Compaction Requirements for Granular Fill and Backfill.

Area	Minimum Relative Density ^{a,b}
Structural ^c	70%
Non-Structural	70%
Pavement Base Course	75%

^a Relative density evaluated from the maximum and minimum index densities measured by ASTM D4253 and ASTM D4254, respectively.

^b For granular soils that exhibit a well-defined moisture density relationship, refer to Table 1 for minimum percent compaction and moisture-conditioning requirements.

^c Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint and 1V:1H outward and downward projections from the bearing elevation of structure.

Maintaining the moisture content of bearing and subgrade soils within the acceptable range provided in Table 1 is important during and after construction. The silty and clayey bearing and subgrade soils should not be allowed to become wet or dry during or after construction, and



measures should be taken to prevent water from ponding on these soils and to reduce drying of these soils. Asphalt, concrete, or fill should not be placed over frozen or saturated soils, and frozen or saturated soils should not be used as compacted fill or backfill.

Upon completion of earthwork, disturbed areas should be stabilized. It is also recommended that riprap and/or armoring be used at the outlets of storm sewers and headwalls to reduce flow velocities and protect against erosion.

Site Water Management. Managing site water is important in successful performance of the pavement and foundation systems. Water from surface runoff and subsurface drains should be collected and discharged through a storm water collection system. Positive drainage should be established to promote drainage of surface water away and reduce ponding of water.

Vegetation. Trees and other, deep-rooted vegetation should not be planted 1.5 times their projected mature foliage radius from foundations, as their roots extract moisture from plastic and low-plastic soils alike, causing them to shrink, which can potentially result in foundation settlement. Shrubs and flowerbeds should be located a minimum of 5 feet away from the perimeter of foundations.

6.2 Seismic Site Classification and Seismic Design Parameters

The site lies within influence of the New Madrid Seismic Zone (NMSZ). It is our understanding the proposed construction will be designed in accordance with the 2015 International Building Code (IBC). The 2015 IBC stipulates structures be designed based on an earthquake event with a probability of exceedance of 2% in 50 years. Based on the results of the field and laboratory testing, our experience in the vicinity, and our interpretation of the 2015 IBC, it is our understanding the site class and seismic parameters in Table 3 are applicable for this project.

Table 3. Site Class and Seismic Parameters (2% Probability of Exceedance in 50 Years).

Category/ Parameter	Designation/ Value	Reference
S _S	0.934g ^a	Latitude 35.253215°N/Longitude 89.740993°W
S ₁	0.324g ^a	
Seismic Site Class	D	Chapter 20 of ASCE 7-10
F _a	1.126	2015 IBC Table 1613.3.3(1)
F _v	1.752	2015 IBC Table 1613.3.3(2)
F _{PGA}	1.000	ASCE 7-10 Table 11.8-1
S _{MS}	1.052g	2015 IBC Equation 16-37
S _{M1}	0.568g	2015 IBC Equation 16-38
S _{DS}	0.701g	2015 IBC Equation 16-39
S _{D1}	0.379g	2015 IBC Equation 16-40
PGA	0.500g	ASCE 7-10 Figure 22-7
PGA _M	0.500g	ASCE 7-10 Equation 11.8-1

^a S_S and S₁ were computed using the web-based U.S. Seismic Design Maps (<http://earthquake.usgs.gov/designmaps/us/application.php>) using the indicated latitude and longitude coordinates of the project site.



6.3 Utility Construction

Settlement of trench backfill can result in unsightly depressions and localized pavement failures. The magnitude of settlement can be reduced by mechanically compacting the trench backfill. Select granular backfill can be used for pipe bedding and minimum cover for utilities. The remainder of the utility trenches should be backfilled with flowable fill or compacted clayey soils up to design subgrade elevation to reduce the potential for water collecting in these trenches and being absorbed by the surrounding clays, causing heave pavement, athletic field surfaces, etc.

Granular bedding and backfill that exhibits a well-defined moisture density relationship should be compacted and moisture-conditioned per the requirements presented in Table 1; otherwise, the granular material should be compacted to at least the minimum relative densities indicated in Table 2 in the Site Preparation and Earthwork section of this report.

Utility trench backfill should be placed in 6- to 8-inch thick lifts with each lift compacted to at least the specified degree of compaction. Thinner lifts should be used for lighter compaction equipment. The backfill should not be flushed with water in an attempt to obtain compaction. Prior to placing the bedding and utilities within the utility trench, soft, saturated, and compressible material should be removed from the bottom of the trench to expose stiff soils.

7.0 RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on: Geotechnology's understanding of the proposed design and construction, as outlined in this report; site observations; interpretation of the exploration data; and our experience. Since the intent of the design recommendations is best understood by Geotechnology, we recommend Geotechnology be included in the final design and construction process, and be retained to review the project plans and specifications to confirm the recommendations given in this report have been correctly implemented. We recommend Geotechnology be retained to participate in pre-bid and preconstruction conferences to reduce the risk of misinterpretation of the conclusions and recommendations in this report relative to the proposed construction of the subject project.

Since actual subsurface conditions between boring locations could vary from those encountered in the borings, our design recommendations are subject to adjustment in the field based on the subsurface conditions encountered during construction. Therefore, we recommend Geotechnology be retained to provide construction observation services as a continuation of the design process to confirm the recommendations in this report and to revise them accordingly to accommodate differing subsurface conditions. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. Regardless of construction observation, contractors, suppliers, and others are solely responsible for the quality of their work and for adhering to plans and specifications.



8.0 LIMITATIONS

This report has been prepared on behalf of, and for the exclusive use of, the client for specific application to the named project as described herein. If this report is provided to other parties, it should be provided in its entirety with all supplementary information. In addition, the client should make it clear the information is provided for factual data only, and not as a warranty of subsurface conditions presented in this report.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

Our scope for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include an assessment of the effects of flooding and erosion of creeks or rivers adjacent to or on the project site.

Our scope did not include: any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site; or any services, designed or intended, to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the geotechnical exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Consequently, subsurface conditions could vary gradually, abruptly, and/or nonlinearly between sample locations and/or intervals.

The conclusions or recommendations presented in this report should not be used without Geotechnology's review and assessment if the nature, design, or location of the facilities is changed, if there is a lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, Geotechnology must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. Geotechnology will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or with reuse of the subsurface data or engineering analyses in this report.

The recommendations included in this report have been based in part on assumptions about variations in site stratigraphy that can be evaluated further during earthwork and foundation



construction. Geotechnology should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. Geotechnology cannot assume liability for the adequacy of its recommendations when they are used in the field without Geotechnology being retained to observe construction.



APPENDIX A – IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



Telephone: 301/565-2733

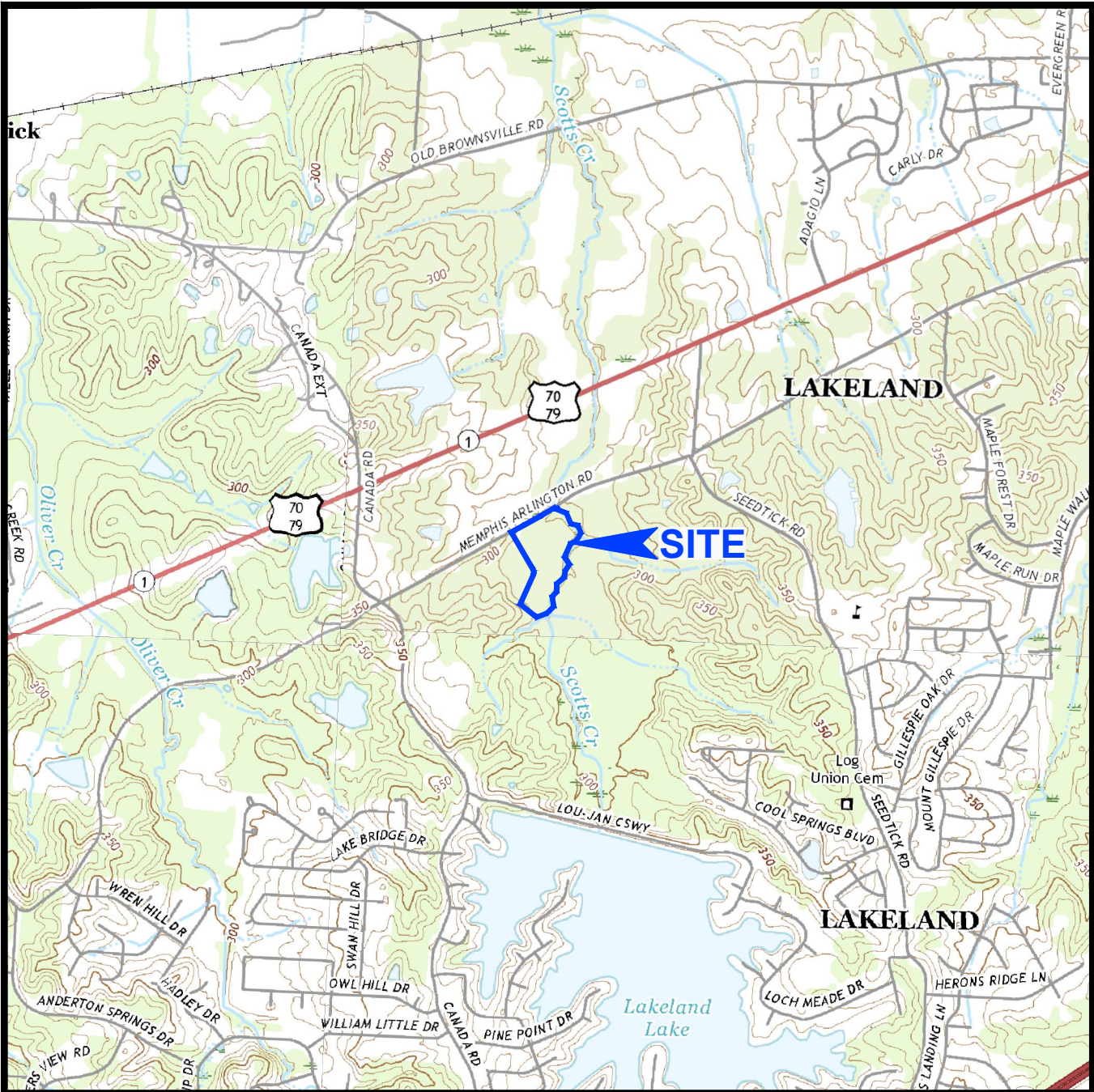
e-mail: info@geoprofessional.org www.geoprofessional.org



APPENDIX B – FIGURES

Figure 1 – Site Location and Topography

Figure 2 – Aerial Photograph of Site and Boring Locations



NOTES

1. Plan adapted from 7.5 minute U.S.G.S. maps for Arlington, Brunswick, Eads, and Ellendale, Tennessee quadrangles, last revised in 2019, 2013, 2016 and 2016, respectively.

0 2,000 4,000



SCALE IN FEET

Drawn By: WAH	Ck'd By: JDM	App'vd By: DMS
Date: 3-3-20	Date: 3-4-20	Date: 3-4-20



Lakeland Athletic Complex
Lakeland, Tennessee

**SITE LOCATION
AND TOPOGRAPHY**

Project Number
J032791.01

FIGURE 1



NOTES

1. Plan adapted from a March 14, 2018 aerial photograph courtesy of Google Earth and an undated, untitled drawing, supplied by the client.
2. Borings were located in the field with reference to site features and are shown approximate only.

LEGEND

● Boring Location



Drawn By: WAH	Ck'd By: JDM	App'vd By: DMS
Date: 3-3-20	Date: 3-4-20	Date: 3-4-20



Lakeland Athletic Complex
Lakeland, Tennessee

**AERIAL PHOTOGRAPH OF SITE
AND BORING LOCATIONS**

Project Number
J032791.01

FIGURE 2



APPENDIX C – BORING INFORMATION

Boring Logs

Boring Log Terms and Symbols

LOG OF BORING 2002 WL J032791.01 LAKELAND ATHLETIC COMPLEX.GPJ GTINC 06383013 15/03/2020 10:15:11 AM

Surface Elevation: _____ Datum _____		Completion Date: <u>2/28/20</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
DEPTH IN FEET	DESCRIPTION OF MATERIAL	STANDARD PENETRATION RESISTANCE (ASTM D 1586)							
		Δ - UU/2	○ - QU/2				□ - SV		
		WATER CONTENT, %							
		PLI	LL						
	Stiff to very stiff, brown and gray, SILTY CLAY - (CL-ML)								
		3-6-7	SS1	▲	●				
		4-7-10	SS2	●	—				
5									
	Medium stiff, brown to gray and brown, LEAN CLAY - CL trace sand	2-3-4	SS3	▲	●				
		3-3-4	SS4	▲					
10	Boring terminated at 10 feet.								

GROUNDWATER DATA

FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM WASHBORING FROM ___ FEET
JCG DRILLER ANC LOGGER
Diedrich D-50 DRILL RIG
 HAMMER TYPE Auto
 HAMMER EFFICIENCY 97 %

REMARKS:

Drawn by: JDM	Checked by: DMS	App'vd. by: DBA
Date: 3/2/20	Date: 3/4/20	Date: 3/4/20



Lakeland Athletic Complex
Lakeland, Tennessee

LOG OF BORING: B- 1

Project No. J032791.01

LOG OF BORING 2002 WL J032791.01 LAKELAND ATHLETIC COMPLEX.GPJ GTINC 06383015 15/03/2020 10:15 AM

Surface Elevation: _____ Datum _____		Completion Date: <u>2/28/20</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
DEPTH IN FEET	DESCRIPTION OF MATERIAL	Δ - UU/2 \circ - QU/2 \square - SV 0.5 1.0 1.5 2.0 2.5							
		STANDARD PENETRATION RESISTANCE (ASTM D 1586) \blacktriangle N-VALUE (BLOWS PER FOOT)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
	Medium stiff, brown to gray and brown, LEAN CLAY - CL								
	trace sand	1-2-5	SS1						
5		3-3-3	SS2						
	trace sand	3-3-4	SS3						
10	Boring terminated at 10 feet.	2-2-3	SS4						

GROUNDWATER DATA

FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM WASHBORING FROM ___ FEET
JCG DRILLER ANC LOGGER
Diedrich D-50 DRILL RIG
 HAMMER TYPE Auto

REMARKS:

Drawn by: JDM	Checked by: DMS	App'vd. by: DBA
Date: 3/2/20	Date: 3/4/20	Date: 3/4/20



Lakeland Athletic Complex
Lakeland, Tennessee

LOG OF BORING: B- 2

Project No. J032791.01

LOG OF BORING 2002 WL J032791.01 LAKELAND ATHLETIC COMPLEX.GPJ GTINC 06383015 15/03/2020 10:15:00 AM

Surface Elevation: _____ Datum _____		Completion Date: <u>2/28/20</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf			
DEPTH IN FEET	DESCRIPTION OF MATERIAL	STANDARD PENETRATION RESISTANCE (ASTM D 1586)								
		WATER CONTENT, %								
		Δ - UU/2	○ - QU/2	□ - SV	▲ N-VALUE (BLOWS PER FOOT)					
		0.5	1.0	1.5	2.0	2.5	PLI 10 20 30 40 50 LL			
	Soft, brown SILT - (ML)									
		1-1-1	SS1	▲						
	Soft to medium stiff, brown to brown and gray, LEAN CLAY - CL									
5		1-1-3	SS2	▲						
	trace sand									
		4-3-5	SS3	▲						
	trace sand									
		2-2-2	SS4	▲						
10	Boring terminated at 10 feet.									

GROUNDWATER DATA

FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

AUGER 3 3/4 HOLLOW STEM WASHBORING FROM FEET
JCG DRILLER ANC LOGGER
Diedrich D-50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: JDM	Checked by: DMS	App'vd. by: DBA
Date: 3/2/20	Date: 3/4/20	Date: 3/4/20



Lakeland Athletic Complex
Lakeland, Tennessee

LOG OF BORING: B- 3

Project No. J032791.01

LOG OF BORING 2002 WL J032791.01 LAKELAND ATHLETIC COMPLEX.GPJ GTINC 06383015 15/03/2020 10:15:00 AM

Surface Elevation: _____ Datum _____		Completion Date: <u>2/28/20</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
DEPTH IN FEET	DESCRIPTION OF MATERIAL	STANDARD PENETRATION RESISTANCE (ASTM D 1586)							
		▲ N-VALUE (BLOWS PER FOOT)							
		PLI WATER CONTENT, % LL							
	Soft, brown to gray, LEAN CLAY - CL								
		1-1-2	SS1	▲		●			
5		1-1-1	SS2	▲		●			
		1-1-2	SS3	▲		●			
		2-1-2	SS4	▲		●			
10	Boring terminated at 10 feet.								

GROUNDWATER DATA

FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM WASHBORING FROM ___ FEET
JCG DRILLER ANC LOGGER
Diedrich D-50 DRILL RIG
 HAMMER TYPE Auto

REMARKS:

Drawn by: JDM	Checked by: DMS	App'vd. by: DBA
Date: 3/2/20	Date: 3/4/20	Date: 3/4/20



Lakeland Athletic Complex
Lakeland, Tennessee

LOG OF BORING: B- 4

Project No. J032791.01

LOG OF BORING 2002 WL J032791.01 LAKELAND ATHLETIC COMPLEX.GPJ GTINC 06383015 15/03/2020 10:15:00 AM

Surface Elevation: _____ Datum _____		Completion Date: <u>2/28/20</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
DEPTH IN FEET	DESCRIPTION OF MATERIAL	Δ - UU/2 \circ - QU/2 \square - SV 0.5 1.0 1.5 2.0 2.5							
		STANDARD PENETRATION RESISTANCE (ASTM D 1586) \blacktriangle N-VALUE (BLOWS PER FOOT)							
		WATER CONTENT, % PL ----- LL 10 20 30 40 50							
5	Very soft to medium stiff, brown, SILTY CLAY - (CL-ML)	0-0-0	SS1	\blacktriangle	\bullet				
5	Medium stiff, brown, LEAN CLAY - CL	2-2-3	SS2	\blacktriangle	\bullet -----				
10	Boring terminated at 10 feet.	3-3-4	SS3	\blacktriangle	\bullet				
	trace sand	3-3-3	SS4	\blacktriangle	\bullet				

GROUNDWATER DATA

FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM WASHBORING FROM ___ FEET
JCG DRILLER ANC LOGGER
Diedrich D-50 DRILL RIG
 HAMMER TYPE Auto

REMARKS:

Drawn by: JDM	Checked by: DMS	App'vd. by: DBA
Date: 3/2/20	Date: 3/4/20	Date: 3/4/20



Lakeland Athletic Complex
Lakeland, Tennessee

LOG OF BORING: B- 5

Project No. J032791.01

LOG OF BORING 2002 WL J032791.01 LAKELAND ATHLETIC COMPLEX.GPJ GTINC 06383015 15/03/2020 10:15:11 AM

Surface Elevation: _____ Datum _____		Completion Date: <u>2/28/20</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
DEPTH IN FEET	DESCRIPTION OF MATERIAL	Δ - UU/2 \circ - QU/2 \square - SV 0.5 1.0 1.5 2.0 2.5							
		STANDARD PENETRATION RESISTANCE (ASTM D 1586)							
		\blacktriangle N-VALUE (BLOWS PER FOOT) WATER CONTENT, % PLI 10 20 30 40 50 LL							
	Stiff, brown, SILTY CLAY - (CL-ML)								
		3-5-5	SS1						
	Medium stiff, brown, LEAN CLAY - CL								
5		2-4-5	SS2						
		2-3-3	SS3						
		2-3-4	SS4						
10	Boring terminated at 10 feet.								

GROUNDWATER DATA

FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

AUGER 3 3/4 HOLLOW STEM WASHBORING FROM _____ FEET
JCG DRILLER ANC LOGGER
Diedrich D-50 DRILL RIG
 HAMMER TYPE Auto

REMARKS:

Drawn by: JDM	Checked by: DMS	App'vd. by: DBA
Date: 3/2/20	Date: 3/4/20	Date: 3/4/20



Lakeland Athletic Complex
Lakeland, Tennessee

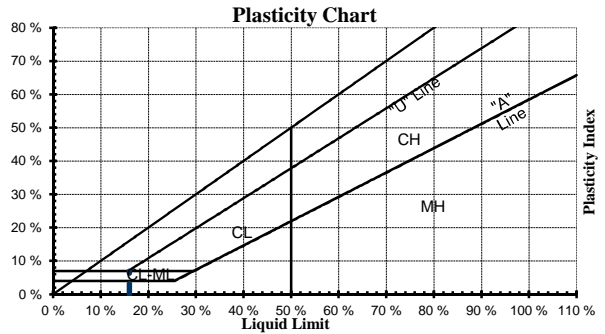
LOG OF BORING: B- 6

Project No. J032791.01

BORING LOG: TERMS AND SYMBOLS

LEGEND

CS	Continuous Sampler
GB	Grab Sample
NQ	NQ Rock Core
PST	Three-Inch Diameter Piston Tube Sample
SS	Split-Spoon Sample (Standard Penetration Test)
ST	Three-Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
PL	Plastic Limit (ASTM D4318)
LL	Liquid Limit (ASTM D4318)
SV	Shear Strength from Field Vane (ASTM D2573)
UU	Shear Strength from Unconsolidated-Undrained Triaxial Compression Test (ASTM D2850)
QU	Shear Strength from Unconfined Compression Test (ASTM D2166)



SOIL GRAIN SIZE

US STANDARD SIEVE

	12"	3"	3/4"	4	10	40	200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY	
		COARSE	FINE	COARSE	MEDIUM	FINE			
	300	76.2	19.1	4.76	2.00	0.42	0.074	0.005	
SOIL GRAIN SIZE IN MILLIMETERS									

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbol	Description	
Coarse-Grained Soils (More than 50% Larger than No. 200 Sieve Size)	Gravel and Gravelly Soil	Clean Gravels Little or no Fines	GW Well-Graded Gravel, Gravel- Sand Mixture	
		Gravels with Appreciable Fines	GP Poorly-Graded Gravel, Gravel-Sand Mixture	
		Sand and Sandy Soils	Clean Sands Little or no Fines	GM Silty Gravel, Gravel-Sand-Silt Mixture
			Sands with Appreciable Fines	GC Clayey-Gravel, Gravel-Sand-Clay Mixture
	Fine-Grained Soils (More than 50% Smaller than No. 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	SW Well-Graded Sand, Gravelly Sand
				SP Poorly-Graded Sand, Gravelly Sand
				SM Silty Sand, Sand-Silt Mixture
		Silts and Clays	Liquid Limit Greater Than 50	SC Clayey-Sand, Sand-Clay Mixture
			ML Silt, Sandy Silt, Clayey Silt, Slight Plasticity	
			CL Lean Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity	
Highly Organic Soils			OL Organic Silts or Lean Clays, Low Plasticity	
Highly Organic Soils			MH Silt, High Plasticity	
Highly Organic Soils			CH Fat Clay, High Plasticity	
Highly Organic Soils			OH Organic Clay, Medium to High Plasticity	
Highly Organic Soils		PT	Peat, Humus, Swamp Soil	

STRENGTH OF COHESIVE SOILS

DENSITY OF GRANULAR SOILS

Consistency	Undrained Shear Strength (tsf)	Unconfined Comp. Strength (tsf)	Descriptive Term	Approximate N_{60} -Value Range
Very Soft	less than 0.125	less than 0.25	Very Loose	0 to 4
Soft	0.125 to 0.25	0.25 to 0.5	Loose	5 to 10
Medium Stiff	0.25 to 0.5	0.5 to 1.0	Medium Dense	11 to 30
Stiff	0.5 to 1.0	1.0 to 2.0	Dense	31 to 50
Very Stiff	1.0 to 2.0	2.0 to 3.0	Very Dense	>50
Hard	greater than 2.0	greater than 4.0		

N-Value (Blow Count) is the last two, 6-inch drive increments (i.e. 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on the grid plot and shown in the Unit Dry Weight/SPT column.

RELATIVE COMPOSITION

OTHER TERMS

Trace	0 to 10%	Layer - Inclusion greater than 3 inches thick.
Little	10 to 20%	Seam - Inclusion 1/8-inch to 3 inches thick
Some	20 to 35%	Parting - Inclusion less than 1/8-inch thick
And	35 to 50%	Pocket - Inclusion of material that is smaller than sample diameter



Relative composition and Unified Soil Classification System (USCS) designations are based on visual descriptions and are approximate only. If laboratory tests were performed to classify the soil, the USCS designation is shown in parenthesis.



APPENDIX D – LABORATORY TEST DATA

Atterberg Limits

CONSTRUCTION SIGN FOR:
BLACK LETTERS ON A WHITE BACKGROUND
HEVETICA MEDIUM LETTERING

**CITY OF LAKELAND
2018 LPRF PROJECT
LAKELAND ATHLETIC COMPLEX & RECREATION PARK**

THIS PROJECT IS FUNDED IN PART BY A LOCAL PARKS AND RECREATION FUND GRANT

ADMINISTERED BY THE

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION RECREATION EDUCATIONAL SERVICES DIVISION

ADMINISTERING AGENCY:

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT & CONSERVATION
RECREATION EDUCATIONAL SERVICES DIVISION

ENGINEERING DESIGN / SURVEY / PLANNING

BARGE DESIGN SOLUTIONS, INC.
MEMPHIS, TENNESSEE

GRANT MANAGEMENT AND ADMINISTRATION

SIC PROJECT MANAGEMENT,
ROSSVILLE, TENNESSEE

BOARD OF COMMISSIONERS & MAYOR

MIKE CUNNINGHAM, MAYOR
MICHELE DIAL, VICE-MAYOR
JIM ATKINSON, COMMISSIONER
RICHARD GONZALES, JR., COMMISSIONER
WESLEY WRIGHT, COMMISSIONER

SHANE HORN, CITY MANAGER
PATRICK O'MARA, PARKS & RECREATION DIRECTOR

CONTRACTOR

Federal Law prohibits discrimination because of race,
color, religion, sex, national origin, age, marital status,
and physical/mental handicap.

Donald J. Trump, President
Bill Lee, Governor, State of Tennessee
David Salyers, Commissioner TN Environment & Conservation

PLYWOOD PANEL (APA RATED A-B GRADE -- EXTERIOR)
SIGN DIMENSIONS: 1200MM X 2400MM x 19MM (4' X 8' X 3/4")

SECTION 01100

GENERAL CONSTRUCTION REQUIREMENTS

PART 1 - Description.

To establish uniform requirements for construction of water distribution facilities, sanitary sewerage collection facilities, storm sewer collection systems, streets, and associated appurtenances which will enable the construction to be performed in accordance with Local, State, and Federal laws.

1.01 Definitions.

A. For the purposes of these specifications, the words and phrases set out in the following articles shall have the meanings as follows:

1. "City" means the governing body of the city of Lakeland, TN.
2. "Contractor" means the individual, partnership, firm, or corporation contracting with the developer or the City which will be performing the work, or which will be performing the construction activities.
3. "Developer" means partnership, firm, or corporation developing property where construction will be performed.
4. "Engineer" means the consultant or City Engineer.
5. "Owner" means the individual, partnership, firm or corporation being the owner of record of property where construction will be performed.
6. "Underground facility" means any item of personal or public property buried or placed below ground for use in connection with the storage or conveyance of electronic, water, sewage, telephonic or telegraphic communications, cable television, electric energy, oil, gas, hazardous liquids, or other substances and including, but not limited to pipes, sewers, water, storm water, conduits, cables, valves, lines, wires, manholes, and attachments.

B. The following abbreviations shall have the designated meanings:

1. "APWA" means the American Public Works Association.
2. "ASTM" means the American Society for Testing and Materials.
3. "AWWA" means the American Water Works Association.

4. "AASHTO" means the American Association of State Highway & Transportation Officials.
- C. Reference to a specific specification, i.e., AWWA C900, means the latest Edition of that specification.

PART 3 Execution

3.01 Scheduling and Construction Progress.

- A. Prior to the start of any work, the Contractor shall submit in writing to the Engineer for review, a progress schedule that shall be followed as closely as possible. Progress scheduling using critical path method is approved and encouraged. Once work has started on a street, it must be pursued continuously until all work on that street is finished.
1. The Contractor shall schedule a preconstruction conference prior to the start of work. Persons attending shall include representatives of the Contractor, subcontractors, owner, developer, Engineer, and affected utilities.
- B. Each successive phase of work will follow the preceding phase as closely as possible so that the time any one street is under construction is kept to a minimum.
- C. In the event that the work is not being accomplished expeditiously or in accordance with the time period set forth in the progress schedule, or if the work on an excavation has ceased or is abandoned without due cause, the Engineer may give written notice to the Contractor and/or the surety company for the project.

3.02 Notification of Landowners, Residents, and Businesses

- A. At least one (1) week prior to beginning construction operations Contractor shall notify in writing, all those directly affected by the Work, including the Fire, Ambulance, Police Departments, and the Engineer's Office. The notification shall include the following as a minimum:
1. Name, address, telephone number, and contact person for Developer, Developer's Contractor, Owner, and Engineer.
 2. A brief description of the proposed Work.
 3. Name and telephone number of Contractor's person to contact in emergency.
 4. A map showing the Work area, the traffic control plan, and the planned access to be provided to the affected properties. The map should also show the property or business owners' access during construction, and access in case of an emergency for fire, ambulance, police, or other emergency service agency vehicles.

5. A schedule for start up and completion of the Work. Schedules shall be updated as needed as the work progresses.
6. Contractor shall notify property owner and occupant 24 hours in advance of any disruption of service or access.

3.03 Available Maintenance Personnel

The Contractor shall have personnel available to maintain the Work as required, 24 hours per day every day. Accordingly, the Contractor shall furnish the City, the Owner, the Engineer, and the Shelby County Sheriff's Office with the names, addresses, and telephone numbers of local employees or representatives who will be available to maintain the Contractor's work during non-working periods, evenings, nights, weekends, and holidays.

3.04 Utility Locates

- A. It is the responsibility of the Contractor to obtain locates for buried facilities within the project area prior to the start of work as necessary and as required by law. The Contractor is responsible for any damage to buried utilities or damage or injury to persons or property resulting from Contractor's work in the vicinity of the utilities.
- B. It is the responsibility of the Contractor to provide advance notice to all utility notification centers serving that area. The Contractor shall request the notification center to provide the nature, location, and elevation of the utility at each location and at whatever interval is necessary for the work. If the utility company cannot or will not provide the information, the Contractor shall obtain the information by whatever means are necessary. For each location that the utility is exposed, the Contractor shall locate the utility by tying it both horizontally and vertically by coordinates, to the datum established by the City.
- C. At all utility crossings the Contractor shall locate the utility at a minimum of one point directly over the proposed line or appurtenance. When existing utilities that parallel the proposed line or appurtenance are exposed by excavation, the Contractor shall locate the utility by tying it both horizontally and vertically to the datum and include the information on the record drawings. At a minimum, the utility shall be tied horizontally and vertically at 300-foot (90 m) intervals.
- D. If during the field location of the utilities, additional unforeseen utilities are discovered, the Contractor shall immediately notify the Engineer and proceed in accordance with approval of the Engineer. The utility must be located by the Contractor as specified above and include the information on the record drawings.
- E. The Contractor must protect all existing utilities and improvements, public or private, located on the right-of-way, and other work areas, during the entire period of his work. Special care must be taken in backfilling and compacting under and around

such improvements. Any breakage or damage to underground facilities caused by trenching, backfilling, resurfacing, or any other activity associated with the work shall be the responsibility of the Contractor.

- F. Whenever utility mains or services are crossed, the utility owner shall be notified and the crossing shall be constructed in accordance with the utility owner's requirements.
- G. Before the Contractor begins his grading operations, he shall confer with the owners of any underground or overhead utilities which may be in or in close proximity to the grading areas, and shall arrange for the necessary disconnection of these utilities in accordance with the regulations of the utility companies concerned. The Contractor shall take such measures as the Engineer may direct in protecting these utilities properly throughout the period his grading operations are in progress. The party or parties owning or operating overhead or underground utilities shall perform the actual work of moving, repairing, reconditioning, or revising the utilities, except as otherwise specified in this Section. Whenever and wherever such operations are undertaken by the owners of utilities, the Contractor shall cooperate to the extent that ample protection of their work will be provided so that the entire work as contemplated may be expedited to the best interests of all concerned, as judged by the Engineer.
- H. Protect and safeguard existing service lines and utilities structures, the locations of which have been made known to the Contractor by the owners of the utilities or by others, prior to excavation or construction of fills or embankments, from damage during grading operations. Any damage to such lines or structures shall be repaired at the Contractor's expense. The above provisions are applicable to all service lines or utilities structures, all or any portion of which protrude above the original ground or street surfaces, or lie beneath such surfaces in any grading area or any other area upon which the Contractor has encroached.

3.05 Protection of Existing Buildings and Structures

For collapse of adjacent buildings, sidewalks, structures, and underground or above ground utilities, the Contractor shall repair damage done to the owner's property or any other property, on or off the premises, by reason of his operations. The Contractor shall adequately brace walls during backfilling and compacting operations.

3.06 Construction Stakes – Alignment and Grades

- A. All work shall be constructed in accordance with lines and grades shown on the drawings and as designated by the Engineer. These lines and grades may be modified by the Engineer as provided in the General Conditions.
- B. The Contractor shall provide experienced personnel, materials, and equipment necessary to complete all survey, layout, and measurement work. The Contractor shall keep the Engineer informed a reasonable time in advance, of the times and places he wishes to do work so that initial control points may be designated.

3.07 Restoration of Street Surface, Street Signs, Curbs, Driveways, Sidewalks, Irrigation and Landscaping

- A. Wherever existing improvements are removed, damaged or otherwise disturbed by Contractor's activities, Contractor shall replace or repair the improvements to conditions equal to or better than the condition prior to the start of work. Any crushed rock, sod, or natural vegetation disturbed by the Contractor shall be replaced, rebuilt or restored to conditions equal to or better than the condition prior to the start of work.

3.08 Temporary Utilities, Public Access and Safety

- A. Contractor shall provide temporary water and sewer service to properties when permanent facilities will be out of service for eight (8) hours or longer, or when other circumstances make it necessary. Where service cannot be interrupted, such as sewer mains, Contractor shall provide plant and equipment to pump around the sections which are out of service.
- B. Where the Engineer deems necessary, the Contractor shall provide access wherever possible to public and private property to prevent serious inconvenience to pedestrian and vehicular traffic. This shall not be construed to require the Contractor to provide such access at the times and locations where it will interfere with his construction progress. The Contractor shall furnish, place, and maintain sufficient flags, flares, barricades, signs, etc., along the location of his work in accordance with the Federal Highway Administration, "Manual on Uniform Traffic Control Devices." Flag persons shall be utilized if necessary to maintain safe traffic flow.

3.09 Erosion and Sediment Control

- A. Erosion and sediment control shall be performed in accordance with rules and regulations adopted by the City of Lakeland and the Tennessee Department of Environment and Conservation.

3.10 City Permits

- A. All necessary permits shall be obtained prior to the beginning of any construction project. Those permits may include: City of Lakeland/TDEC Permit to Construct, Street Cut Permits, Traffic Control Permits, Bonds, and Erosion and Sediment Control Permit, as well as any other appropriate permits required for the project by the City.

3.11 Punchlist and Final Closeout

- A. Initial City Punchlist

1. The Contractor, Owner, Engineer, and City personnel will conduct an initial walkthrough and develop a list of deficiencies that will be presented to the Contractor by the Engineer.
2. The Contractor, Owner, and Engineer will conduct a walkthrough identifying items to be corrected. A final punch list will be developed by the Contractor and Engineer. The punch list will contain dates for completion of the various identified items.
3. All items on the list will be completed to the satisfaction of the City prior to acceptance of the project and start of the one-year warranty period.

3.12 Submittals

The Contractor shall submit for approval by the Engineer a minimum of five (5) copies of data required by specific sections of this specification.

3.13 Workmanship and Cleanup

- A. All debris and rubbish caused by the operations of the Contractor shall be removed, and the areas occupied during his operations shall be left in a neat and presentable condition satisfactory to the Engineer. Construction cleanup and all backfill operations shall immediately follow installation of underground facilities. Cleanup shall be completed to allow local traffic on the street and access to driveways, parking lots, etc. During construction, all existing gutters, storm drains, runoff channels, etc. shall be kept clean of dirt, rubble, or debris which would impede the flow of storm sewer.
- B. Excess, unsuitable, and waste materials from the project (including that from trench excavation, pavement removal, curbwalk removal, and grading operations), shall be suitably disposed of, offsite, by Contractor.
- C. Excess material resulting from parkway and shoulder finishing and other final operations shall not be permitted to accumulate on the pavement surface and shall be removed concurrently with the finishing operations. Care shall be taken to prevent the entrance of this material into drainage structures or other waterways during the construction period. It shall be the responsibility of the Contractor to properly dispose of all excess material.

3.14 Design Mixes, Testing and Quality Assurance

- A. The testing requirements and cost responsibilities of design mixes, testing requirements, and quality assurance testing are listed in each specific section of these specifications.
- B. Unless specified by the contract documents, or addressed specifically within these

Standard Specifications, the Owner will be responsible for moisture/density/compaction testing only. If the initial moisture/density/compaction test fails to meet the minimum standards as established by these specifications, the Contractor shall pay for any and all additional tests until a moisture/density/compaction test meeting the minimum standards is obtained.

END OF SECTION

SECTION 01010

SUMMARY OF WORK

A. Project Identification:

2018 LPRF Project – Lakeland Athletic Complex & Recreation Park

B. Project Summary:

This project consists of constructing (2) multi-use natural turf fields, a gravel vehicular access road, parking with lighting, ADA parking stalls, an ADA compliant concrete sidewalk connecting to an ADA compliant seating area, landscaping, site preparation, erosion control, and minor drainage improvements.

C. Particular project requirements.

1. Apply for, obtain, and pay for permits when required to perform the work.
2. Field-verify dimensions indicated on drawings (when applicable) before fabricating or ordering materials. Do not scale drawings.
3. Notify Owner of existing conditions differing from those indicated on the drawings. Verify the existence and location of underground utilities along the route of proposed work. Omission from, or inclusion of, locations on the drawings, is not to be considered as the nonexistence of, or the definite location of, existing underground utilities. Do not remove or alter existing utilities without prior written approval.
6. The Contract Documents are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the project shall be included.
7. The Provisions are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, "furnish..." means "Contractor shall furnish..."

END OF SECTION

SECTION 01200

PROJECT COORDINATION

PART 1 – Description

1.01 SUMMARY

- A. Contractor shall schedule a preconstruction conference (if required) to be held within twenty (20) days of the Notice of Award. Contractor's assigned supervisory personnel and subcontractors shall attend this conference. Contractor shall provide a work schedule at or prior to this meeting for review by all parties. A corrected schedule shall be provided within seven (7) days following the meetings.
- B. Conduct all construction activities between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday, except in cases of emergencies. No work will be allowed on Saturdays without the Owner's permission, and no work, except for emergencies, will be allowed on Sundays or City of Lakeland Holidays. All pavement subgrade excavation shall be observed by the Owner Representative. The Owner's Representative shall determine the depth of the subgrade excavation prior to backfill.
- C. Contractor shall obtain water for use during construction at his expense. If Contractor elects to obtain water from the public water utility, he will make all the arrangements, comply with their regulations, and pay all fees and charges.

1.02 COORDINATION WITH PUBLIC AND PRIVATE AGENCIES

- A. If utility companies elect to repair or replace their lines in the project area, their crews will be permitted access to the area to accomplish their work.
- B. Contractor is responsible for locating and protecting existing underground improvements. Contact all utility companies for location of their facilities. To contact all utility companies call the local underground number at least 48 hours prior to excavation for field locates.
- C. Contractor shall have personnel available to maintain his work as required 24 hours per day every day. Contractor is responsible for housekeeping, dust and erosion control, and shall provide all equipment and personnel necessary to meet the requirements of this responsibility. Contractor shall provide Engineer with the name(s) and telephone number(s) of the person(s) designated to be available for after-hours contact. If this person cannot be contacted, Owner may use its equipment to correct problems. In this case, Contractor shall pay all costs incurred by Owner.
- D. Do not utilize private property for any purpose without written permission from the property owner.

1.03 COORDINATION WITH OWNER AND ENGINEER

- A. Construct all work in accordance with the lines and grades shown on the Drawings, and as designated by Engineer (when applicable). Engineer may modify these lines and grades as provided in the General Conditions. Where the Contract Documents specify survey work to be provided by Engineer, give Engineer a minimum of 24 hours notice.
- B. Owner shall employ and pay for the services for an independent testing agency to perform tests as required by the Contract Documents. Notify Engineer a minimum of 24 hours in advance to request testing. Contractor shall be responsible for cost of re-tests required if the results of the original tests do not meet the minimum requirements.
- C. Coordinate on-site staging areas, access and temporary facilities with Owner.
- D. For additional information, contact Lakeland City Engineer at 867-5418.

1.04 COORDINATION OF CONSTRUCTION

- A. Contractor is responsible for coordinating work of all trades by preparation of schedules and progress reports, coordination of drawings and other work as necessary.
- B. Schedule work to produce orderly, continuous progress and avoid delays due to lack of materials, subcontractor schedule, lack of available manpower, etc.
- F. Contractor is responsible for ensuring that installed and/or completed work is complete and satisfactory prior to enclosing or covering. Call for required inspections in a timely manner and do not cover work that requires inspection.

END OF SECTION

SECTION 01340

SUBMITTALS

PART 1 - Description

1.01 Summary

- A. Comply with Submittal format requirements as specified in the Contract Documents.
- B. Provide, in a timely manner, the number of copies and types of submittals listed in individual sections of the Contract Documents. If not specified elsewhere, provide the following as a minimum:
 - 1. Mix designs and certifications of compliance for Portland Cement Concrete, Cement Treated Base, Aggregate Base Course, Asphaltic paving material, and any other material or product used as part of this project as required in the Standard Specifications.
 - 2. Closeout submittals.
- C. Provide required resubmittals in the appropriate quantities if original submittals are not approved.
- D. Samples and shop drawings shall be prepared specifically for this project. Shop drawings shall include dimensions and details, including adjacent construction and related work. Note any special coordination required. Note any deviations from requirements of the Contract Documents. Submittal data shall be properly labeled indicating specific service for which material or equipment is to be used, section and article number of specifications, project name, Contractor, etc. Data of a general nature will not be accepted.
- E. Failure of Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time.

END OF SECTION

SECTION 01505

TEMPORARY FACILITIES

PART 1 - Description

1.01 Summary

A. Provide temporary services and utilities, including utility costs:

1. Potable and non-potable water.
2. Lighting and power.
3. Toilet facilities.
4. Materials storage.
5. Heating.

B. Provide construction facilities, including utility costs;

1. Construction equipment.
2. Dewatering and pumping.

C. Provide security and protection requirements:

1. Fire extinguishers.
2. Site enclosure fence, barricades, warning signs, and lights.
3. Snow and ice removal, if applicable.

D. Provide personnel support facilities:

1. Sanitary facilities.
2. Drinking water.
3. Cleaning and trash removal.
4. First aid and Emergency Medical Services.
5. Trash removal.

END OF SECTION

SECTION 01551

TEMPORARY TRAFFIC CONTROLS

PART 1. Description

To establish uniform requirements for detours, signs and barricades, and traffic control plans associated with construction activities performed on or affecting City of Lakeland streets. The work in this article shall consist of furnishing, erecting, maintaining, relocating, and removing temporary traffic control devices at the locations specified on the drawings and as directed by the Engineer. All traffic control devices shall conform to the provision for construction signing as set forth in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) latest edition.

PART 2 MATERIALS

2.01 Traffic Control Products

A. Sign Panels

1. Sign panels will be constructed of ¾” plywood conforming to plywood sign panels and barricades of the standard specification for road and bridge construction; or 6061-T6 or 5052-H38 aluminum alloy sheeting conforming to ASTM B209.
2. Wood sign panels will be backed with metal backing angles; except that backing is not required for those sign panels 48” x 60” or smaller.
3. Aluminum sign panels will be 0.125” thick and backed with metal backing angles; except that those sign panels 48” x 60” or smaller may be:
 - i. 0.080” thick and backed with metal backing angles or 2 x 4 lumber; or,
 - ii. Unbacked, 0.125” thick.
4. Special signs which are unique to the project, i.e., signs not shown on the plans or included in part VI of the MUTCD, and signs shown on the plans which contain a message that is unique to the project, will be furnished by the contractor, as specified on the plans, and erected by the Contractor. Posts and hardware for fixed special sign installations, and all equipment for portable special sign installations will be furnished by the contractor. Post lengths will be specified by the Engineer. Upon removal, the special sign panels, posts, hardware, and portable installation equipment will remain the property of the Contractor.

- i. Special signs will be erected on fixed mountings unless portable mountings are authorized by the Engineer.
- B. Barrels will be plastic conforming to the MUTCD, with 6" wide reflective stripes.
- C. Temporary markings
 1. Temporary reflective pavement markings will be paint, preformed tape, or raised pavement markers, and will be suitable for use on either Portland cement concrete or asphalt pavements. Minimum acceptable standards are as follows:
 - i. Paint used for temporary markings will be commercially manufactured highway striping paint. The paint will be applied without dilution.
 - ii. All painted stripes will be 4" wide, and will be reflectorized by dropping or spraying glass beads onto the wet paint.
 - iii. The reflective beads will conform to AASHTO Specification M247, Type 1.
 2. Temporary reflective pavement striping tape will be 4" wide, pressure-sensitive tape manufactured for use as pavement striping.
 - i. Striping tape applied to finished pavement surfaces which will be returned to normal traffic use will be a removable type.
 - ii. Striping tape applied to temporary pavement surfaces which will be obliterated may be a non-removable type.
 - iii. Striping tape applied to the surface of intermediate lifts of asphalt pavement may be non-removable type, and may be let in place. If a removable type is used, it will be removed before placing the next lift.
 3. Temporary retro-reflective raised pavement markers manufactured by Astro Optics of Schaumburg, Illinois, Model No. TPM, or Stimsonite Products of Niles, Illinois, Model No. 66, or an approved equal will be acceptable.
 4. Temporary retro-reflective motorist guidance markers manufactured by Davidson Plastic Company of Ken, Washington, Model NO. TRPM, or TOM, or an approved equal will be acceptable.

PART 3 EXECUTION

3.01 Traffic Control Plans

- A. A complete traffic control plan shall be submitted to the Engineer and the Lakeland City Engineering office at least one week prior to the start of construction.
1. Traffic will be permitted to use the street at all times, unless a detour is specifically permitted on the drawings or by the Engineer. Access to all abutting residences and properties shall be maintained to the maximum extent possible.
 2. The Contractor shall construct and maintain temporary crossings, complete with flagmen, whenever necessary to expedite the work or to maintain traffic. The Contractor shall furnish not less than two flagmen at each location where loading or depositing of material requires the turning of the trucks on any highway or street and where the operation of construction equipment endangers traffic. Temporary crossings shall be of ample size to safely carry the load which comes upon them.
 - i. The Contractor shall maintain the streets in a passable condition. The work shall be conducted so as to create a minimum of inconvenience to traffic.
 - ii. Excavations which traverse a street shall be limited to one-half the width of the street at any one time, unless an emergency situation exists which requires that the entire width of the street be excavated. City Engineer's office approval is required prior to excavation traversing an entire street.
 3. The Contractor shall furnish sufficient signs and barricades to facilitate the directing of traffic. Unless directed otherwise by the Engineer, all signs and barricades shall conform to:
 - i. Within the "Manual on Uniform Traffic Control Devices (MUTCD), " latest edition.
 4. The Contractor shall have a sufficient number of barricades and signs on hand prior to the start of the construction
 - i. Each detour sign shall be reflectorized and shall be illuminated with two battery-powered blinkers with six-inch (6") amber lenses.
 - ii. All barricades shall have blinker lights on each end.
 - iii. It shall be the Contractor's responsibility to make necessary checks and inspections of all lights and barricades every day, including Sundays and holidays.
 5. Temporary suspension of work does not relieve the Contractor of the responsibility outlined in the above requirements.

3.02 Permits

- A. The Contractor shall obtain all necessary permits from the City Engineer's office for any closure of any street or portion thereof, as provided in the Lakeland Municipal Code. Along with the permit application, the Contractor shall provide a sketch showing traffic routing and traffic control devices to be used. The construction traffic control sketch shall be approved by the City Engineer's office before the permit is issued.

3.03 Street Closure

- A. The City Engineer may permit the closing of streets to all traffic for a period of time prescribed by the office if, in the City Engineer's Opinion, it is necessary.

END OF SECTION

SECTION 01650

MEASUREMENT AND PAYMENT PROCEDURES

PART 1 – Description.

All work completed under this Contract will be measured by the Engineering according to the bid items and to the construction drawings. Units of measurement and dimensions will be shown in these specifications.

1.01 Payment

A. Progress payments will be processed in accordance with the following schedule.

<u>Cut-Off Date</u>	<u>Date of Submittal</u>
Next to last Friday of the month	Last Friday of the month

Submit pay requests to the City by the dates of submittal listed above.

B. Owner will make progress payments as defined in Article 5 of the Agreement, on the forms provided by the Engineer.

C. If the Contractor elects to enter into a joint account agreement, two (2) pay requests and vouchers must be submitted. One pay request and voucher for the appropriate progress payment amount, the other for the retained amount.

1.02 Measurement of Quantities

Quantities shown on the bid schedule are estimated and are to be considered approximate. Actual constructed quantities will vary. The Contractor will be compensated only for those items and materials actually installed and approved as part of the project. No additional pay will be granted for items or materials not installed.

A. Payment will be made for the work completed and stored materials less retained amounts in accordance with provisions of the contract documents.

B. Payment amounts will be based on the scheduled values and mutually agreed upon percentage of completion for each item.

1.03 Bid Item Descriptions

The cost of all material and labor required to complete this project as specified and shown on the drawings, but not specifically included as a pay item, shall be included in the bid price of its related

bid item. No extra pay shall be granted for items that are reasonably foreseen as necessary for the proper installation of an item.

PART 3 Execution

3.01 Measurement and Payment of Bid Items

A. Mobilization

1. Includes all costs for mobilization and bonding complete, including mobilization of equipment to the project site and property owner notifications in accordance with these specifications. Cost for mobilization not to exceed 10-percent of the Total Base Bid for each bid schedule. If the Contractor's bid price for mobilization exceeds 10-percent of the Total Base Bid for the bid schedule, the Owner will pay 10-percent of the Total Base Bid for the bid schedule after the Contractor mobilizes equipment on site. The remaining amount will be paid following substantial completion of the entire contract. Payment shall be by the contract unit price per Lump Sum (LS).

B. Remove and Replace Asphalt Pavement

1. Measurement of this item shall be by the number of square yards (SY) in place and approved. Measurements shall be made on the surface of the finished patch taken from the lines formed by the junction of new asphalt and old asphalt. This item shall include saw cutting, removal of existing asphalt pavement, all excavation, installation of base material, grading, compaction, and re-pavement of the surface with new hot mix asphalt. New asphalt pavement shall have a compacted thickness of no less than four inches (4") of hot mix asphalt pavement and have a base thickness of no less than six inches (7") after compaction. Payment shall be by the contract unit price per Square Yard (SY).

C. Furnish and Install Geotextile

1. Geotextile shall be stress absorbing fabric MIRAFI 500X or approved equal. Placement of Geotextile fabric shall be as directed by the Engineer. Payment shall be by the contract unit price per Square Yard (SY).

D. Sub-excavate and Install Select Backfill

1. Measurement of this item will be by the number of cubic yards of "Select Backfill" in place, compacted, and approved. This item includes all excavation, removal, and disposal of excavated material. Reconstruction of subgrade and placement of "Select" backfill shall be as directed by the Engineer. Payment shall be by the contract unit price per Cubic Yard (CY).

E. Remove and Replace Concrete Valley Gutter

1. Measurement shall be by the area, in square feet, of "Fibermesh" reinforced Portland Cement Concrete valley gutter in place and approved. The price shall include removal and disposal of

existing valley gutter, all necessary saw cutting of adjacent existing concrete, all material, leveling course material, grading, compaction, forming, finishing and protection. All concrete surfaces shall have curing compound applied once finishing is complete. Curing Compounds for all Portland Cement concrete surfaces shall be Poly-Alpha-Methyl-Styrene (PAMS) meeting the requirements of AASHTO 148 Class B, or Engineer approved equal. Valley Gutter shall conform to the "Standard Street Specifications". Measurement and payment for the installation of new valley gutter where asphalt now exists shall be the same. Included in this item shall be any necessary adjustment of water valve boxes and manhole rings to match the new finish grade. Manholes rings and valve boxes covered in this pay item are only the manholes and valves that are located in the valley pan. The replacement of adjacent asphalt shall be paid for under item A-2. Payment for this item shall be by the contract unit price per square foot (SF).

F. Remove and Replace Sidewalk

1. Measurement shall be by the length, in lineal feet, of Portland Cement Concrete sidewalk constructed as specified in place and approved. Sidewalk shall be measured along the centerline of the walk. All concrete surfaces shall have curing compound applied once finishing is complete. Curing Compounds for all Portland Cement concrete surfaces shall be Poly-Alpha-Methyl-Styrene (PAMS) meeting the requirements of AASHTO 148 Class B, or Engineer approved equal. ADA wheelchair ramps shall be constructed in all sidewalks which intersect street intersections or at radii to be replaced as directed by the Engineer. All ADA wheelchair ramps shall be Type II or Type III as shown on standard drawings. Sidewalk replaced at alley approaches shall be constructed as a curb cut. The price shall be the same whether sidewalk is constructed with or without ramps or curb cuts. New sidewalk shall match existing adjacent sidewalk. The price shall include removal and disposal of existing curbside; all necessary saw cutting of adjacent existing concrete, all material, leveling course material, grading, compaction, forming, finishing and protection. Replacement of damaged existing landscaping behind the curbside like in kind, i.e. replacement of existing grass with sod, shall be considered subsidiary to this item. Any property corners found in or behind the curbside shall be preserved. If any property corner is destroyed during the replacement of curbside the Contractor will be responsible for its replacement and will be considered subsidiary to this item. The replacement of adjacent asphalt shall be paid for in standard sidewalk, wheelchair ramps, and curb cuts shall conform to the construction specifications.

G. Furnish and Install Overlay

1. Asphalt Overlay shall be as specified in the Section 02741. Measurement shall be by the square yards to the depth specified in the drawings.

H. Furnish and Install Type II Slurry Seal

1. Measurement of Slurry Seal shall be by the actual area, in square yards, of Slurry Seal in place and accepted. The price shall be full compensation for furnishing all materials, surface preparation, mixing and applying these materials, and for all labor, equipment, tools, design testing, acceptance testing and all incidentals necessary to complete and warrant this work item as

specified. If roadway surface is not cleaned and approved prior to application of Slurry Seal , no payment shall be made. Payment shall be made by the contract unit price per Square Yard (SY).

I. Furnish and Install Temporary Traffic Control

1. Temporary traffic control shall be paid on a lump sum (LS) basis for each schedule of the project. Payment shall be consistent with the percentage of work completed in the pertinent schedule at the time of the request for payment. The lump sum payment shall cover all of the Contractor's activities in meeting traffic control requirements for the project. Flagging, replacement of traffic control devices damaged or destroyed from any cause whatsoever, furnishing and installing cones, wands, portable flashers, any barricades and channelizing devices will be incidental to Traffic Control and no separate payment will be made for any item or activity necessary to comply with this specification. Contractor is required to obtain a Traffic Control Permit from the City, but will be provided at no cost. Payment shall be made by the contract unit price per Lump Sum (LS) per Schedule.

J. Furnish and Install Truncated Domes

1. Furnish and install truncated domes shall be paid on a per each (EA) basis for each truncated dome mat that is installed and accepted. Truncated Dome mats shall be an approved color; surface installed mats shall be installed on existing ramps and cast in place mats shall be installed on all new ramps install on this project. Payment shall be made by the contract unit price of per Each (EA) per Schedule.

K. Adjust Manhole

1. Adjust manhole shall be paid on a per each (EA) basis for each manhole ring and cover adjusted, constructed, and accepted. When requested by the engineer manhole ring and cover will be lowered to expedite a milling operation. Final adjustment and construction of the manhole ring and cover shall be constructed as per the standard manhole drawing located in the appendix. This item includes all needed materials and labor needed to lower a manhole ring and cover, raise to final grade a manhole ring and cover, and install a concrete collar as per the standard drawing in the appendix. Payment shall be made by the contract unit price per Each (EA) per schedule.

L. Adjust Water Valve

1. Adjust valve box shall be paid on a per each (EA) basis for each valve adjusted, constructed, and accepted. Final adjustment and construction of the valve box shall constructed as per the standard valve box drawing located in the appendix. This item includes all needed materials and labor needed adjust the valve box, and install a concrete collar as per the standard drawing in the appendix. Payment shall be made by the contract unit price per Each (EA) per schedule.

M. Furnish and Install Lined Sewer Mains and Point Repairs

1. The method of measurement to furnish and install lined sewer main shall be by the accepted lineal foot of sewer main lined complete in place. Payment to furnish and install lined sewer main, complete and accepted in place, shall be at the contract unit price bid to furnish and

install sewer main liner per lineal foot. Payment shall be full and complete compensation for providing all labor, equipment, materials, and ancillary items to complete the work including but not limited to the cleaning of the main, video inspection of the main before and after lining and the preparation of tapes and reports detailing the findings of these inspections, the temporary diversion and pumping of effluent flows, communications with the sewer users and the public, and appurtenant work whether specifically delineated herein or incorporated by reference.

2. The method of measurement to furnish and install lined sewer main lateral reinstatement shall be by each lateral reinstated completed and accepted in place. Four (4) inch services are estimated. Actual sizes may vary. Payment to furnish and install lined sewer main lateral connections, complete and accepted in place, shall be at the contract unit price bid for each lined sewer main lateral connection. Payment shall be full and complete compensation for providing all labor, equipment, materials, and ancillary items to complete the work including but not limited to the cleaning of the lateral, video inspection of the lateral before and after lining and the preparation of tapes and reports detailing the findings of these inspections, the temporary diversion and pumping of effluent flows, communications with the sewer users and the public, and appurtenant work whether specifically delineated herein or incorporated by reference.
3. The method of measurement to furnish and install sewer main point repairs to permit the installation of the liner or correct other deficiencies shall be by each ten (10) foot segment of sewer main repaired, complete and accepted in place. Point repairs shall be measured and paid for per each ten (10) foot segment repaired, complete and accepted in place, providing the repairs of the main line required at one location are not in excess of ten (10) lineal feet, measured along the centerline of the main. Measurement for payment shall NOT be MADE for various component parts of the point repair installation, which shall be performed in conformance with the applicable sections of these Contract documents, including excavation, backfill, asphalt removal and replacement, or traffic control.
4. Payment to furnish and install sewer main point repairs, complete and accepted in place, shall be at the contract unit price bid to furnish and install the sewer main point repairs. Payment shall be full and complete compensation for providing labor, equipment, materials, and ancillary items to complete the work including but not limited to the removal and replacement of piping, the connections of the old main to new main at each end with the Fernco, or equal, coupling, the installation of "controlled density backfill" around each connection, excavation and backfill in conformance with these contract documents, temporary diversion of effluents, communications with sewer users and the public, and appurtenant work whether specifically delineated herein or incorporated by reference including but not limited to service wyes, service pipe, reconnection of services necessary select backfill, traffic control, removal of asphalt surfacing or other types of surfacing. The method of measurement to furnish and install additional point repairs necessitated and discovered through the Contractor's inspection process shall be measured and paid for at the same rate as the contract unit price bid to furnish and install the sewer main point repairs

complete in place.

5. The method of measurement to abandon in place sewer main manholes shall be by the accepted manhole abandonment complete in place. Payment to abandon in place sewer manholes complete and accepted in place shall be at the contract unit price bid to abandon in place sewer manholes. Payment shall be full and complete compensation for providing all labor, equipment, materials, and ancillary items to complete the work, including but not limited to filling the manhole with “control density backfill”, removing the ring and cover, and restoring the surface to existing conditions. No manholes are contemplated for abandonment on this project.
6. The method of measurement to route protruding service taps in sewer mains shall be by the accepted routing complete in place. Payment to route protruding service taps in place in sewer mains complete and accepted in place, shall be at the contract unit price bid to route protruding service pipes in place in sewer mains. Payment shall be full and complete compensation to provide the labor, the equipment, materials, and ancillary items to complete the work including but not limited to abrading the service pipe in place safely to reduce the profile of the service pipe protruding into the main.
7. The liner shall be fabricated to tightly fit the internal circumference and length of the host pipe. Compensation for supplementary investigations, if any, cure time, public interactions, processing methods, or other necessary procedures necessitated by the use of Cure in Place Pipe installations shall be incorporated into the unit price bid to Furnish and Install eight (8) inch Sewer Main Liner, ITEM 4 in the ITEMIZED BID SCHEDULE. Additional compensation for work necessitated by the Cured in Place Pipe installation method, which may not be specifically delineated in Section B of the Special Provisions, shall not be made.

N. Furnish and Install Guardrail

1. The method of measurement to furnish and install guardrail of various classes and dimensions will be measured in accordance with the Plans. Terminal Anchors of the various types will be measured for payment by the unit within the limits of the plans. No measurement for payment will be made for projections or anchors beyond the end post, except as noted. Furnishing and placing anchor bolts and/or devices for guardrail posts on bridges will be considered incidental to the construction and the costs thereof will be included in the price bid for other items of construction. No measurement for payment will be made for excavation or backfilling performed in connection with this construction.
2. Guardrail of the various classes and Guardrail End Terminals of the various types will be paid at the contract price per linear foot (meter) and per each, respectively, as indicated on the Plans for each class and type. No payment will be made for a section of guardrail, including end terminals, until it is complete in place. Payment shall be full compensation for all posts, blocks, rail elements, terminal sections, fittings, hardware, labor and equipment, and all incidentals necessary to complete the work. When no contract unit price has been

established for Shop Curved Metal Deep Beam Single Guardrail, payment will be made at a rate equal to 1.5 times the contract unit price for Metal Deep Beam Single Guardrail with corresponding post spacing. When no unit price has been established for Shop Curved Protective Guardrail at Bridge Ends, payment will be made at a rate equal to 1.25 times the contract unit price of Protective Guardrail at Bridge Ends. No additional payment will be made for shop curving the guardrail in the Guardrail End Terminal units.

END OF SECTION

SECTION 01750

CONTRACT CLOSEOUT

PART I Description

1.01 Summary

- A. Provide prerequisites to substantial completion.
 - 1. Punch list.
 - 2. Supporting documentation.
 - 3. Warranties.
 - 4. Certifications.

- B. Provide prerequisites to final acceptance.
 - 1. Final payment request with supporting affidavits.
 - 2. Completed punch list.
 - 3. Submit record documents: One set of drawings and project manual with all changes noted in red and Project Manual changes flagged with page tabs.
 - 4. Final clean-up.
 - 5. Removal of temporary facilities.

END OF SECTION

1.1 General

- A. Qualifications of Sports Field Contractors (SFC) will be based on the information submitted and interviews of owners of previous projects completed by the SFC, financial stability, and equipment available to accomplish the task, experience of labor force and any other pertinent information requested by the Owner.
- B. Required scope of work by the Sports Field Contractor (SFC) on the project shall include grading of subgrade to $\frac{1}{2}$ " of specified elevations, installation of underground drainage system (synthetic turf only), irrigation systems (natural grass only), soil amendments, stone subbase (synthetic turf only), finish grading of the sports fields using laser grading technology to $\frac{1}{4}$ " of specified elevations, sodding of natural grass fields and installation of synthetic turf.
- C. The General Contractor shall provide the qualifications of their SFC utilizing the attached Sports Field Contractor Statement of Qualifications.

1.2 Qualifications

- A. Sports Field Contractors shall meet the following minimum qualifications:
 - 1. The SFC shall demonstrate that they have experience with at least ten projects similar in scope to this project that have been completed within the last three consecutive years. This project includes natural and synthetic turf multi-purpose fields. Said project(s) shall be of similar scope and character with the work to be performed and have been performed by and only by the actual SFC that is submitting their qualifications. Further, prior work performed as a subcontractor involving only part of direct field construction on such previous projects shall not be considered. For example, contractors whose primary experience only involves the installation of sod on athletic fields shall not be considered as SFC's.
 - 2. Contractor shall have experience with the installation of underground sports field drainage systems for synthetic turf fields similar to those as set forth in the drawings and specifications for this project. The Contractor shall have installed such drainage systems on at least five fields within the last three years.
 - 3. The SFC shall provide an on-site construction superintendent having at least three years' experience constructing athletic fields using laser grading systems and with the installation of synthetic turf fields.
 - 4. The SFC must perform all required work with their own staff supervision and employees, using company equipment either owned or leased without the subcontracting of any of the said required work, except the SFC may be allowed to subcontract 1) irrigation, 2) grow-in maintenance (if required), as long as the SFC directly controls and supervises the subcontractor(s).

Sports Field Contractors Minimum Qualifications

5. SFC shall have experience with automatically controlled laser guided grading equipment, specifically a dual slope hydraulically actuated soil plane adjustable to 1/100 of a foot. Equipment shall be pulled with a high flotation tractor with a gross weight of less than 15,000 lbs. Equipment must be made available for inspection by the Owner if requested. The contractor shall also use other specialized sports field equipment such as tractors, disc harrows, power rakes, tillers, infield groomers and drags in construction of athletic fields.
 6. The SFC must demonstrate the ability to accomplish the work in accordance with the Owner's schedule as evidenced by their current and projected workload and the availability of equipment and resources to accomplish the work. Contractors must, in the opinion of the Owner, have sufficient experience and resources to accomplish a project of this size and scope, in a quality manner, within the Owner's schedule.
- B. The Owner may make minor exceptions to the minimum qualifications if deemed in the Owner's best interests to do so.
- C. The following SFC information must be submitted with project bid:
1. A completed copy of the attached "Statement of Qualifications".
 2. The following information for each of the projects required under Item 1, 2 and 4 in the minimum qualifications set forth above:
 - Project Name and Location
 - Project Description
 - Owner's Name
 - Owner's Complete Address
 - Owner's Telephone Area Code and Number
 - Owner's Current Contact Person
 3. A listing of laser technology and equipment plus other specialized sports field construction equipment owned and/or leased.
 4. Resumes or other evidence of the experience of the principals of the firm and for the project superintendent proposed for this project.
 5. Any other information concerning the SFC that evidences your ability to meet the minimum qualifications necessary to be qualified for the project.

STATEMENT OF QUALIFICATIONS
SPORTS FIELD CONTRACTOR

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information desired to demonstrate their qualifications.

1. Name of Sports Field Contractor's Company:

2. Permanent main office address, phone and fax, email and (if available) web site address:

3. When organized: _____

4. If a Corporation, where incorporated: _____

5. How many years have you been engaged in the sports field contracting business under your present firm or trade name? _____

6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion):

7. Provide your revenues for 2020 \$ _____,
2019 \$ _____, and 2018 \$ _____.

8. General description of work performed by your company: _____

Sports Field Contractors Minimum Qualifications

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

10. Have you ever defaulted on a contract? If so, where and why? _____

The undersigned hereby authorizes and requests any referenced person, firm, or corporation to furnish any information requested in verification of the recitals comprising this Statement of Qualifications and associated attachments.

Dated this _____ day of _____, 20 _____.

Sports Field Contractor:

Company Name: _____

By (Signature): _____

Printed Name: _____

Title: _____

State of _____

County of _____

END OF DOCUMENT

SECTION 02115

EROSION AND SEDIMENT CONTROL

PART 1 - Description

This work shall consist of providing erosion and sediment control during and upon completion of construction as specified herein and as shown on the Construction Drawings.

1.01 General

- A. The Contractor shall provide the Engineer a copy of the Storm Water Pollution Prevention Plan (SWPPP) as submitted to the Tennessee Department of Environment and Conservation.
- B. All erosion and sediment control plans shall be developed as per regulations outlined by the Tennessee Department of Environment and Conservation.
- C. All erosion and sediment control plans as outlined in the SWPPP shall be installed prior to any grading and land disturbance.
- D. All control measures shall be checked, and repaired as necessary, twice weekly in dry periods and within 24 hours after any rainfall of 0.5 inches (minimum). During prolonged rainfall daily checking and repairing is necessary. Maintain records of checks and repairs.
- E. A specific individual who is certified by a TDEC Certification Program or its equivalent shall be designated to be responsible for erosion and sediment control.

1.02 Related Sections

Section 02230 Clearing and Grubbing

Section 02315 Excavation, Embankment and Fill

Section 02335 Roadway Earthwork

Section 02340 Geotextiles

Section 02370 Storm Drain Outfall Protection

Section 02835 Topsoil, Seeding and Lawn Restoration

PART 2 – Materials

- A. The Contractor shall submit the following to the Engineer for inspection and acceptance all materials used for this Section.
- B. Silt Fence Materials shall be as follows:
 - 1. Silt Fence-See Section 02340 Geotextiles.
 - 2. Fence Post (for fabricated units): Steel posts will be a standard “T” and “U” sections weighting not less than 1.33 pounds per lineal foot with a minimum length 42 inches.
 - 3. Wire Fence (for fabricated units): Wire fencing shall be minimum 14-1/4 gage welded wire fabric with a maximum six inch mesh opening or as approved by the Owner.
- C. Stabilized Construction Entrance Materials shall be as follows:
 - 1. Aggregate shall be in accordance with Tennessee Department of Transportation (TDOT) #1 or #2 stone specifications (1.5 to 3.5 inch stone), washed and well graded. Refer to Tennessee Department of Environment and Conservation (TDEC) specification Riprap for aggregate size tables.
 - 2. Geotextile fabric shall meet the requirements of Section 02340 Geotextiles.

PART 3 - Execution

3.01 Silt Fencing

- A. Silt fence shall be constructed by securely fastening silt fence fabric and wire reinforcement to steel posts using wire ties. The silt fence fabric panels shall be installed loosely with adjacent panels overlapped a minimum of 12 inches. The top edge of the fabric shall be reinforced or shall have a one inch tuck.
- B. Accumulated silt and debris shall be removed by the Contractor behind the face of the silt fence when the silt deposits reach approximately one half the height of the fence. Clogged or damaged silt fence fabric or wire reinforcement shall be immediately replaced at no additional expense to the Owner.
- C. Refer to Silt Fence details on the construction drawing for additional details and general notes.

3.02 Erosion Control During Construction

- A. The Contractor shall take sufficient precautions during construction to minimize the run-off of polluting substances such as silt, clay, wastes, fuels, oils, bitumens, and calcium chloride into the water supplies and surface waters of the State. Special precautions shall be taken in the use of construction equipment to prevent operations which promote erosion.
- B. Disposal of drainage shall be in an area approved by the Owner. The Contractor shall prevent the flow or seepage of drainage back into the drainage areas. Drainage shall not be disposed of until silt and other sedimentary materials have been removed. Particular care shall be taken to prevent the discharge of unsuitable drainage to a water supply or surface water body.
- C. As a minimum, the following shall apply:
 - 1. Approved silt fencing shall be provided as points where drainage from the worksite leaves the site, to reduce the sediment content of the water.
 - 2. Drainage leaving the site shall flow to water courses in such a manner to prevent erosion.
- D. Measures for control of erosion must be adequate to assure that turbidity in receiving water will not be increased more than 10 standard turbidity units (s.t.u.) or as otherwise required by the State or other controlling body, in waters used for public water supply or fish unless limits have been established for the particular water. In surface water used for other purposes, the turbidity increases must not exceed 25 s.t.u. unless otherwise permitted.

3.03 Stabilized Construction Entrance

- A. Contractor shall install stabilized construction entrances in at least one main entry point to the construction site. Additional entrances shall be stabilized depending on the project size and use of entry points to the construction sites. Construct stabilized construction entrance as per dimensions shown on the construction.
- B. Geotextile Engineering fabric shall be installed prior to placement of aggregate. Fabric shall not be required for work on single family residential lot.
- C. Maintenance of stabilized construction entrance shall include periodic top dressing of entrance with additional stones as conditions demand to prevent tracking or flow of sediment onto public rights of way.

END OF SECTION

SECTION 02220

SITE DEMOLITION

PART 1 – Description

This work shall consist of the removal and satisfactory disposal of all buildings, structures, old pavements, fences, and abandoned pipe lines. It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes, and pits; the preservation from injury or defacement of all vegetation and objects designated to remain; and all necessary replacement of fences, trees, hedges, shrubs, and flowers.

PART 2 – Materials and Equipment

All equipment for the satisfactory performance of the Work shall be on the project and approved before the Work will be permitted to begin.

PART 3 – Execution

3.01 Removal of Structures and Obstructions

- A. The Contractor shall raze, remove, and dispose of all buildings, foundations, bridges, drainage structures, curbs, curbs and gutters, pavements, sidewalks, and other obstructions not covered under Specification Section 02230 except for those for which other provisions have been made. Demolition of buildings shall be done in accordance with all applicable sections of the City Building Code.
- B. Structures and obstructions shall be removed to a depth of not less than one (1) foot below natural ground except that within construction limits removal shall be to a depth of not less than two (2) feet below subgrade elevation. Basement floors shall be broken up to prevent holding of water and bridges and drainage structures shall be removed or broken up in a manner to prevent voids below subgrade elevation, and the cavities left shall be filled to the level of the surrounding ground and compacted in accordance the provisions of Specification Section 02335. With the approval of the Owner, sewer and drainage pipes and structures may be abandoned in place and filled with sand or grout. Any blasting or other operations necessary for the removal of an existing structure or obstruction which may damage new work shall be completed prior to placing the new work. Where property line adjustments are required by the Work, existing fencing shall be removed from the original property lines, replaced with in-line fencing along the new property lines, and tied back to the old fence.
- C. When specified on the Plans or Right-of-Way Agreement or so directed by the Owner, all fences removed for construction purposes shall be replaced with salvaged existing materials or with acceptable in-kind new materials to enclose the original enclosed area as nearly as possible and tie back to the old fence.

- D. When specified on the Plans, trees, hedges, shrubs, flowers, or other growth shall be replaced or substituted for in-kind as nearly as possible to its original position, and growth established at the completion of the contract.
- E. All pavements, base courses, sidewalks, curbs, gutters, and other improvements designated for removal shall be removed and the material disposed.
- F. All salvageable pipe, frames and grates, manhole rims and covers, precast manhole sections, cobblestones, or granite curbs shall be carefully removed and every precaution taken to avoid damage. These salvaged items shall be taken to Collins Yard or other designated storage locations as directed by the Owner.

3.02 Disposal of Debris

- A. All material from removal of structures and obstructions except salvaged items shall be disposed of off the Project and it shall be the Contractor's responsibility to secure any permits necessary for the disposal.

END OF SECTION

SECTION 02230

CLEARING AND GRUBBING

PART 1 - Description

This work shall consist of clearing, grubbing, scalping, removal of trees and stumps, and removing and disposing of all vegetation and debris within the limits of the work as described on the drawings, except such objects that are to remain or are to be removed in accordance with other sections of these specifications.

1.01 General

- A. The Engineer shall exercise control over clearing and grubbing and shall designate all trees, shrubs, plants, and other objects to be removed. This work shall also include the preservation from injury or defacement of all vegetation and objects to remain. Paint required for cut or scarred surfaces of trees or shrubs selected for retention shall be a suitable asphaltum base paint.
- B. Before the Contractor removes any tree or stump which the plans state is to be removed, the Engineer shall review the plan requirements with the Owner and Contractor and appropriately mark each tree or stump which is to be removed.
- C. Only such trees and stumps which have been marked for removal by the Engineer shall be removed.
- D. Limitations of areas of clearing and grubbing and earthwork operations shall be in accordance with the construction drawings

PART 2 – Materials (Not Used)

PART 3 - Execution

3.01 Clearing and Grubbing

- A. All surface objects, brush, roots, and other protruding obstructions, not designated to remain, and all trees and stumps marked for removal, shall be cleared and/or grubbed, including mowing, as required, except for special treatment as follows:
 - 1. In locations to be seeded, stumps shall be removed to a minimum of 150 mm (6 inches) below ground surface.
 - 2. In unseeded areas to be rounded at the top of backslopes, stumps shall be cut off flush with or below the surface of the final slope line.

3. Except in areas to be excavated, stump holes and other holes from which obstructions are removed, shall be backfilled with suitable material and compacted in accordance with other divisions within these specifications.
4. Materials and debris may be removed from the construction site and properly disposed of at locations off the project outside the limits of view from the right-of-way with the written permission of the property owner on whose property the materials and debris are placed. No burning of vegetation will be allowed. The Contractor shall make all necessary arrangements with property owners for obtaining suitable disposal locations.
5. Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. Branches of trees extending over the roadbed shall be trimmed to give a clear height of 6 m (20 feet) above the roadbed surface.

3.02 Scalping

- A. The Contractor shall scalp all areas where excavation or embankment is to be made. Scalping shall include the removal of material such as roots, sod, grass, residue of agricultural crops, sawdust, and decayed vegetable matter from the surface of the ground.
- B. Sod and incidental topsoil removed in the scalping operation shall be salvaged and stockpiled for use as specified elsewhere. The stockpiles of scalplings shall be made in such a manner and at such locations that they will be well drained and will not impound water.
- C. The depth of scalping performed under this section is not intended to include topsoil.

END OF SECTION

SECTION 02315

EXCAVATION & EMBANKMENT FILL

PART 1 – Description

- A. This work consists of excavating and disposal of unsuitable material from roadbed excavations; and building controlled embankments and the sloping, shaping and dressing of all slopes including preparation of the areas upon which they are to be constructed by the placing and compacting of material in holes, pits, and other depressions within the embankment area, all in conformity with the lines, grades, and typical cross-sections shown on the Plans. Only approved materials shall be used in the construction of embankments.

PART 2 – Materials

All equipment for the satisfactory performance of excavation and hauling shall be on the project and approved by the Owner before the work will be permitted to begin.

2.01 Related Sections

Section 02335 Roadway Earthwork

PART 3 – Execution

3.01 General

- A. Prior to beginning excavation all necessary Clearing and Grubbing and Removal of Structures and Obstructions shall have been completed in the area in accordance with Sections 02220 and 02230 of these Specifications. The removal of unsuitable material and/or undercutting ordered by the Owner will not be considered contract items and these two operations will be included in either excavation (unclassified) or embankment (unclassified) respectively. Unsuitable material above subgrade or from undercutting in cuts shall be disposed of as directed by the Owner at no additional cost to the Owner. Any imbalance of material quantities caused by these operations or change in actual shrinkage factor shall be the Contractor's responsibility. The Owner's decision on the suitability of material or the need for undercutting shall be final.
- B. If approved by the Owner, gravel for undercut backfill or stabilization and Portland cement for stabilization will be used and paid for as separate items in the contract.
- C. When ordered by the Owner, water used for dust control will be paid for as a contract item.
- D. The Contractor shall provide for proper drainage of the project area to protect from ponding and erosion.

3.02 Excavation

- A. Excavation (unclassified) shall consist of the removal of all suitable or unsuitable material in cut sections to the lines, grades, and cross-sections shown on the Plans. All slopes, ditches and berms shall be neatly trimmed to the lines given. Excavation beyond given lines or to correct slides, regardless of the location, will be at the Contractor's expense, and the suitability of the material from slides for embankment construction will be determined by the Owner.
- B. Surplus excavated material, if determined to be suitable by the Owner, may be used to widen embankments or to flatten slopes or may be deposited in such other places and for such other purposes on the right-of-way as the Owner may approve. No payment to the Contractor shall be made for the placement of surplus excavated material. Materials unsuitable for construction of embankment or use as backfill shall be removed to off-site waste disposal areas. The Contractor shall secure waste disposal areas and dispose of surplus and unsuitable materials in such areas. It is the Contractor's responsibility to obtain written permission from the owners of all property(s) to be used for waste disposal areas prior to removal of material to disposal sites. The Contractor shall dispose of all materials on the sites to the satisfaction of the property owner(s).

3.03 Embankments

- A. Prior to beginning embankment operations all necessary Clearing and Grubbing and Removal of Structures and Obstructions shall have been completed in the area in accordance with Sections 02220 and 02230 of these Specifications. The removal of unsuitable material and/or undercutting ordered by the Owner will not be considered contract items and these two operations will be included in either excavation (unclassified) or embankment (unclassified) respectively. If there is insufficient suitable material from excavation on the project, it shall be the Contractor's responsibility to obtain the additional material off the project to complete embankments according to the lines, grades, and cross-sections on the Plans.
- B. When ordered by the Owner, water used for dust control will be paid for as a contract item.
- C. This work shall consist of constructing roadway or street embankments including the preparation of the area upon which they are to be constructed, the placing and compacting of approved materials where unsuitable material has been removed, and the placing and compaction of embankment material in holes, pits, and other depressions not filled in accordance with Sections 02220 and 02230. All work shall be in accordance with these Specifications and in conformity with the lines, grades, and cross-sections shown on the Plans. Only approved materials shall be used in the construction of embankments, which material shall come from excavation on the Project or from approved sources furnished by the Contractor.

- D. Any area upon which an embankment is to be constructed shall be plowed or scarified, all cleavage planes destroyed, and the area rolled thoroughly with a sheeps-foot roller before embankment construction is begun in the area. An area upon which an embankment is to be constructed having a slope steeper than 3 to 1 shall be benched with steps of not less than eight (8) inches rise before any embankment materials are placed thereon. Benching shall be of sufficient width to permit the operation of placing and compacting equipment. Each successive benching cut shall begin at the intersection of the original ground line and the vertical side of the previous cut. Material thus cut out shall be recompacted along with new material at the Contractor's expense.
- E. Embankment construction will not be permitted within fifty (50) feet of any structure or proposed structure until such structure is cured sufficiently to permit embankment formation against it. This requirement will be waived when an embankment or portion thereof is to form the foundation of a structure or part thereof. Embankment to be placed on both sides of a concrete wall, manhole, or box type structure shall be so constructed that the embankment is always approximately the same elevation on both sides of the structure. Embankments on only one side of abutments, wingwalls, or piers shall not be constructed until the superstructure is in place or final concrete design strength has been obtained.
- F. Where embankment is to be constructed across ground that will not support earth moving equipment, the fill shall be started with a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. In the construction of such a lift the density requirement will be waived but the moisture content of the material used shall not exceed the optimum moisture content for that material. Maximum thickness and minimum density requirements will apply to all succeeding layers of embankment construction. Each succeeding layer of embankment is to be constructed with a compacted thickness not to exceed six (6) inches and shall be approved before material for the next succeeding layer is placed.
- G. Embankments shall be so constructed that adequate surface drainage will be provided at all times. Roadway embankment materials shall be placed in horizontal layers not to exceed a depth which will produce a six (6) inch compacted layer. Each layer shall be compacted for the entire embankment width to a density no less than ninety-five (95) percent of maximum density as determined in accordance with the standard specification of compaction and density of soils, ASTM D-698. The moisture content of the embankment material shall be controlled in such a way that the material will be compacted with a moisture content ranging from two (2) percent below to two (2) percent above the optimum moisture content as determined from the above mentioned test and approved by the Owner. If the moisture content of the material in the embankment prior to compaction is greater than two (2) percent above the optimum moisture content, the material shall be aerated by disking, harrowing, plowing, or other means approved by the Owner, who shall be the sole judge as to when the required density has been obtained. For each layer of embankment material, the Contractor shall disk sufficiently to break down oversize clods, thoroughly mix any different materials, secure correct moisture content, ensure uniform density, and obtain proper compaction. Rolling with compacting equipment shall start longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least one-half of the width of the tamping

roller. Tamping equipment shall be operated at a speed of no more than three (3) miles per hour.

- H. The Contractor shall be responsible until final acceptance for the stability of all embankments and shall replace at this own expense any portion which in the opinion of the Owner has become displaced or damaged due to carelessness, negligence, or by rainfall and weathering.
- I. The slopes of all embankments, ditches, channels, and such other appurtenances as may be indicated on the Plans shall be shaped and trimmed to the lines, grades, and cross-sections shown or as directed by the Owner. This work shall also include the satisfactory shaping of spoil banks, waste deposits, and any other areas deemed necessary by the Owner to prepare the project for final inspection and acceptance.
- J. Water for dust control when ordered by the Owner, whether to comply with local air pollution ordinances, safety, or good construction practices, shall be readily available along with adequate distribution equipment.

END OF SECTION

SECTION 02335

ROADWAY EARTHWORK

PART 1 - Description

This section covers work for all excavations, embankments, grading, or removal of unsuitable material from roadbed excavations; sloping, shaping and dressing of all slopes for the construction and preparation of the graded road bed to receive the placement of a subbase or pavement material. Subgrade preparation shall also consist of the final grading of the roadbed in both cuts and fills to the density specified. .

1.01 Definitions

- A. Unclassified Excavation Above Subgrade - Unclassified excavation above subgrade is defined as any material excavated above the subgrade elevation within the street right-of-way which is placed in fill or disposed of as directed by the Engineer, and any material taken from borrow pits and deposited as embankments or fill within the streets above the proposed subgrade elevation.
- B. Optimum Moisture Content (OMC) - Optimum moisture content is defined by ASTM D698.
- C. Undercutting - This work consist of the removal and disposal of unsatisfactory excavated material below grade in cut sections or below the subgrade elevation within the street paving width as directed by the engineer. Areas to have unclassified excavation may be designated on the plans if sufficient information is available. Undercut areas shall be backfilled with suitable material from imported borrow excavations, gravel backfill, or materials stabilized with gravel or soil cement as ordered by the Owner
- D. Imported Borrow Excavation - Imported borrow excavation shall consist of excavation made from borrow areas inside or outside the project limits, and outside the normal grading limits for completion of embankments.
- E. Subgrade - That part of the roadbed to receive the immediate construction of a base or pavement thereon.
- F. Subbase - That part of the roadbed above the subgrade and below the base or pavement extending across the entire section of the roadway.

PART 2 - Materials (Not Used)

PART 3 - Execution

3.01 Excavation to Grade

- A. Excavation shall be made to grade, dimensions, and cross sections as shown on the plans or as directed by the engineer. The top of the finished subgrade shall be of such smoothness that when tested with a ten foot (10') (3m) straight edge it shall not show any deviation in excess of one-half inch (1/2") (12.5mm) from true grade as established by grade hubs or pins. Any deviations in excess of these amounts shall be corrected by loosening, adding, or removing materials, reshaping, and recompacting by wetting and rolling.
- B. Excavation shall be done in one process. All material above the subgrade shall be removed to the top elevations shown on the plans or specifications. When the excavation has been completed, the material at subgrade elevation shall be examined and inspected by the engineer. If the material at proper grade and depth meets or exceeds the requirements of material for subgrade course, as specified in these specifications and/or as determined by the Engineer, further excavation will not be required.
- C. If subbase material (bound aggregate) is specified, it shall be installed and prepared as specified in Section 02710.

3.02 Subgrade Preparation

- A. Excavation to the subgrade shall be cut approximately one inch (1/2") (13mm) above subgrade and the subgrade shall be scarified 12 inches (12") (304mm), the moisture adjusted to within $\pm 2\%$ of optimum moisture content and compacted to at least 95% of maximum density as determined by ASTM D698. The compacted subgrade shall extend one foot (1') (.3m) beyond the outside edges of the pavement base course or from rear face of the curb and gutter.
- B. Undercutting below subgrade shall be performed where spongy, organic, or otherwise unsuitable material is encountered, which, in the opinion of the engineer, will not provide a suitable foundation for the subbase or pavement material. The unsuitable material shall be removed to the depth specified by the engineer and replaced with acceptable material or stabilized with gravel or Portland Cement, or undercut and backfilled with gravel as directed by the Owner, who shall be the sole judge as to the method to be used. Replacement material shall be moisture conditioned and compacted to a minimum of 95% maximum density, as determined by ASTM D698 and a moisture content of $\pm 2\%$ of optimum.

3.03 Subgrade Protection.

- A. During construction, the subgrade shall be kept shaped and drained. Ditches and drains along the subgrade shall be maintained so as to drain effectively at all times. Where ruts occur in the subgrade, it shall be brought to grade, reshaped, and recompacted prior to placing of subbase or pavement material. The storage or stockpiling of materials on the subgrade will not be permitted. No subbase course or pavement material shall be laid until the subgrade has been checked, proof-rolled, and approved by the Engineer. Under no circumstances shall subbase or pavement material be placed on a muddy subgrade.

3.04 Imported Borrow Excavation

- A. Where fill is required for embankment, the fill shall be composed of clean earth, sand, or gravel, free from organic matter or other objectionable foreign material. The area to receive fill shall be stripped of all vegetation and other unsuitable material before fill placement is started. Slopes shall have surfaces broken up in such a manner that fill material will bond with existing surface as directed by the Engineer. The fill shall be placed in layers not to exceed ten inches (10") (254mm) inches in depth prior to compaction. The material in each layer shall be moistened to within $\pm 2\%$ of optimum moisture content as directed by the Engineer and shall be rolled until at least 95% of maximum density as measured by ASTM D698. When borrow is required, it shall be taken from a source approved by the Engineer. Fill shall be defined as imported borrow excavation. Unless otherwise specified, the top twelve inches (12") (304mm) of the pavement subgrade in both cut and fill sections shall be compacted to 100% of maximum density.

3.05 Parkway and Shoulder Finish

- A. Promptly after completion of curb and gutter construction, the areas between the curb and gutter and the property lines, shall be brought to a uniform, smooth grade, unless otherwise directed by the engineer. Hand raking may be required around trees and in areas where larger equipment cannot be used. Fill material placed in such areas shall be free from stones, sticks, or other materials which will be objectionable for seeding or sodding purposes. Backfill material shall be suitable for the growth of lawn grass. The backfill shall be compacted to a minimum of 90% of maximum dry density as measured by ASTM 698 -- however, finished grade shall be left one inch (1") (25mm) high to allow for settlement. The Contractor shall maintain the parkway area until final acceptance.

3.06 Soil Erosion Control

- A. It shall be the responsibility of the Contractor to take such action as may be necessary to minimize water pollution due to blowing dust or soil erosion due to precipitation. All disturbed soils shall be covered with hydromulch according to the erosion control plan. If this method is used, care shall be taken to avoid development of mud holes and to avoid erosion. With the Engineer's approval, other methods of soil erosion control may be utilized, such as hygroscopic materials. Such materials shall not be used if they may have a deleterious effect on future work to be accomplished on the surface to which they are applied, if they may harm vegetation with which they come in contact, if they may contribute to corrosion of metals, or if they are dangerous or irritating to humans or to animals. Refer to sections 02115 and 02481 for details on erosion control and hydromuching.

3.07 Subgrade Proof Rolling

- A. Before the placing of any type of pavement surfacing on the finished subgrade, such subgrade

shall be proof rolled with at least one pass of coverage for its full width and length with a self-propelled pneumatic roller single axle (min load) or other approved equipment by the City Engineer. Ground contact pressure of all tires shall be 85-90 psi (585-621 kPa). At the discretion of the Engineer, the specified ground pressure may be lowered and alternate equipment can be utilized. When the proof rolling shows an area to be unstable, such area shall be brought to satisfactory stability by additional compaction, reworking, or removal of unsuitable material and replacement with acceptable material.

B. Schedules for Proof Rolling.

1. All utilities, including laterals or service pipes located under the street or the curb, gutter must be in place before the Proof Rolling operation is performed.
2. Proof Rolling shall not take place more than 24 hours prior to the placing of the concrete for the curb, gutter, and/or bound aggregate base course or the hot mix asphalt street section.
3. The Owner, City representatives, and Engineer must be notified, and approval of the subgrade condition must be given, prior to the installation of any portion of the street section including curb and gutter.

END OF SECTION

SECTION 02370

STORM DRAIN OUTFALL PROTECTION

PART 1 – Description

Storm drain outfall projection shall consist of furnishing and setting or placing, stones or sacked sand cement or approved materials downstream of pipes, culverts, and other drainage structures. The outfall projection shall be constructed in conformity to the lines, grades, and cross-sections, and at the locations indicated on the Plans or as directed by the Owner and in accordance with the requirements and provisions of these Specifications.

PART 2 – Materials

2.01 Material

A. Stone

1. Stone shall be sound, dense and durable, free from cracks, pyrite intrusions and other structural defects and have a density of not less than 150 pounds per solid cubic foot. When tested by the Los Angeles method, the percent of wear shall not exceed 60.
2. When the stone is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than 15 percent.
3. Stone shall conform to one of the following gradations and shall be approximately rectangular in shape:

RIP-RAP GRADATIONS
Grade B
1,200 pound maximum weight

Weight	Percent
750 lbs. to 1,200 lbs.	27%
400 lbs. to 749 lbs.	25%
200 lbs. to 399 lbs.	25%
50 lbs. to 199 lbs.	15%
10 lbs. to 49 lbs.	5%
Less than 10 lbs.	3%

Grade C

400 pound maximum weight

Weight	Percent
250 lbs. to 400 lbs.	30%
50 lbs. to 249 lbs.	20%
30 lbs. to 49 lbs.	25%
10 lbs. to 29 lbs.	20%
Less than 10 lbs.	5%

Grade D

125 pound maximum weight

Weight	Percent
90 lbs. to 125 lbs.	25%
25 lbs. to 89 lbs.	50%
10 lbs. to 24 lbs.	15%
Under 10 lbs.	10%

Grade E
(upper bank)

Weight	Percent
75 lbs. to 125 lbs.	10%
25 lbs. to 74 lbs.	40-60%
5 lbs. to 24 lbs.	20-40%
Under 5 lbs.	15%

B. Filter Cloth and Fasteners.

1. The filter cloth material used as a base for rip-rap shall be pervious sheets of strong, rot proof plastic fabric meeting the following Specifications:

PHYSICAL PROPERTY	TEST METHOD	ACCEPTABLE RESULTS
Tensile Strength, wet, lbs	ASTM D-1682	200 (min)
Elongation, wet, %	ASTM D-1682	40 (min)
Coefficient of Water	Constant Head	.03 (min)
Permeability, cm/sec	ASTM D-4491	≥0.80
Puncture Strength, lbs.	ASTM D-751	100 (min)
Pore Size – EOS	Corps of Engineers	40 (max)
U.S. Standard Sieve	CW-02215	

2. The filter cloth material used as a base for cellular concrete blocks shall meet the following minimum physical requirements

PHYSICAL PROPERTY	TEST METHOD	ACCEPTABLE RESULTS
Grab Tensile Strength (Unaged Geotextile)	ASTM D4632	200 Lbs. (in any principal direction)
Breaking Elongation (Unaged Geotextile)	ASTM D4632	50% max. (in any principal direction)
Burst Strength	ASTM D3786	400 psi
Puncture Strength	ASTM D4833	115 lbs.
A.O.S., U.S. Std. Sieve	ASTM D4751	See Design Manual
% Open Area	CWO-22125-86	See Design Manual
Permittivity	ASTM D4491	See Design Manual

3. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic, if necessary, to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.
4. During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, ultraviolet rays and temperatures greater than 140 degrees Fahrenheit. To the extent possible, the fabric shall be maintained wrapped in its protective covering. The geotextile shall not be exposed to sunlight, ultraviolet rays until the installation process begins.
5. Final acceptance of the filtration geotextile by the Engineer shall be dependent upon the geotextile performance when tested in accordance with ASTM D5105, Standard Test Method for Measuring the Soil-Geotextile System Clogging by the Gradient Ratio test or the Hydraulic Conductivity Ratio test. Soil characteristics such as grain size distribution and plasticity shall be determined for every 200,000 square feet of geotextile installed or for each source of borrow material used during construction. Significant differences in soil characteristics shall require further performance testing by either the Gradient Ratio or the Hydraulic Conductivity Ratio tests at the discretion of the Engineer. The locations for which the material to be tested is extracted shall be approved by the Engineer. The Contractor shall provide the site-specific soil and modified proctor curves for the site-soil, at his own expense, to the manufacturer. Also, the contractor shall be responsible for the performance of the test by a certified independent laboratory experienced in performing such test. The test shall be performed under the actual field soil conditions or as otherwise required by the Engineer.
6. At the time of installation, the filter fabric shall be rejected if it has been removed from its protective cover for over 72 hours or has defects, tears, punctures, flow deterioration, or damage incurred during manufacture, transportation or storage. With the acceptance of the Engineer, placing a filter fabric patch over the damaged

area prior to placing the mats shall repair a torn or punctured section of fabric. The patch shall be large enough to overlap a minimum of three (3) feet in all directions.

7. In the event pre-assembled panels of fabric are required, the panels of filter fabric shall be sewn together at the manufacturer or another approved location.
8. The Contractor shall furnish a certified laboratory test report from an approved testing laboratory with each shipment of materials. Laboratory test reports shall include actual numerical test data obtained on this product.
9. Pins may be any commercially available pin 6 inches in length capable of retaining a washer.
10. Washers may be any commercially available washer 2 inches in diameter and compatible with the pin.
11. The pins and washers shall be manufactured from corrosion resistant metal material.

C. High-Density Polyethylene (HDPE) Plastic Transition Matting

1. Matting shall be 4 feet by 4 feet in size and ½ inch in thickness manufactured with High Density Polyethylene. Matting shall be manufactured by ScourStop or approved equal.
2. Anchor Straps. Anchor Straps shall be provided to tie HDPE matting to soil by manufacturer.

D. Cellular Concrete Blocks

1. Materials shall be manufactured by Contech or approved equal and conform to the following applicable ASTM specifications:

Portland Cements - Specification C 150, for Portland Cement

Blended Cements - Specification C 595, for Blended Hydraulic Cements

Hydrated Lime Types - Specification C 207, for Hydrated Lime Types

Pozzolans - Specification C 618, for Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete.

2. Aggregates shall conform to the following ASTM specifications, except that grading requirements shall not necessarily apply:

Normal Weight - Specification C 33, for Concrete Aggregates.

3. The concrete units shall be produced by a dry cast method. The dry cast units obtain strength in a shorter duration as well as an increase in the durability and overall quality of product.
4. At the time of delivery to the work site, the units shall conform to the physical requirements prescribed in Table 2 listed below.

Compressive Strength Net Area		Water Absorption	
Min. psi (mPa)		Max. lb/ft ³ (kg/m ³)	
Avg. of 3 units	Individual Unit	Avg. of 3 units	Individual Unit
4,000 (27.6)	3,500 (24.1)	10 (160)	12 (192)

5. When applicable, the manufacturer shall meet all requirements pertaining to a concrete unit's durability pertaining to a freeze-thaw environment.
6. Units shall be sampled and tested in accordance with ASTM D 6684-04, Standard Specification for Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems.
7. The cellular concrete blocks, cables and fittings shall be fabricated at the manufacturer or another approved location into mats with a width of up to eight (8) feet and a length up to forty (40) feet, which is approved by the Engineer.

E. Polyester Revetment Cable and Fittings

1. Revetment cable shall be constructed of high tenacity, low elongating, and continuous filament polyester fibers. Cable shall consist of a core construction comprised of parallel fibers contained within an outer jacket or cover. The weight of the parallel core shall be between 65% to 70% of the total weight of the cable. The revetment cable shall have the following physical properties:

Nominal Cable Dia. (in.)	Approx. Ave. Strength		Weight per Length	
	(lbs)	(kN)	(lbs)/100ft	(kg/m)
1/4	3,000	13.3	2.2	0.03
5/16	7,000	31.1	4.4	0.07
3/8	10,000	44.5	5.5	0.08
1/2	15,000	66.7	9.7	0.14

2. Elongation requirements specified below are based upon stabilized new, dry cable. Stabilization refers to a process in which the cable is cycled fifty (50) times between a load corresponding to $200D^2$ and a load equal to 10%, 20% or 30% of the cable's approximate average breaking strength. Relevant elongation values are as shown in the table below. The tolerance on these values is $\pm 5\%$.

ELASTIC ELONGATION

(at Percentage of Break Strength)

10%	20%	30%
0.6	1.4	2.2

3. The revetment cable shall exhibit resistance to most concentrated acids, alkalis and solvents. Cable shall be impervious to rot, mildew and degradation associated with marine organisms. The materials used in the construction of the cable shall not be affected by continuous immersion in fresh or salt water.
4. Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be taken for the bending of the cables around hooks or pins during lifting. Revetment cable splicing fittings shall be selected so that the resultant splice shall provide a minimum of 60% of the minimum rated cable strength. Fittings such as sleeves and stops shall be aluminum and washers shall be galvanized steel unless otherwise shown on the Contract Drawings.

F. Galvanized Steel Revetment Cable and Fittings

1. Revetment cable shall be constructed of preformed galvanized aircraft cable. The cables shall be made from individual wires and strands that have been formed during the manufacture into the shape they have in finished cable.
2. Cable shall consist of a core construction comprised of seven (7) wires wrapped within seven (7) or nineteen (19) wire strands. The revetment cable shall have the following physical properties:

Nominal Cable Dia. (in.)	Type	Approx. Ave. Strength		Weight per Length	
		(Lbs)	(kN)	(Lbs)/100ft	(kg/m)
1/8	7x7	1,700	7.5	2.8	0.04
3/16	7x7	3,700	16.4	6.2	0.09
1/4	7x7	6,100	27.1	10.6	0.16
5/16	7x19	9,800	43.6	17.3	0.26
3/8	7x19	14,400	64.1	24.3	0.36

3. The revetment cable shall exhibit resistance to mild concentrations of acids, alkalis, and solvents. Fittings such as sleeves and stops shall be aluminum, and the washers shall be galvanized steel. Furthermore, depending on material availability, the cable type (7x7 or 7x19) can be interchanged while always ensuring the required factor of safety for the cable.

4. Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be taken for the bending of the cables around hooks or pins during lifting. Revetment cable splicing fittings shall be selected so that the resultant splice shall provide a minimum of 75% of the minimum rated cable strength.

PART 3 – Execution

3.01 Sub-grade Preparation for Stone

- A. The area to be occupied by the rip-rap stabilization shall be cleared of all trees, roots, vegetation, and similar material. Immediately prior to the placement of rip-rap, the slopes or ground surface shall be trimmed in conformity to the lines and grades indicated on the Plans or as directed by the Owner and shall be thoroughly compacted by the use of hand or mechanical tamps. Unless otherwise specified herein make all fill with suitable materials excavated from site.
- B. All fills in dry areas shall be compacted to a maximum density of 90 percent as determined by ASTM D 698 (Standard Proctor). On slopes, the bottom of the rip-rap shall be placed at least 2 feet below the natural ground surface, unless otherwise directed.
- C. Surplus excavated material shall be removed from the site and disposed of as shown on the Plans or as directed by the Owner. Spoil material shall not be disposed of in a watercourse or on the banks of a watercourse.

3.02 Placing Filter Fabric

- A. Filter Fabric for Stone Rip-Rap
 1. Unless otherwise specified, filter fabric shall be placed on the prepared and compacted subgrade within the limits shown on the Plans for stone rip-rap. The filter fabric shall be laid loosely without wrinkles or creases.
 2. When more than one width or length of filter fabric is necessary, the joints shall be overlapped a minimum of 24 inches.
 3. Securing pins with washers shall be inserted through both strips of overlapped material and into the material beneath, until the washer bears against the fabric and secures it firmly to the base material. These securing pins shall be inserted through the overlapped fabric at no greater than 2 foot intervals along a line through the midpoint of the overlap.
 4. If the fabric is torn or damaged, a patch overlapping the edges of the damaged area by 2 feet shall be sewn securely to the fabric with a continuous, monofilament, rot-proof material.

B. Filter Fabric for ACB Revetment System

1. The filtration geotextile shall be placed directly on the prepared area, in intimate contact with the subgrade, and free of folds or wrinkles. The geotextile shall not be walked on or disturbed when the result is a loss of intimate contact between the cellular concrete block and the geotextile or between the geotextile and the subgrade. The geotextile filter fabric shall be placed so that the upstream strip of fabric overlaps the downstream strip.
2. The longitudinal and transverse joints shall be overlapped at least two (3) feet. The geotextile shall extend at least one foot beyond the top and bottom revetment termination points. If cellular concrete blocks are assembled and placed as large mattresses, the top lap edge of the geotextile should not occur in the same location as a space between cellular concrete mats unless the space is concrete filled.

3.03 Placement of Rip-Rap

A. Stone Rip-Rap

1. Stone rip-rap shall be constructed upon the prepared foundation by hand placing, so that the stones shall be as close together as is practicable in order to minimize void space.
2. When rip-rap is constructed in more than one layer, it shall be so placed that it will be thoroughly tied together with the larger stones protruding from one layer into the other.
3. Each stone shall be placed so that the depth will be perpendicular to the surface upon which it is set. The length shall be placed as directed by the Owner and each main stone shall be placed so that it will be against the adjoining stones. The stones shall be placed in such a manner as to stagger all joints as far as it is possible and practicable.
4. The main stones shall be thoroughly “chinked” and filled with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. This work shall continue with the progress of the construction. Tamping of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.
5. Knapping of the stones will not be required, except stones protruding more than 4 inches above the specified grade.

3.04 Depth of Rip-Rap

- A. The standard depth of stone rip-rap shall be 18 inches unless otherwise indicated or directed. The average depth for each 25 square feet of surface shall be not less than the depth indicated on the Plans or directed by the Owner, or the standard depth required in these Specifications.
- B. In no case shall any part of the finished depth of stone rip-rap vary more than 3 inches above or below the specified depth.

3.05 Placement of High-Density Polyethylene (HDPE) Transition Matting

- A. HDPE Matting shall not be installed over bare soil. Install HDPE matting in accordance with the dimensions shown on the plans and construction details. Optional soil covers shall be sod, turf reinforcement mats, and geotextiles. Soil covers shall extend beyond the limits of the HDPE transition matting. Install HDPE in accordance with installation instructions and with a qualified installer.
- B. All transition matting shall be in contact with sod, TRM or geotextile fabric. Soil anchors shall be driven at least 18 inches deep or deeper as need to secure HDPE matting. Anchors shall be provided by manufacturer. Anchors shall be installed in a 3 by 2 by 3 pattern.

3.06 Placement of Armortec Concrete Block (ACB) Revetment System

- A. The slope shall be graded to a smooth plane surface to ensure that intimate contact is achieved between the slope face and the geotextile (filter fabric), and between the geotextile and the entire bottom surface of the cellular concrete blocks. All slope deformities, roots, grade stakes, and stones which project normal to the local slope face must be re-graded or removed. No holes, "pockmarks", slope board teeth marks, footprints, or other voids greater than 1.0 inch in depth normal to the local slope face shall be permitted. No grooves or depressions greater than 0.5 inches in depth normal to the local slope face with a dimension exceeding 1.0 foot in any direction shall be permitted. Where such areas are evident, they shall be brought to grade by placing compacted homogeneous material. The slope and slope face shall be uniformly compacted, and the depth of layers, homogeneity of soil, and amount of compaction shall be as required by the Engineer.
- B. Excavation and preparation for anchor trenches, flanking trenches, and toe trenches or aprons shall be done in accordance to the lines, grades and dimensions shown in the Contract Drawings. The anchor trench hinge-point at the top of the slope shall be uniformly graded so that no dips or bumps greater than 0.5 inches over or under the local grade occur. The width of the anchor trench hinge-point shall also be graded uniformly to assure intimate contact between all cellular concrete blocks and the underlying grade at the hinge-point.
- C. The filtration geotextile shall be placed directly on the prepared area, in intimate contact with the subgrade, and free of folds or wrinkles. The geotextile shall not be walked on or disturbed when the result is a loss of intimate contact between the cellular concrete block and the geotextile or between the geotextile and the subgrade. The geotextile filter fabric shall be

placed so that the upstream strip of fabric overlaps the downstream strip. The longitudinal and transverse joints shall be overlapped at least two (3) feet. The geotextile shall extend at least one foot beyond the top and bottom revetment termination points. If cellular concrete blocks are assembled and placed as large mattresses, the top lap edge of the geotextile should not occur in the same location as a space between cellular concrete mats unless the space is concrete filled.

- D. The cellular concrete blocks shall be placed on the filter fabric in such a manner as to produce a smooth plane surface in intimate contact with the filter fabric. No individual block within the plane of placed cellular concrete blocks shall protrude more than one-half inch or as otherwise specified by the Engineer. To ensure that the cellular concrete blocks are flush and develop intimate contact with the subgrade, the blocks shall be "seated" with a roller or other means as approved by the Engineer.
- E. If assembled and placed as large mattresses, the cellular concrete mats shall be attached to a spreader bar or other approved device to aid in the lifting and placing of the mats in their proper position by the use of a crane or other approved equipment. The equipment used should have adequate capacity to place the mats without bumping, dragging, tearing or otherwise damaging the underlying fabric. The mats shall be placed side-by-side and/or end-to-end, so that the mats abut each other. Mat seams or openings between mats greater than two (2) inches shall be filled with 4000 p.s.i. non-shrink grout. Whether placed by hand or in large mattresses, distinct changes in grade that results in a discontinuous revetment surface in the direction of flow shall require a grout seam at the grade change location so as to produce a continuous surface.
- F. Anchor trenches and side trenches shall be backfilled and compacted flush with the top of the blocks. The integrity of the trench backfill must be maintained so as to ensure a surface that is flush with the top surface of the cellular concrete blocks for its entire service life. Toe trenches shall be backfilled as shown on the Contract Drawings. Backfilling and compaction of trenches shall be completed in a timely fashion. No more than 500 linear feet of placed cellular concrete blocks with non-completed anchor and/or toe trenches shall be permitted at any time.
- G. The cells or openings in the cellular concrete blocks shall be backfilled and compacted immediately with suitable material to assure there are no voids and so that material extends from the filter fabric to one-inch above the surface of the cellular concrete block. Backfilling and compaction shall be completed in a timely manner so that no more than 500 feet of exposed mats exist at any time.
- H. The cells or openings in the cellular concrete blocks shall be backfilled and compacted immediately with suitable material to assure there are no voids and so that material extends from the filter fabric to one-inch above the surface of the cellular concrete block. Backfilling and compaction shall be completed in a timely manner so that no more than 500 feet of exposed mats exist at any time.

END OF SECTION

SECTION 02481
HYDROSEEDING

PART 1 Description

1.01 General

Conform to the requirements and regulations of the Tennessee Department of Agriculture.

1.02 Related Sections

Section 02230 Clearing and Grubbing

Section 02200 Earthwork

Section 02925 Bonded Fiber Matrix

PART 2 Materials

2.01 Materials

A. Equipment

1. Equipment will have a built in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry containing not less than 44 lbs (20 kilos) of organic mulching amendment plus fertilizer, chemical additives and solids for each 100 gallons of water.

B. Cellulose Fiber Mulch:

1. Refer to Section 02925: Bonded Fiber Matrix

C. Fertilizers

1. 6-20-20 or 15-15-15 or approved equal applied at rate per manufacturer's recommendations.

D. Organic Tackifier

1. Refer to Section 02925: Bonded Fiber Matrix

E. Hydroseed Seed Mix

1. Meet or exceed applicable requirements of the Tennessee Department of Agriculture. No “below standard” seed will be acceptable.
2. Priority should be given to native species in any mixture due to the level of damage that non-native species are currently being exhibiting within the City as noted by the Natural Resources Inventory. Suggested native seed mixes are shown below:

Native Grass Mixture	Little Bluestem Indian Grass Blue Fescue (less than 20%) Side Oats Grama Big Bluestem Switchgrass (Native Panicum virgatum)	April 1 – June 30
Southeast Native Mixture	Indiangrass Little Bluestem Switchgrass Big Bluestem Lovegrass (Native only)	March 1 – June 15
Songbird Native Grass / Wildflower Mixture (Useful near conservation easements or natural areas for establishment of wildlife)	Side Oats Grama Little Bluestem Indian Blanket Lance-leaved Coreopsis Purple Coneflower Goldenrod Joe Pyeweed Evening Primrose New England Aster Black-Eyed Susan	April 1 – June 15 August 15 – October 15
Wetland Mixture	Red Top (Native only) Virginia Wild Rye Fox Sedge Woolgrass Soft Rush Lurid Sedge Joe Pyeweed	March 15 – June 15 August 15 – October 15
Native Rough Mixture (Fescue mix may not be appropriate in all locations due to invasive nature)	Hard Fescue Little Bluestem Chewings Fescue Blue Fescue	March 15 - June 1 August 15 – October 15

Some mixtures may not be appropriate near natural areas due to the inclusion of non-natives and plants that are invasive by nature. Focus on native species, including but not limited to: Big and Little Bluestem, Broomsedge Bluestem, Indiangrass, Native Switchgrass, Sideoats Grama, and

Eastern Gramagrass. These species should be planted from April to May. Mowing should only be done in late October and late February to early March. Other forms of maintenance (that closely resemble natural disturbance) may be needed to exclude undesirables and to further promote the growth and spread of the native grasses.

PART 3 Execution

3.01 Installation

A. Installation procedures:

1. Examine related work including irrigation and grading of surface before proceeding with any work and notify the Engineer in writing on conditions which may prevent the proper execution of this work. Failure to report unsuitable conditions will require the rectification of unacceptable work at no additional expense to the Owner. Verify that acceptable topsoil (minimum depth of six (6) inches) is in place before commencing of hydroseeding operations.
2. Water all plant areas thoroughly to saturate upper layers of soil prior to the hydroseeding operation.
3. Allow the planting area soil surface to dry out for one day only prior to the hydroseeding application. Exercise care not to allow the soil surface to be overly saturated with water prior to the hydroseeding installation. At the same time the soil surface should not become too dry during this period. There should be some residual moisture within the first ¼ inch of the soil surface.
4. Prior to starting the hydroseeding operation, notify the Engineer forty eight (48) hours in advance to be present at start of start of hydroseeding.

B. Hydroseeding Application:

1. Apply the hydroseeding in the form of a slurry consisting of organic soil amendments, commercial fertilizer, and any other chemicals that are called out. When hydraulically sprayed onto the soil, the mulch will form a blotter-like material. Direct the spray operation so that this procedure will drill and mix the slurry components into the soil, the slurry spray will also penetrate the soil surface, thus ensuring maximum impregnation and coverage. The impregnation and mixing of the components will help in retaining moisture while stabilizing soil surface from superficial erosion.
2. Do not let the hydroseeding slurry components in the hydroseeding machine for more than two (2) hours because of possible seed destruction. If slurry components are left for more

than two hours in the machine, add 50% more of the originally specified seed mix to any slurry mixture which has not been applied within the two hours after mixing. Add 75% more of the original seed mix to any slurry mixture which has not been applied eight (8) hours after mixing. All mixtures more than eight (8) hours old must be disposed, off-site, at no additional expense to the Owner.

3. Spray the area with a uniform visible coat, using the dark color of the cellulose fiber as a visual guide. The slurry will be applied in a downward drilling motion via a fan stream nozzle. Insure that all of the slurry components enter and mix with the soil. Insure the uniformity of the hydroseed application.
4. Exercise special care to prevent any of the slurry from being sprayed onto any hardscape areas including concrete walks, fences, walls, buildings, etc. Remove all slurry sprayed onto these surfaces at no additional expense to the Owner.
5. Save all seed and fertilizer tags and fiber mulch bags for the Engineer to verify compliance with the drawings and specifications.
6. The Engineer does not need to be present during the hydroseeding operation but has final determination if conditions are acceptable for hydroseed application.

3.02 Time of Sowing

A. The grass seed percentages listed below indicate quantity by weight percent.

1. Fall
 - a. Hydroseed during the period of September 15 to December 1 at the rate of ninety (90) pounds per acre.
2. Spring
 - a. Hydroseed during the period of April 1 to July 1 at the rate of ninety (90) pounds per acre.
3. Summer
 - a. Hydroseed during the period of July 1 to September 15 at the rate of ninety (90) pounds per acre.

B. Do not hydroseed during weather where prevailing winds exceed 15 miles per hour or are gusty, nor when the ground surface is frozen, wet or otherwise non-tillable. No hydroseeding will be allowed during the period December 1 to April 1 without written approval of the Engineer.

3.03 Maintenance

A. Upon acceptance of hydroseeding operations, maintain all hydroseeding areas for a period of 90 calendar days as follows:

1. Germination stage irrigation: Approximately 25 hours after hydroseeding the Planting areas, initiate the watering sequence. Leave the water on long enough to moisten the soil thoroughly to the depth of the slurry mulch taking care not to super saturate or wash away the slurry and seed. Perform frequent, light irrigation until the seed has germinated. Repair all seed washings and erosion.
2. Establishment stage irrigation: After germination, reduce each watering. The specific watering program will be approved by the Engineer.

B. Fertilization

1. Fertilize all hydroseed areas with an approved commercial fertilizer, 30 calendar days from the start of the maintenance period and continuing one every 60 calendar days until the completion of the 90 calendar day maintenance period.

C. Weeding

1. All concentrated developments of weed growth appearing in the seed mix planting areas during the maintenance period will be removed at two (2) week intervals. Remove such concentrations of weeds manually or by a City approved herbicide program.

D. Minimum Coverage and Acceptance

1. Minimum coverage
 - a. Final acceptance may be given at the end of the 90 calendar day maintenance period if an acceptable germination of turf and adequate plant establishment has been obtained, as determined by the Engineer.
 - b. Final approval and acceptance will be given in writing by the Engineer following a final acceptance inspection. The Engineer reserves the option to extend the maintenance period to achieve complete germination of all turf or other plant materials with a uniform height, color and density throughout all hydroseeded areas.

END OF SECTION

SECTION 02632

STORM SEWERS AND CULVERTS

PART 1 - Description

This section covers storm sewer and culvert materials, excavation, trenching, and backfilling for storm sewers and appurtenances. Work shall consist of removal of all material of whatever description that may be encountered; removal and disposal of debris; handling and storage of materials; all necessary bracing, shoring, and protection; pumping and dewatering as necessary; all backfill preparation of subgrades; and final grading, dressing, and surface restoration cleanup of the site.

PART 2 - Materials

2.01 Submittals

Before the fabrication of the pipe and manholes is started, the contractor shall submit for review, drawings showing the pipe lengths, complete laying schedule, joint details, special sections, and other additional details, such as fittings. All pipe and manholes furnished shall be fabricated in accordance with the reviewed drawings. Manufacturer's certificates of compliance and installation recommendations shall be provided to the City prior to construction.

2.02 Materials

The materials furnished for the storm sewer pipe and culverts shall be equal to or shall exceed the following requirements.

A. Storm Sewer Pipe and Culverts

The materials furnished for the storm sewer pipe and culverts shall be equal to or shall exceed the following requirements.

1. Reinforced Concrete Pipe (RCP)

- a. All reinforced concrete pipe shall conform to the requirements of ASTM Standards for the specified diameter and strength class as follows:
 1. Circular Pipe – ASTM C76
 2. Horizontal and Vertical Elliptical Pipe – ASTM C507
 3. Arch Pipe – ASTM C506
- b. Minimum wall thickness shall be "Wall B" in referenced specifications C76 and C14 of ASTM.

- c. Strength class or classes shall be as required by the Plans or Contract Documents but in no case shall pipe of less than strength Class III be used. Portland Cement used in manufacturing reinforced concrete pipe shall be Type II, ASTM C150.
- d. Lifting holes will not be permitted in any of the pipe, except elliptical pipe and box sections.
- e. Joints for the reinforced concrete pipe shall be either tongue and groove or bell and spigot. Except for special pieces, each joint shall be at least seven and one-half feet (7'6") (2.3m) in length. Unless deleted elsewhere in the specifications, joints in reinforced concrete pipe shall conform to one of the following types:

Rubber Trapped "O" Ring Gasket type – ASTM C 443
Flexible Plastic Rope Gasket type – AASHTO M 198 – Type B
Flexible Butyl Rope Gasket type – AASHTO M 198 – Type A
Portland Cement Mortar Joint type

- f. Type D, Portland Cement Mortar Joint, may only be used on radial, elliptical, and arch pipe. The shape, dimensions, and tolerance of the bell and spigot or tongue and groove ends of the pipe shall be compatible with the type of joint used and shall conform to the above referenced specifications.
- g. Reinforced concrete pipe shall be manufactured in a plant that is certified by the American Concrete Pipe Association.
- h. In addition to the certifications and bearing test results, the contractor shall furnish the Owner with mill test reports for all cement used to manufacture proposed pipe. The owner reserves the right to sample and test any pipe after delivery and to reject all pipe represented by any sample which fails to comply with the specified requirements.

2. Polyvinyl Chloride Pipe (PVC)

- a. Polyvinyl chloride pipe (PVC) shall conform to ASTM D3034, SDR 26, for four inch (4") (100mm) through fifteen inch (15") (375mm) diameter and ASTM F679 for eighteen inch (18") (450mm) through thirty six inch (36") (914 mm) diameter. The pipe shall have bell and spigot joints with an approved gasketed joint.
- b. When special fittings such as wyes, tees, etc., are required, they shall be manufactured from the same material as the pipe and shall be made for use with PVC pipe. Connections to manholes and catch basins shall be made using O-ring gaskets whenever ground water is present; otherwise, catch basins and manholes may be grouted. Other suitable elastomeric boots may be used.

3. Corrugated Steel Pipe (CSP)

- a. Corrugated steel pipe, band couplers, and fittings, shall be manufactured in accordance with AASHTO M-36, latest edition, as revised in these specifications. All seams shall be joined in a manner that develops the full strength of the pipe and shall not affect the shape or nominal diameter of the pipe. The wall thickness of the steel shall be specified in the Special Provisions. Corrugated Steel pipe shall not be used unless shown on the construction drawings.
- b. The materials used to coat the steel sheets shall be specified in the Special Provisions and may be one or more of the following types:
 - i Zinc-coated (galvanized) steel sheets for annular pipe shall be coated in accordance with AASHTO M-218.
 - ii Aluminized coated (Type 2) steel sheets shall be coated by the hot dip process in accordance with AASHTO M-274, M-36, and M-274.
 - iii Precoated (Polymeric) galvanized steel sheets shall be coated in accordance with AASHTO M-246 and M-245. The precoated sheets shall be Type C with a polymeric coating in a thickness of 0.010 inch (3mm) minimum on each side and edge of the sheets.
- c. After the fabrication of the pipe, the manufacturer will coat the cut ends of each section of pipe with the specified coating before shipping. Exposed uncoated metal at the ends of the pipe may be reason for rejection of the pipe.
- d. The CSP shall be joined together with coupling bands manufactured in accordance with AASHTO M-36. If coatings of the CSP are specified, the couplings shall be coated with the same materials. Unless otherwise specified, the couplings shall make a watertight joint.
- e. All pipe shall be inspected when delivered to the job site and prior to the unloading of the pipe. Any pipe damaged during shipping and/or handling will be rejected and will not be installed. If the exterior bituminous coating is damaged during installation, the contractor shall repair the coating using approved methods and materials. If the concrete lining is damaged during installation, the contractor shall remove and replace the damaged pipe at no expense to the owner.
- f. The pipe supplier shall prepare and supply the contractor with a pipe-laying schedule, and the Contractor's supervisor and superintendent and the owner's representative shall have these laying schedules available on the job site.
- g. Connections for the laterals and catch basin leads may be shop fabricated or made in the field. In some instances, field connections shall be required. All field connections shall be saw cut using a saber type saw and templates made for such use. Flame cutting shall not be

allowed. After field cuts have been made, the exposed metal shall be coated with the specified coating. Coating materials shall be supplied by the pipe manufacturer. The connection shall be completed according to the manufacturer's recommendations.

- h. Installation of corrugated steel pipe is considered to be a flexible conduit and, therefore, special care must be taken during the bedding and backfilling operations. Installation and backfilling operations shall be in accordance with the recommended practices set forth in the "Handbook of Steel Drainage and Highway Construction Projects", published by the American Iron and Steel Institute.
 - i All pipe shall be bedded with an approved granular bedding material. The pipe shall be bedded true to line and grade with uniform and continuous support from a firm base. Blocking shall not be used to bring the pipe to grade.
 - ii The bedding material shall be placed evenly on both sides of the pipe to a point twelve inches (12") above the top of the pipe. Special care shall be taken to insure that all voids are filled beneath the pipe haunch and that the bedding material is properly placed and compacted to provide lateral restraint. The trench sidewall shall be adequately braced, shored, or sheeted as necessary to stabilize the trench walls. The trench shall not be any wider than necessary for proper installation, and pipe jointing. The bedding material shall be placed under haunches and around the pipe alternately in 6-inch layers on both sides of the pipe to permit thorough consolidation of the bedding material. This material is placed alternately to keep it at the same elevation on both sides of the pipe at all times.
 - iii Extreme care shall be taken in the removal of cribbing, shoring, sheeting, etc., so as not to disturb previously constructed foundation, bedding and initial backfill. If it was necessary to place or drive sheeting or other trench protection below the top of the pipe, the sheeting, shoring, etc., shall be cut off at a point one foot (1') above the pipe and the remaining material shall be left in place. Removal of this portion could seriously jeopardize the side support necessary for "flexible conduits" and create excessive lateral soils pressures and pipe deflections.
 - iv Excessive concentrated loads or heavy equipment on top of or along side of the pipe shall be avoided. Maximum supporting strength in flexible conduits does not develop until the fill consolidates.

4. Corrugated PVC Drainage Pipe

- a. Corrugated Polyvinyl Chloride (PVC) pipe shall conform to ASTM F794 and F949 for twelve inch (12") through thirty-six inch (36") diameter. Joints shall be an integral bell-gasketed joint. When the joint is assembled, it shall prevent misalignment of adjacent pipes and form either a soil tight joint (2psi) hydrostatic test per AASHTO Standard Specification for Highway Bridges, Section 26.4.2.4 or a watertight joint (10.8) psi test per

ASTM D3212.

- b. When special fittings such as wyes, tees, etc., are required, they shall be manufactured from the same material as the pipe and shall be made for use with Corrugated PVC Drainage pipe. Connections to manholes and catch basins shall be made using O-ring gaskets whenever ground water is present; otherwise, catch basins and manholes may be grouted. Other suitable elastomeric boots may be used.

5. Reinforced Concrete Box Culverts

- a. Reinforced box culverts shall be precast or cast in place
- b. Precast concrete box culverts shall conform to the requirements of ASTM C1433, latest revision. Concrete box culverts shall be manufactured in a plant that is certified by the American Concrete Pipe Association.

B. Manholes

1. All manholes and other precast items shall be manufactured in a plant that is certified by the National Precast Concrete Association. Manufacturer's certificates of compliance and installation recommendations shall be provided to the Engineer and City prior to construction.
 - a. All manholes shall be constructed with concentric precast sections without steps unless otherwise approved. Precast concrete manhole sections shall be manufactured to standards at least equal to or greater than the requirements of the standard specifications for precast reinforced concrete manhole sections, ASTM designation C478. The minimum internal diameter for storm manholes shall be forty-eight inches (48") (1.2m) unless shown otherwise. Manholes shall conform to all requirements as shown on the detail drawings. Precast manhole joints shall be made water-tight with RAM-NEK material, or approved rubber gasket at each joint. The RAM-NEK and primer must be used in accordance with the manufacturer's instructions. Rubber gaskets used for precast manhole joints shall be designed in accordance with ASTM designation C443. All lifting holes must be grouted. All Portland cement for manholes shall be Type II.
 - b. The concrete base shall be cast-in-place or precast concrete of the size and depth shown on the drawings. Concrete used for bases shall have a twenty-eight (28) day compressive strength of at least four thousand pounds per square inch (4,000psi) (27,600 kPa). Approved precast concrete bases will be allowed if provided with an integral groove for barrel placement. Precast concrete bases shall conform to ASTM C478. Manholes with a monolithically poured base with bottom barrel are also acceptable and preferred.
 - c. Precast manhole inverts shall be constructed using a secondary invert forming system designed to provide a finished invert that aligns precisely with the incoming pipelines, incorporating a finished flow depth of 0.8 to 1.0 diameter of the largest pipe. The

completed precast invert shall include an alignment bench for each pipe, and provide for uniform horizontal and vertical transition through the manhole in accordance with drawings. Provide 0.1' (30mm) minimum fall between inlet and outlet. After the installation of the pipelines into the manhole, the interior annular space around the outside of the pipe shall be sealed with grout. The acceptable tolerances for manhole inverts are one-quarter inch (1/4") (6.25mm) in any dimension and within 2 degrees for alignment. The invert forming system shall be "a-lok tru contour", or approved equal.

- d. The manhole ring and cover shall be centered over the connection at the centerline of flow.
- e. For manholes with depths of six feet (6') (1.8m) or less, all of the precast manhole sections shall be of the specified diameter and shall have a flat, precast concrete top.
- f. For sewer manholes four (4) to six (6) feet in diameter and less than twenty (20) feet deep, precast reinforced manhole base sections shall be a minimum of 8 inches thick. For sewer manholes greater than six (6) feet in diameter or more than twenty (20) feet deep, precast reinforced concrete manhole base sections shall be a minimum of 12 inches thick. All precast manhole base sections shall be reinforced with #4 steel reinforcement bars placed 6 inches on center each way and at mid depth of the slab, unless shown otherwise on the plans.

C. Catch Basins.

1. All catch basins, inlet boxes, and other precast items shall be manufactured in a plant that is certified by the National Precast Concrete Association. Catch basins (storm inlets) shall be cast-in-place or precast concrete with dimensions as shown on the drawings or standard details.
 - a. Precast concrete catch basins shall comply with all the requirements of ASTM C858 and C857. Cast-in-place concrete basins shall be constructed of materials in accordance with Section 03050, Portland Cement Concrete.
 - b. The Contractor may elect to install pre-cast or cast-in-place catch basins.

D. Castings

1. Manhole frames and covers, and catch basins frames and grates shall meet the requirements of this Section unless specified otherwise in the Special Provisions or drawings.
2. Manhole frames and covers shall be heavy duty Neenah R 1643 or approved equal. Heavy-duty manhole ring and cover shall have a minimum depth of seven and half inches 1.5 inch thick cover, and an inside clearance of 24 inches in diameter.
3. Acceptable grates shall be determined by the design, hydraulic efficiency, and placement

required. Additionally, grates must be suitable for use in areas where it is possible for handicap persons and pedestrians to be present. The adoption of the Americans with Disabilities Act (ADA), the prominence of narrow-tired bicycles and concern for pedestrian safety dictates the design considerations of storm water installations.

Grate selection criteria should include a combination of capacity, and functionality for the specific location. Directional and/or vane grates are not recommended at the low points of vertical curves, and shall be used only when approved by the Engineer.

Catch basin frames and curb box shall be Neenah R-3067, D&L Supply I-3517, or equivalent. I-3516 is recommended for use in the lowpoint of vertical curves.

Grates shall be certified by the manufacturer as bicycle friendly, and the certification shall be submitted to the City prior to installation.

4. Cover and frame seat shall be machine finished to prevent any rocking of cover in its associated frame. Cover shall have the word "storm sewer" clearly cast on its surface.

When required, self-sealing, waterproof frames and covers meeting Neenah R-1916-F, or approved equal shall be used.

5. Flared end sections for culverts shall be manufactured of the same material as the culvert. End sections shall be fitted for a trash rack on both upstream and downstream ends, or as directed by the Engineer.

E. Granular Materials

1. Granular materials furnished for foundation, bedding, encasement or other purposes as may be specified, shall consist of any material or synthetic mineral aggregate such as sand, gravel, crushed rock, crushed stone or slag, that shall be so graded as to meet the gradation requirements specified herein for each particular use.
2. Granular materials furnished for use in foundation, bedding, or encasement recommended for use in construction are:

MATERIAL USE DESIGNATION

Sieve Size	Percent Passing	
	Foundation AASHTO M43 (No.57)	Bedding & Encasement AASHTO M43 (No. 67)
1 inch (25mm)	95-100	100
3/4 inch (20mm)	-	90-100
1/2 inch	25-60	-
3/8 inch (9.5mm)	-	20-55

No. 4 (4.75mm)	0-10	0-10
No. 8 (0.075mm)	0-5	0-5

3. Other approved material for bedding and encasement shall consist of sand, sandy gravel, or fine gravel having a maximum size of three-quarter inch (3/4") (20mm), uniformly graded and a maximum plasticity of 6 as determined by AASHO T-89 and T-90. Other gradations may be used if written approved is obtained from the City.
4. Certified copies of all sieve analysis and plasticity analysis for the above materials shall be submitted to the City Engineer and approved before construction starts. Other sieve or plasticity analysis may be required during construction as directed by the City Engineer.
5. Granular materials provided for Foundation, Bedding, or Encasement use, shall be classified as to use in accordance with the following:
 - a. Granular Foundation: placed below and to the midpoint of the pipe as replacement for unsuitable or unstable soils, to achieve better foundation support.
 - b. Granular Bedding: placed from four inches (4") (100mm) to six inches (6")(150mm) below the pipe to the pipe midpoint, to facilitate proper shaping and achieve uniform pipe support. When foundation material is required, the granular bedding shall be of foundation material gradation.
 - c. Granular Encasement: placed below an elevation one foot (1') (300mm) above the top of pipe, after pipe installation, for protection of the pipe and to assure proper filling of voids or thorough consolidation of backfill. Granular encasement shall be provided for all flexible piping.
6. Granular encasement and bedding material shall meet the gradation requirements listed in herein. Other gradations may be used if written approval is obtained from the City Engineer. Gradations should meet the requirements of ASTM 2321. Guidelines for the maximum particle size for encasement material in relation to pipe type and diameter are shown below:

<u>Pipe Type</u>	<u>Nominal Diameter Inches (mm)</u>	<u>Maximum Particle Size Inches (mm)</u>
PVC, Other Plastic	15" and greater	3/4 (20)
PVC, Other Plastic	Less than 15"	1/2 (12.5)
Concrete	6.1 - 12.0 (155 - 300)	1 (25)
Concrete	12.1 (307) and greater	1 (25)
CMP	6.1 - 12.0 (155 - 300)	1 (25)
CMP	12.1 (307) and greater	1 (25)

7. Select Backfill

Job excavated and imported select backfill material shall be free from debris, organic material, and stones larger than three inches (3") (75mm) in diameter. Contractor shall be responsible, at his expense, for separating debris, organic material and stones larger than three inches (3") (75mm) in diameter. Select material that the Engineer directs to be used shall be the same gradation as the bedding and encasement material. No asphalt chunks or concrete may be used as select backfill.

8. Structural Fill Material

Structural fill shall consist of excavated or imported material, free of organic or deleterious material and particles larger than three inches (3") (75mm) in maximum dimension. Structural fill shall be well graded from coarse gravel to fine sand with less than 10% passing the No. 200 sieve. Structural fill material shall be within +2% of optimum moisture content when placed as determined by Proctor, and shall not exhibit pumping (horizontal or vertical displacement) after completion.

9. Groundwater Barriers

Low permeability ground water barriers may be used in areas designated by the City Engineer. Barrier material shall meet soil classification GC, SC, or CL per the Unified Soil Classification System and shall have a liquid limit less than 50. The barrier material shall be compacted to 95 percent of maximum density. Job excavated material meeting one of the above soil classifications and free from stones, organic matter and debris may be used.

10. Portland Cement Concrete shall be of the class and dimensions as shown on the Plans or as directed by the Owner. The classes of concrete for drainage facility construction are referred to as Class AS and Class C. Class AS concrete is intended principally for concrete structures designed for high strength. Class C concrete is intended principally for low strength concrete used primarily for foundation stabilization, pipe cradles and encasement and other general purposes. All Portland Cement Concrete shall meet the requirements of Division 3 of these specifications.

Part 3 - Execution.

3.01 Excavation for Pipe and Related Structures (General)

1. Complete all excavation regardless of the material encountered. If structures, utilities, or other objects are encountered that may be necessary for continued facility operation or may need preservation, immediately notify the Engineer and protect said object.
2. When cutting into existing roads, streets, alleys, or other public rights-of-way, the Contractor,

shall obtain the proper licenses, cut permits, etc., from the appropriate authority.

- a. Where trench excavation requires the removal of curb and gutter, concrete sidewalks, or asphaltic or concrete pavement, the pavement or concrete shall be cut in a straight line parallel to the edge of the excavation by use of a concrete saw, or similar approved equipment to obtain a straight, square, clean break. Cuts shall be located at standard joint locations, when possible.
3. When crossing existing or prospective cultivated areas, gravel streets or other developed surfaces, the Contractor shall strip the cover material to full depth of the existing surfacing. This surfacing shall be stockpiled and placed back over the trench after backfilling to the extent that it is acceptable and usable for that purpose. New material shall be provided as necessary. Topsoil shall be removed to full depth of the topsoil, or to a maximum depth of twelve inches (12") (300mm), whichever is less.
 4. The disturbed area from construction shall be confined within the construction limits.
 - a. The trench shall be dug only as far in advance of the pipeline as work can be reasonably completed that day. The sides of the trench shall be sloped and/or braced in accordance with the current OSHA Standards and the trench drained so that workers can work safely and efficiently. It is essential that the discharge of pumps when required, be laid to approved natural drainage channels or storm sewers
 5. Pipe crossings under sidewalks or curbs may be made by tunneling only if approved by the Engineer. If the Contractor elects to remove a portion of the sidewalk or curb, he must use a concrete saw for making neat joints corresponding to existing joints, compact the backfill as specified, and pour a new concrete sidewalk or curb section in accordance with the applicable sections of these specifications.
 6. During excavation, materials suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials shall be stored and retained at least two feet (2') (600mm) or more from the edge of the trench in accordance with Occupational Health and Safety Rules and Regulations for Construction. Excavated material must not be piled over nearby existing parallel trench lines unless adequate precautions are taken by the Contractor to prevent sidewall failure. Ready access to existing fire alarm boxes, fire hydrants, valves, manholes, and other appurtenances must be maintained.
 - a. When making excavations, the various materials excavated shall be piled separately. All concrete and bituminous materials, any soils, which cannot be properly compacted, and all other deleterious materials shall be immediately removed from the construction site and properly disposed of in accordance with applicable laws.
 - b. All excavated material shall be piled within the construction limits or in a location obtained

by the Contractor and accepted by the Engineer in a manner that will not endanger the work and that will avoid obstructing sidewalks, driveways, and fire hydrants.

7. Surface drainage of adjoining areas shall be unobstructed. Grading shall be done as may be necessary to prevent surface water from flowing into excavations, and any other water accumulating therein shall be promptly removed. Under no circumstances shall water be permitted to rise in unbackfilled trenches until after the pipe has been placed, tested, and covered with backfill. Any pipe having its alignment or grade changed as a result of a flooded trench shall be reinstalled.
 - a. Gutters shall be kept clear or other satisfactory provisions made for street drainage at all times.
8. The bottom of the trenches shall be accurately graded to the line and grade shown on the drawings. Bedding material shall be added (four inches (4'') (100mm) minimum) to provide uniform bearing and support for each section of pipe at every point along its length. Care must be taken to avoid over excavation. Unauthorized over-depths shall be backfilled with approved bedding material at the Contractor's expense. All bedding material added shall be moistened and compacted to the satisfaction of the City Engineer. The finished trench bedding beneath the pipe shall be prepared accurately by means of hand tools.
 - a. The bottom of all excavations shall be neat and clean, containing no abrupt changes in grade except as shown and shall be free from all slough. Suitable methods shall be used to produce an excavated surface without disturbance to the underlying material by compacting soil material to at least 95% Standard Proctor, ASTM D698.
 - b. If in its natural state the material at the bottom of the trench is soft and, in the opinion of the City Engineer, cannot support the pipe, a further depth and/or width shall be excavated as directed by the City Engineer and refilled with foundation material to the midpoint of the pipe. Other approved methods may be used to assure a firm foundation.
 - c. Foundation material used to dewater the trench or to replace a wet material shall be considered incidental to construction.
9. Blasting the excavation to remove rock, clay, or hardpan will not proceed until the Contractor has notified the City Engineer of the necessity to do so and obtained written approval. This notification shall in no manner relieve the Contractor of the hazard and liability contingent on blasting operations. The City Engineer shall fix the hours of blasting. The Contractor at his expense shall repair any damage caused by blasting. The Contractor's methods of procedure relative to blasting shall conform to local and state laws and municipal ordinances, and the necessary permits shall be obtained.
10. The width of the trench shall be such to provide adequate working room for workers to install the pipe in the specified manner. The trench in the pipe zone and to one foot (1') (300mm)

above the pipe zone shall be adequate in width to allow for proper compaction but shall in no case be less than one and half times the outside pipe diameter plus one foot (1') (300mm).

11. Where the trench is not located near existing utilities, buildings, or other structures, and where water and other conditions permit, the Contractor may omit sheeting and bracing of the excavation. In this event, sides of the trench shall be sloped to protect the workers working within them in accordance with Occupational Health and Safety Rules and Regulations for Construction. However, the trench must stay within the construction limits.
12. The Contractor shall provide safety boxes or sheeting and bracing necessary to confine his work within the construction limits, to provide safe working conditions, to prevent damage and delay to the work, and to prevent the disturbing or settlement of adjacent road surfaces, foundations, structures, utility lines or railroad tracks. The Contractor shall be responsible for the strength and sufficiency of all sheeting and bracing.
13. Any damage to the work under this contract or to adjacent structures or property caused by settlement, water or earth pressures, slides, cave-ins, or other reasons due to failure or lack of sheeting and bracing, or improper bracing, or through negligence or fault of the Contractor in any manner, shall be repaired by the Contractor without delay and at his expense.
14. Bracing shall be so arranged as to provide ample working space, so as not to interfere with the work, and so as not to place any strain on the structures being constructed, until such structures are of sufficient strength to withstand such strain. No sheeting and bracing shall be removed until the construction has proceeded far enough to provide ample strength for its safe removal.
 - a. Sheeting or bracing may be left in place in the trench at the discretion of the City Engineer. Any sheeting or bracing left in place shall be cut off approximately three feet (3') (900mm) above the top of the pipe or two feet (2') (.6m) below finish grade, whichever is lower, and the cut-off portion removed. All sheeting or bracing left in place shall be accurately located and shown on the "Record Drawings"
15. The Contractor shall be responsible for enforcing safety and maintaining safe working conditions in all trenching, shoring, and blasting operations to conform to OSHA regulations.
16. Trenching and tunneling standards near and around trees.
 - a. Trenches should be routed outside the tree protection zone or critical root zone (CRZ). For trees less than 6" diameter at breast height (DBH), defined as 4.5 feet about average ground level, that are to be retained, no trenching should occur within the dripline or tree protection/critical root zone as defined by the City of Lakeland Tree Management Ordinance. For trees 6" DBH and less than 20" DBH no trenching should occur within an area equal to 1' radius for every inch of DBH or within the tree protection/critical root zone as defined by the City of Lakeland Tree Management Ordinance. For trees 20" DBH and greater, no trenching should occur within an area equal to 1.5' of radius for

every inch of DBH or within the tree protection/critical root zone as defined by the City of Lakeland Tree Management Ordinance.

- b. Soil removed from the trenches should be placed on the side away from the trees and replaced as soon as possible. The width of the trench should be minimized. The use of trench walls should be considered rather than sloping sides when working around trees.
 - c. Trenches should be backfilled with quality or native soil when inside of a tree protection zone or critical root zone. Gravel, slurry, stone, and concrete are not appropriate fill material within a tree protection zone, unless used as bedding material.
 - d. If placement of utilities or other infrastructure is unavoidable within the tree protection zone or critical root zone then specific measures should be applied to minimize root damage. Tunneling is recommended as soon as roots 1 inch diameter and greater are encountered. Minimum tunnel depth should be 24 inches. Launch and recovery pits should be located outside of tree protection zones and critical root zones. If tunneling is impossible due to specific soil restrictions, the trenching should be done by hand within the tree protection zone or critical root zone. If this required trenching will sever more than 25% of the tree protection/critical root zone then the trench should be re-directed at the center of the tree with the final section dug under the base of the tree.
 - e. Changes to the approved construction plans or methods for trenching and tunneling must be submitted to and receive approval by the City's Representative before proceeding.
17. Dewatering, if required by site conditions, shall be provided by the Contractor. The contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface water and groundwater entering the excavations, trenches, or other parts of the work.
18. All trench excavations which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations twelve inches (12") (300mm) or more below the bottom of the excavation.
19. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.
20. The Contractor shall be responsible for the conditions of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
21. In areas where dewatering is required, the Contractor will comply with the following requirements.
- a. All discharges from dewatering systems, including well points, dewatering wells, pumps

in the bottoms of the trenches, etc. will require a permit from the Tennessee Department of Environment and Conservation (TDEC). Before starting any construction, the Contractor shall submit an application to discharge to the TDEC along with this proposed dewatering plan for review.

- b. One copy of the initial application, dewatering plan, and of the permit authorizing the discharge must be provided to the City Engineering office with the application for an excavation permit. Copies of any revisions to the dewatering plan shall be immediately provided to the City Engineering office.

3.02 Disposal of Excess Material

1. Except as otherwise permitted, dispose of excess excavated materials in a legal manner.
2. When making excavations, the various materials excavated shall be piled separately. All concrete and bituminous materials, any soils which cannot be properly compacted, and all other deleterious materials shall be immediately removed from the construction site and properly disposed of in accordance with applicable laws.

3.03 Pipe and Structure Installation

1. The Contractor shall use laser beam equipment, surveying instruments, or other proven techniques to maintain accurate alignment and grade. Reasonable care shall be exercised in handling and laying the pipe and fittings. The interior of all pipe and fitting shall be kept free from dirt and foreign matter at all times, and cleaned out thoroughly before being lowered into the trench. Under no circumstances shall materials be dropped or thrown into the trench.
2. Materials shall be placed where they will not be subject to injury from vehicles or equipment. The contractor's facilities for lowering the pipe into the trench shall be such that neither the pipe nor trench will be damaged or disturbed. Pipe shall be lowered into the trench with rope slings, gin poles, dragline, or trench in such manner as to lay the pipe carefully into place and shall be lowered and laid with the bell end up. Holes shall be dug under the bells so that pipe is unsupported at the pipe connection. The laying of pipe in the finished trench shall be started at the lowest point and laid up. The Contractor shall clean and remove all sand, gravel, concrete, and cement grout that has entered the lines in the process of construction.
3. Any pipe which is broken, cracked, or otherwise unsuitable, as determined by the Engineer, shall be removed and replaced by the contractor at no additional cost to the owner. Any damage to pipe coatings shall be repaired with the same materials used for the original coating before laying the pipe.
4. The Contractor shall keep the pipe, manholes, catch basins, and other structures free from deposits of mud, sand, gravel, or other foreign matter, and in good working condition until the construction is completed and accepted. Upon completion of each line between manholes, a

clear and unobstructed view of the whole bore of a pipe shall be obtained between manholes by use of a light or subreflector. If such view is not apparent an air-filled rubber ball, approved by the Engineer, having a diameter one-inch (1") (25mm) less than the tile to be tested, shall be flushed through the line between manholes. Any obstruction found in any line shall be removed by the contractor without cost to the owner. Any methods used by the contractor to remove deposits of mud, sand, gravel, or other foreign matter from the line shall be approved by the Engineer. Unless specified in the Special Provisions, a leakage test will not be required. However, this does not preclude the fact that obvious and concentrated leaks (such as open joints, pinched gaskets, cracked barrels or bells, etc.) will not be allowed.

5. Pipe shall not be laid on frozen ground, or when trench conditions are unsuitable for such work.
6. The upgrade end of pipelines not terminating in a structure shall be plugged with a cap or plug approved by the Engineer.
7. Fine grading to the bottom of the barrel shall proceed ahead of the pipe laying and, should any over-excavation exceeding two inches (2") (50mm) be encountered, the material added shall be moistened (95% of Standard Proctor) and compacted to the density of the existing subgrade or foundation material shall be added at the Contractor's expense.
8. Bell holes shall be dug for the pipe bells or couplings and the materials placed along the preceding pipe laid. The pipe shall be supported for the bottom 60 degrees and throughout its length (except for the minimum distance necessary at the bell holes). Bell holes shall be adequate to make the joint, but no larger than necessary so that maximum support on undisturbed ground or pipe zone material will be provided for the pipe. The remainder of the pipe shall be surrounded to at least its midpoint by granular bedding material, compacted in maximum six inch (6") (150mm) layers to completely fill all space under and adjacent to pipe.
9. Pipe laying should proceed upgrade with the spigot ends pointed in the direction of flow. No pipe shall be laid in water or when the trench conditions are unsuitable for such work, except by written permission of the Engineer. The Contractor shall make all connections of pipe to the manholes which have previously been constructed.
10. The Contractor shall connect all existing storm inlets and sewers to the new storm sewer as shown on the drawings. These connections shall be made as the storm sewer construction progresses which will require that each section of the new sewer be fully completed and ready for operation as the construction advances.
11. Open excavation shall be satisfactorily protected at all times. At the end of each day's work, the open ends of all pipes shall be protected against the entrance of animals, children, earth, or debris, by bulkheads or stoppers. The bulkheads or stoppers shall be perforated to allow passage of water into the installed pipeline to prevent flotation of the pipeline. Any earth or other material that may find entrance into the main sewer or into any lateral sewer through any

such open end of unplugged branch must be removed at the Contractor's expense.

12. Curved alignments shall be constructed with precast, beveled end concrete radius pipe which meet the same requirements as for straight pipe. Concrete radius pipe less than or equal to 36 inch diameter shall have a minimum centerline radius of 20 feet and all radius pipe greater than 36 inch diameter and less than 72 inch diameter shall have a minimum centerline radius of 30 feet.

3.04 Installation of Manholes

1. Excavation shall be to a depth and size to provide for construction of the manhole. Concrete bases shall be poured on undisturbed ground. Precast concrete bases shall be carefully lowered onto one of the following:
 - a. Six inches (6") (150mm) minimum layer of well-compacted granular material accurately laid to a smooth level surface using a straight edge and hand level.
 - b. Three inches (3") (75 mm) of concrete poured on undisturbed soil.
2. Walls shall be of precast concrete as shown in the standard drawings and shall be constructed to form a complete watertight structure.
3. The Contractor shall provide a minimum of two inches (2") (50mm) and a maximum of twelve inches (12") (300mm) in two-inch (2") (50mm) layers of precast reinforced concrete adjusting rings between the cast iron frame and the manhole top section. Each ring shall be set on a full bed of mortar and shall be made watertight in accordance to Drawing 602-2. Wood will not be allowed as spacers. Adjusting rings shall conform to the size and shape of the casting frame. Frames and covers shall be set to the designated elevation in a full mortar bed.
 - a. The minimum two-inch (2") (50 mm) concrete ring for grade is not needed if grade can be met with a six-inch (6") (150mm) flange on top of the cone section of the manhole.
 - b. If the number of adjusting rings exceeds the maximum twelve inches (12") (300 mm), the manhole shall be reexcavated and a manhole barrel section installed.
4. Manholes shall be set as shown on drawing details. All lifting holes must be grouted in after placement.
5. When manholes are to be constructed in new streets, manhole rings shall be set to the final grade before the street-wearing course is placed. Riser rings shall not be used to make adjustments for new construction. In gravel or unpaved roads, the manhole ring shall be kept four to six inches (4"-6") (100mm-150mm) below the road surface.

6. The invert of all manholes shall be smoothly shaped so as to allow a free, uninterrupted flow of storm water. The invert forming system shall be "A-Lok Tru Contour", or approved equal. Floor troughs shall be furnished for all storm sewers entering manholes. Inverts shall be U-shaped to the 1.0 diameter point before sloping at a 1 to 12 slope to the manhole walls.

3.05 Trench Backfilling.

A. Trench Backfilling

1. All excavation in trenches shall be backfilled to the original ground surface or to such grades as specified or as shown on the drawings. The backfill shall begin as soon as practical after the pipe has been placed and shall thereafter be carried on as rapidly as the protection of the balance of the work shall permit.
2. No pipe shall be covered before the Project Representative or the Engineer has observed and approved the pipe. If any piping or appurtenance is covered without the approval of the Engineer or Resident Project Representative, at the discretion of the Engineer, the Contractor shall be required to re-excavate to expose the covered materials. The cost of exposing those materials and then backfilling and recompacting will be at the Contractor's expense regardless of the condition of the pipe and/or the materials under question.
3. The Contractor shall completely backfill all excavations before stopping work at the end each day. Open excavations (fenced or unfenced) shall not be allowed overnight or on weekends at any site after work has stopped for the day unless approved by the City.
4. Complete cleanup shall proceed directly behind the backfilling operation to accommodate the return to normal conditions. Should the Contractor, in the City's opinion, fail to pursue diligently the backfilling and cleanup, the amount of work on which complete cleanup has not been accomplished shall be limited to one thousand lineal feet (1,000') (300m) for the entire job. The Contractor shall have sufficient equipment on the job to assure timely backfill and cleanup at all times.

B. Pipe Bedding.

1. **Class A - Concrete Cradle**
Class A bedding for storm sewers and culverts shall consist of a continuous concrete cradle up to springline constructed in conformity with the details shown on the Plans or as directed by the Engineer.
2. **Class B - Granular Encasement Bedding**
Class B bedding shall consist of a bed of granular material having a thickness of at least 150 mm (6 inches) below the bottom of the conduit. For conduits other than precast reinforced concrete box sections and corrugated aluminum and steel box culverts, the bedding shall extend up around the pipe for a depth of not less than 12 inches above the

top of the pipe.

3. Class C - Granular Bedding

Class C bedding shall be constructed by bedding the drainage pipe on a bed of granular material shaped by a template to fit the lower part of the pipe exterior for at least 10 percent of its overall height (Minimum of 4 inches below the bell of the pipe). After pipe installation granular encasement material shall then be rammed and tamped in layers not over 6 inches in loose thickness around the pipe to the springline.

4. Class B bedding shall be provided for all piping unless otherwise shown on the drawings and authorized by the City Engineer.

5. Bedding material shall be placed as shown on the typical trench detail and described above. Spread bedding material to provide continuous and uniform support beneath pipe at all points between bell holes or pipe joints. Particular attention shall be given to the area from the base of the pipe or culvert to the centerline to ensure firm, uniform, and continuous support is obtained and to prevent any lateral movement upon subsequent backfilling or under service conditions. Bedding material shall be placed, prepared, and compacted simultaneously on both sides and lateral movement shall be prevented. Bedding material shall be moisture conditioned to +2% to -4% of optimum and compacted to 90% maximum density, as determined by ASTM D698. Class C bedding material shall be placed manually with shovels, and tamped in maximum 6" lifts and evenly placing the material on both sides of the pipe. Bedding material shall not exhibit pumping (horizontal or vertical displacement) after compaction. Encasement material will then be placed around and over the top of the pipe, but need not be hand placed. During conditions where flexible piping shall be buried in excess of 20 feet in depth, all bedding material shall be moisture conditioned to +2% to -4% of optimum and compacted to 95% maximum density, as determined by ASTM D698.

6. Trench Backfill above the Encasement Zone. Trench backfill above the encasement zone may consist of excavated material or select backfill material. Excavated material shall be used unless the minimum density requirements cannot be met. Select backfill material such as pit run shall be substituted for excavated material to meet compaction requirements. Backfill material shall be pushed onto the slope of the excavated trench and allowed to slide down into the trench. Backfill material shall not be permitted to free fall into the trench until at least one foot (1') (254mm) of cover is over the pipe or culvert. Moisture conditioning may be provided by water trucks or hoses. Excavated or select backfill material shall not exhibit pumping (horizontal or vertical displacement) after compaction.

7. Backfilling shall be done in lifts of uniform layers which will produce the required compaction. Each lift shall be completely compacted over the full width of the excavated area. Compacting shall continue until the specified relative compaction has been attained or until no more settlement occurs. Water jetting of backfill shall not be permitted.

8. In-place densities of compacted backfill material shall be determined by the Engineer using

either ASTM standard test method D1556-82 (Sandcone) or ASTM standard test method D2922-81 (nuclear). The minimum and maximum dry density for non-cohesive materials such as clean sands and gravel shall be determined by ASTM D4253 and D4254. The maximum dry density for cohesive backfill materials, such as clays, silts, etc., shall be determined by ASTM D698.

- a. Backfill above the encasement zone shall be compacted to the minimum densities and moisture conditions listed below. The densities listed below may only be modified through a geotechnical report.

<u>Area</u>	<u>Cohesive</u>
Streets, highway, alleys	95%, $\pm 2\%$
Sidewalks, curbs, and driveway	95%, $\pm 2\%$
Lawns and cultivated areas	90%, $\pm 2\%$

9. Care of Utilities

- a. In excavating and backfilling for pipelines or structures, extreme care must be taken so as to not mar or injure any gas, telephone, sewer, water, power, or television lines. The utility owner shall be notified that the relocation is necessary and shall be given adequate time to provide for the relocation.

10. When the trench excavation for the sewer main and appurtenances is within the rights-of way of state or county highways, the backfilling of the trench, compaction of materials, subgrade preparation and surfacing shall be done in strict accordance with the requirements and specifications of the authority having jurisdiction or as required by these specifications, whichever is more stringent.

11. In all cases, the Contractor shall blade and compact the roadway after the trench has been backfilled, so that it shall be passable to traffic at all times. The Contractor shall maintain the roadway in a condition acceptable to the City at all times until final acceptance of the entire work by the City.

12. The Contractor shall also blade and maintain all detours and bypasses. All maintenance work shall be done at no additional compensation. In addition to the blading and maintenance requirements specified, the Contractor shall provide at least one tank truck with pressurized spray bars for spraying water on the streets to control the dust. Dust control shall be required as necessary on all streets after compacting and grading and on all detours and bypasses.

13. The Contractor is responsible for the complete maintenance of his work at all times. If he fails to provide proper maintenance, and safety or nuisance conditions arise, it is expressly understood that City crews may be directed by the City to provide essential maintenance, and that such work will be done at the expense of the Contractor.

14. The Contractor shall remedy at his own expense any defects that appear in the backfill following completion and during the warranty period.

C. Storm Sewers and Culverts Placed on Fill

1. Fill material placed in areas over which storm sewer or culverts will be constructed shall be select earth material from the elevation of suitable subgrade to the bottom elevation for bedding or foundation of the drainage facility.
2. Placement and Compaction. If storm sewer or culverts are constructed on filled areas, the fill material shall be placed in 6 inch loose layers and compacted to 95 percent of maximum density at plus or minus 2 percent of optimum moisture content as determined by Laboratory Standard Proctor Test (ASTM D 698) up to a point at least 2 feet above the outside top of the pipe or to the foundation of manholes, inlets, special structures, box culverts, concrete channel lining and concrete ditch paving. If compaction standards for storm sewer pipe exceed that of the adjoining fill, the width of compaction for the storm drain shall be not less than the outside diameter of pipe plus 10 feet. If compaction standards for the manhole, inlets, special structure, box culverts, concrete channel lining and concrete ditch paving exceed that of adjoining fill, the limits of compaction for the facility shall be not less than 5 feet outside of the facility base slab.

3.06 Installation of Structures.

1. Structures shall be set on a six-inch (6") (150mm) layer of foundation material when directed by the Engineer. The surface shall be accurately graded to provide uniform bearing for the structure.
2. Catch basins shall be constructed at the locations shown on the drawings and approved by the Engineer. The size and type of catch basins shall be shown on the drawings or in the Standard Details of the Specifications. Catch basin frames shall be set accurately to grade. Concrete grout shall then be placed around and beneath the frame to hold the grate securely in place.
3. Manhole castings shall be installed one-fourth inch (1/4") (6.25mm) to one-half inch (1/2") (12.5mm) below the surface of the existing pavement. Where the structure is in unpaved streets, the manhole casting shall be set to the future street elevation. The casting shall be constructed as shown in the Standard Details. The contractor shall provide a minimum of two inches (2") (50mm) and a maximum of twelve inches (12") (300mm) in two inch (2") (50mm) layers of precast reinforced concrete adjusting rings between the cast iron frame and the manhole top section. Each ring shall be set on a full bed of mortar and shall be made watertight. The bearing surface around the perimeter of the frame shall be grouted to a height within two inches (2") (50mm) from the existing street surface, and to a width of twelve inches (12") (300mm) greater than the manhole ring, and a depth of six inches (6") (150mm) below the bottom adjusting rings or one foot (1') (300MM), whichever is greater. The manhole frame

shall then be tacked and asphaltic concrete pavement shall be placed for the final two inches (2") (50mm).

3.07 Structure Backfilling.

- A. Structure backfilling shall cover manholes, catch basins, junction boxes, and any other structure encountered during the course of the work. Fill around structures shall consist of trench backfill meeting the requirements of structural fill material or select backfill material. Fill material shall be spread and compacted to provide continuous and uniform support around the structure. Special attention shall be given to the compaction operation around structures to ensure uniform compaction.
- B.. Do not place fill when the surface to be filled is frozen. Do not place frozen fill.
- C.. Fill around concrete structures shall commence only after concrete has attained 80% of the ultimate compressive strength specified. Remove all form materials, concrete spills, and trash from around the structures before placing fill. Where backfilling on both sides or around the perimeter of a structure is required, place the backfill and compact simultaneously at the same elevation on opposite sides or around the perimeter in lifts.
- D. Place fill material in eight inch (8") (200mm) maximum lifts and compact to at least 95% density for cohesive soils. The moisture content shall be +2% to -2% of optimum.

3.08 Cleanup

- A. Construction cleanup and all backfill operations shall directly follow the storm sewer installation. Cleanup shall be completed to allow local traffic on the street and access to driveways, parking lots, etc.
- B. During construction, all existing gutters, storm drains, runoff channels, etc., shall be kept clean of dirt, rubble, or debris which would impede the flow of storm sewer.

3.09 Quality Control

- 1. Light Test
 - a. After the trench has been backfilled, a light test shall be made between manholes to check alignment and grade for displacement of pipe. Except for curved alignments shown on the plans, the completed pipeline shall be such that a true circle of light can be seen from one manhole to the next. If alignment or grade is other than specified and displacement of pipe is found, the Contractor shall remedy such defects at his own expense.
- 2. Leakage Test

- a. Unless specified in the Special Provisions, a leakage test will not be required. However, this does not preclude the fact that obvious and concentrated leaks (such as open joints, pinched gaskets, cracked barrels, or bells, etc.) will not be allowed.

3. Gradation Test

- a. Bedding Material

- i One initial gradation test for each type of material plus one additional test for each one thousand cubic yards (1000 yd³) (750m³) placed of each material.

- b. Foundation Material

- i One initial gradation test for each type of material plus one additional test for each one thousand cubic yards (1000 yd³) (750m³) placed of each material.

- c. Structural Fill Material

- i One initial gradation test for each type of material plus one additional test for each one thousand cubic yards (1000 yd³) (750m³) placed of each material.

- d. Select Backfill Material

- i One initial gradation test for each type of material plus one additional test for each one thousand cubic yards (1000 yd³) (750m³) placed of each material.

- e. Encasement Backfill Material

- i One initial gradation test for each type of material plus one additional test for each one thousand cubic yards (1000 yd³) (750m³) placed of each material.

- f. All gradation tests shall be the responsibility of the Contractor using a certified approved testing laboratory acceptable to the Owner and Engineer. The Contractor shall be responsible for all costs associated with gradation testing.

4. Density Test

- a. Encasement Zone Material

- i One test for each five hundred lineal feet (500') (150m) pipe installed.

- b. Bedding Zone Material

- i One test for each five hundred lineal feet (500') (150m) pipe installed.

- c. Trench, Select Backfill Material, and/or Structural Fill Material
 - i One standard proctor test ASTM D698 or one relative density test, (ASTM D4253 and D4254) for each type of material for every two foot (2') (600mm) of trench depth above the pipe zone per every three hundred lineal feet (300') (30m) pipe installed. The Engineer may elect to take one test for each one thousand cubic yards (1000yd³) (750m³) or a portion thereof.
- d. Unless otherwise indicated in the Contract Documents, density and moisture tests shall be the responsibility of the Owner/Engineer. The Contractor shall cooperate with the Engineer or testing agency. If the initial moisture/density tests fail, the Contractor will be responsible for all costs associated with retests, until a passing moisture/density test is completed.

5. Deflection Test

- a. Mandrel or deflection testing for flexible conduit shall be conducted as directed by the City Engineer. Testing shall be conducted using a mandrel with a diameter equal to 95 percent of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices. The mandrel go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with few arms will be rejected. Contact length of mandrel's arms shall equal or exceed nominal inside diameter of pipe to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01 inch maximum. Contractor shall provide mandrel and necessary equipment for mandrel test. Mandrel shall be hand-pulled through flexible pipe lines prior to end of warranty period. Sections of pipe not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to the satisfaction of the owner. Repaired section shall be retested. It is also recommended that the contractor perform a mandrel test prior to placing paving surfaces.

3.10 Final Acceptance and Record Drawings

- A. "Record Drawings" shall be submitted to the City prior to preliminary acceptance of the construction project. "Record Drawings" shall include, in addition to construction drawings and details, "as built" information where it differs from construction drawings and locate information including horizontal and vertical coordinates in the datum established by the City for the Geographical Information System.
- B. Final Acceptance
 - 1. Final acceptance will not take place until preliminary acceptance is obtained and all paving and curbwalk is completed.
 - 2. Before final acceptance of any storm sewer, the following inspections shall be made:

- a. All lines clean and flushed
 - b. Manholes up to proper grade in a proper condition
3. All punch list items must be completed prior to final acceptance.

END OF SECTION

SECTION 02705

EXCAVATION, TRENCHING, AND BACKFILL FOR ELECTRIC, GAS, AND OTHER MINOR UNDERGROUND FACILITIES BENEATH PAVEMENT

PART 1 - DESCRIPTION

The materials and work covered under this section shall cover excavation, trenching, and backfill for electric, gas, and other minor underground facilities trenched beneath roadway surfaces that have been improved with asphalt, concrete, or gravel.

1.01 Definitions

- A. Control density backfill shall also be referred to as flow-fill, cement treated fill, non-shrink backfill or sand-cement slurry material. Controlled density backfill is a composite material that consists of water and a cement binding medium within which are embedded particles or fragments of aggregate.
- B. "Underground facility" means any item of personal property buried or placed below ground for use in connection with the storage or conveyance of electronic telephonic or telegraphic communications, cablevision, electric energy, oil, gas, hazardous liquids, or other substances and including, but not limited to, pipes, conduits, cables, lines, wires, manholes, attachments, and those parts of poles below ground. Underground facility excludes water, sanitary, or storm sewer conveyance or storage systems covered under other sections of this specification.

PART 2 - Materials

2.01 Submittals

Before placement of control density backfill, the contractor shall provide to the engineer and/or owner for review, information on the product data, mixture composition, and material testing characteristics.

2.02 Materials

- A. Cement. Cement shall conform to all requirements for cement set forth under Section 03050.
- B. Aggregate. Aggregate shall consist of fine aggregate and shall conform to all requirements for fine aggregate set forth under Section 03050.
- C. Admixtures. Pozzolan admixtures shall conform to all requirements of Section 03050..

D. Pipe Encasement Material. Pipe encasement material shall conform to all requirements set forth herein this paragraph.

1. Granular Material Gradation Classifications

a. Granular materials furnished for use in Foundation, Bedding, or Encasement installations shall be:

MATERIAL USE DESIGNATION
Percent Passing

Sieve Size	Foundation	Bedding & Encasement
1 inch (25mm)	100	100
3/4 inch (20mm)	90-100	90-100
3/8 inch (9.5mm)	20-55	50-100
No. 4 (4.75mm)	0-10	
No. 8 (0.075mm)	0-5	
No. 200 (0.075 MM)	0-15	

b. Other gradations may be used if written approval is obtained from the City Engineer.

c. Other approved material for bedding and encasement shall consist of sand, sandy gravel, or fine gravel having a maximum size of three-quarter inch (3/4") (20mm), uniformly graded and a maximum plasticity of 6 as determined by AASHTO T-89 and T-90.

2.03 Control Density Backfill Mixture Requirements

A. Control density backfill shall meet the following requirements:

Mixture Requirements

Property	Min.	Max.
Cement factor (lbs. per cubic yard) (kg/cu.m)	50 (38)	60 (45)
Pozzolan admixture (lbs. per cubic yard) (kg/cu.m)	75 (57)	75 (57)
Water cement ratio (gal. per sack) (lit/sack)	6 (23)	
Slump (inches) (m)	7 (175mm)	

Minimum Compressive Strength

Date of Break	Compressive Strength
7 day	11 psi minimum (76 kPa)
28 day	30 psi minimum (210 kPa)
28 day	60 psi maximum(415 kPa)

B. The mix design for flow-fill can vary greatly provided that it meets a twenty eight day (28) compressive strength of between thirty and sixty pounds per square inch (30 – 60 psi) (210 – 415 kpa). The Engineer may modify this design to allow reject or recycled materials provided that the twenty eight day (28) compressive strength is confirmed by lab testing to be between thirty and 60 pounds per square inch (30 – 60 psi) (210 – 415 kpa). Non-specification material is not recommended for heavy loading or water and sewer crossings in which structural support depends on the flow-fills shear strength.

C. Air may be entrained at 1.5 – 2.5 % to improve workability.

2.04 Proportioning of Materials.

A. All materials shall be separately and accurately measured by weight, and each batch shall be uniform. Fine aggregates shall be weighed separately. A sack of cement shall weigh ninety-four pounds (94#) (43kg). When bulk cement is used, ninety-four pounds (94#) (43kg) shall be considered as one sack. The contractor shall furnish and use approved weighing devices, which, in operation, will give the exact quantity of materials required for the class of concrete. When the cement is in contact with the aggregate, it shall not remain more than forty-five (45) minutes before being deposited into the mixer.

2.05 Measurement of Aggregate.

A. Where sack cement is used, the quantities of aggregate for each batch shall be exactly sufficient for one or more sacks of cement. No batch requiring a fraction of a sack of cement will be permitted. All measurements shall be by weight, upon approved weighing scales and shall be such as will insure separate and uniform proportions. Scales shall be of either beam or springless dial types, and shall be suitable for supporting the hopper or hoppers. They shall be set accurately in substantial mountings which will insure a permanent spacing of the knife edges under all conditions of loading and use. They shall be so designed and maintained that they will at all times be accurate to within one-half (1/2) of one (1) percent throughout the entire weight range. Clearance shall be provided between the scale parts and the hopper or the bin structure to prevent displacement of the scale parts due to vibrations, accumulations, or any other cause. The value of the minimum gradations on any scale shall not be greater than five pounds (5#) (2kg). The weighing beam or dial shall be so placed that it will be in full view of the operator during the operation of the gate which delivers the material to the hopper. Scales shall be protected from air currents that may affect the accuracy of weighing.

- B. Separate hoppers shall be provided for weighing fine and coarse aggregate. They shall be of suitable size and tight enough to hold the aggregate without leakage, and shall be supported entirely upon the scales. Suitable provisions shall be made for removal of overload from the hopper by the operator while he operates the bin gates.
- C. The contractor shall provide a sufficient number of fifty pound (50#) (23kg) standard test weights for calibrating the weighing equipment.
- D. The volume of control density backfill mixed per batch shall not exceed the manufacturer's guaranteed capacity of the mixer.

2.06 Mixing Control Density Backfill.

- A. Consistency. The quantity of water to be used shall be determined by the engineer and shall not be varied without his consent. The contractor shall furnish and use with the mixer an approved adjustable, water measuring device which will prevent excess water flowing into the mixer, in order that the consistency may be under positive control and that all batches may be of the same consistency.
 - 1. In general, the minimum amount of water shall be used which will produce the required workability.
- B. Mixer. The mixing machine used shall be of an approved type known as a batch mixer, and of a design having a suitable device attached for automatically measuring the proper amount of water accurate to one percent (1%) and for automatically timing each batch of control density backfill so that all materials will be mixed together for the minimum time required. Such device shall be easily regulated and controlled to meet the variable conditions encountered.
 - 1. The normal mixing time for each batch shall be one (1) minute, and the measuring of this period shall begin after all the materials are in the drum. During this mixing period, the drum shall revolve at the speed for which the mixer is designed, but shall make not less than fourteen (14) nor more than twenty (20) revolutions per minute.
 - 2. No materials for a batch of control density backfill shall be placed in the drum of the mixer until all of the previous batch has been discharged therefrom. The discharge of water into the drum shall commence with the flow of the aggregate, but shall not be started before the entrance into the drum of part of the aggregate. The discharge of all of the mixing water for any batch shall be completed within ten (10) seconds after all of the aggregate is in the drum. The inside of the drum shall be kept free from hardened control density backfill.
 - 3. Control density backfill from a central mixing plant delivered at the work ready for use, will be permitted, provided the mixture is transported to the job site in an agitating truck

having the control density backfill contained in a revolving drum and provided there is no segregation of the mixture at the point of placing. Control density backfill from a central batching plant and mixed in transit will be permitted; however, the mixing and transporting equipment will be subject to the special approval of the engineer. Any control density backfill shall comply with all of the requirements of these specifications. The control density backfill must be of workable consistency when placed. No mixer which has a capacity of less than a two-sack batch shall be used.

4. Hand mixing will not be permitted except with the permission of the engineer and then only in very small quantities or in case of an emergency.

PART 3 - Execution.

3.01 Excavation

A. Excavation for Underground Facilities (General)

1. Excavate to the lines and grades shown, or as approved to accomplish construction. Allow for forms, working space, and materials types where required.
2. Do not excavate deeper than the elevations shown or approved. Excavations carried deeper than the elevations shown or approved shall be backfilled with approved compacted material. Excavation carried deeper than the elevations shown or approved shall be corrected by similarly cutting adjoining areas and creating a smooth transition to facilitate backfill and compaction. Backfill material type, placement, and compaction requirements shall be as determined by the engineer. The contractor shall bear all cost for correcting cuts below grade.
3. The bottom of all excavations shall be neat and clean, containing no abrupt changes in grade except as shown and shall be free from all slough. Suitable methods shall be used to produce an excavated surface without disturbance to the underlying material. The contractor shall correct any disturbance to underlying material by compacting soil material to at least 95% standard proctor, ASTM D698.
4. The engineer may direct excavations to be carried below the lines and grades shown on the drawings if, in the opinion of the engineer, such work is necessary to ensure adequate support of the proposed structure or pipe.

B. Dewatering

1. Dewatering, if required by site conditions, shall be provided by the contractor. The contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface water and groundwater entering the excavations, trenches, or other parts of the work.

2. All trench excavations which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations twelve inches (12") (300mm) or more below the bottom of the excavation.
3. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.
4. The contractor shall be responsible for the conditions of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

C. Limits of Excavation

1. Conditions of the excavation permit may set limits of excavation designating the location of the completed utility and/or maximum dimensions of the excavation to prevent encroaching on adjacent improvements. Contractor shall confine excavation to those limits. Limits of excavation to safely accomplish the work shall be determined by the contractor. All excavations shall be free of overhangs and the sidewalls shall be kept free of loose material. As a minimum, slope all excavations to prevent these conditions and to comply with state OSHA regulations.

D. Disposal of Excess Material

1. Except as otherwise permitted, dispose of excess excavated materials in a legal manner.
2. Dispose of broken concrete, rock and other debris resulting from utility construction activities in a legal manner, off-site.

3.02 Installation of Underground Facilities.

A. Trench Excavation.

1. Safety. The contractor shall not open up more trench in advance of the underground utility operations than what can be completely backfilled properly in one day's operation.
3. Asphalt and Concrete Removal. Where trench excavation or structure excavation requires the removal of curb and gutter, concrete sidewalks, or asphaltic or concrete pavement, the pavement or concrete shall be cut in a straight line parallel to the edge of the excavation by use of a spade bitted air hammer, concrete saw, or similar approved equipment to obtain a straight, square, clean break. Concrete shall be cut at the location of standard joint spacing. One half inch (1/2") (12.5mm) expansion joint material shall be installed between existing concrete and new concrete.

3. Limiting Pipe Zone Widths. Trenches shall be excavated to a width which will provide adequate working space and clearances for proper installation, jointing, and embedment of the underground utility. Excavated material shall be placed at a distance away from the sides of the trench equal to the depth of the trench. Install sheeting, shoring, bracing, and sloping as excavation proceeds.

B. Underground Utility Installation.

1. Reasonable care shall be exercised in handling and laying the underground utility materials and fittings. When strung along the trench, materials shall be placed where they will not be subject to injury from vehicles or equipment. The Contractor's facilities for lowering the utility into the trench shall be such that neither the underground utility materials nor trench will be damaged or disturbed.
2. Open excavation shall be satisfactorily protected at all times.

3.03 Trench Backfilling.

A. Trenches.

1. Encasement Material. Encasement material shall be placed to six inches (12") (155 mm) above the utility, but in no case closer than four inches (4") to finish grade. Spread and surface grade encasement material to provide continuous and uniform support beneath the underground utility at all points. Encasement material shall be placed, prepared, and compacted simultaneously on both sides and lateral movement shall be prevented. Encasement material shall be compacted to 90% maximum density, as determined by ASTM D698 at a moisture content of $\pm 3\%$ of optimum for depths over forty-eight inches (48") (1.2m) below finish grade. Between forty-eight inches (48") (1.2m) below finish grade, compaction shall be a minimum of 95% of maximum density. Encasement material shall not exhibit pumping (horizontal or vertical displacement) after compaction.
2. Trench Backfill Above the Encasement. Trench backfill above the encasement shall consist of control density backfill (CDB) material unless other procedures are permitted by the City Engineer. CDB material shall be used when trenching beneath asphalt or concrete paved streets for gas, electric, irrigation, or other minor underground facility. CDB material shall be placed into the excavated trench by means of concrete chutes or tremie tubes. CDB material shall be placed to the bottom of the asphalt mat. CDB material shall be vibrated using a mechanical vibrator to consolidate the material. Trench backfill above the encasement material and below the base course of the roadway may be select material moisture conditioned to $+2\%$ to -4% of optimum and compacted to 95% of maximum density as determined by ASTM D698 as a substitute for CDB upon approval of the City Engineer.
3. All trenches awaiting final paving shall be backfilled with a temporary material. Paving

shall be completed within two (2) weeks of the date the excavation was opened.

B. Care of Utilities.

1. In excavating and backfilling for pipelines or structures, extreme care shall be taken so as not to damage or injure any adjacent gas, telephone, sewer, water, power, television lines, or other utilities. In the event of damage to a utility, the utility owner and the City Engineer, shall be notified immediately.

3.04 Pavement Replacement

Asphalt or concrete paving, curb and gutter and sidewalk construction shall comply with applicable sections of the City of Lakeland standard specifications.

3.05 Cleanup.

- A. Construction cleanup and all backfill operations shall immediately follow installation of underground facilities. Cleanup shall be completed to allow local traffic on the street and access to driveways, parking lots, etc.
- B. During construction, all existing gutters, storm drains, runoff channels, etc., shall be kept clean of dirt, rubble, or debris which would impede the flow of storm sewer.

3.06 Protection.

- A. It shall be the responsibility of the Contractor to protect from damage all freshly poured CDB material regardless of the location or type of structure for a minimum period of seven (7) days from date of installation.

3.07 Quality Control Testing.

- A. The owner or consultant shall employ a testing laboratory to perform test and submit test reports. Test reports will be reported in writing to City Engineering Office, consultant, owner, and Contractor as soon as possible upon completion of tests.
 1. Control Density Backfill. Concrete test cylinders will be made by a qualified technician from a certified material testing laboratory.
 - i. Tests may be required for each day's run or according to the following schedule:

Total Cubic Yards of Control Density Backfill <u> </u> (cu.m)	Minimum Number of Tests <u>(3 Cylinders Each)</u> (cu.m) One for 7 days, two at 28 days
--	--

0 – 100 (0-75)	One for each 50 cu. yds.(40)
100 – 1000 (75-760)	One for each 125 cu. yds. (95)
1000 – 2000 (760-1525)	One for each 175 cu. yds. (135)
2000 and Over (1525)	One for each 250 cu. yds. (190)

- i. Results of all tests shall be furnished to the engineer as soon as they are available.
 - ii. Slump. Slump tests shall be conducted in accordance with ASTM C172. A test shall be performed for each day's pour of control density backfill and for each set of compressive strength tests.
2. Compaction. Compaction testing shall be performed a minimum of once for each trench, for each two hundred feet (200') (61m) of trench and for each material used including asphaltic cement paving.

END OF SECTION

SECTION 02710

BOUND AGGREGATE BASE COURSES

PART 1 – Description

- 1.01 This section describes the work and materials associated with various aggregates, and binders to produce the following bound aggregate base courses: Cement Stabilized Aggregate Base, Portland Cement Concrete Base (Plain), Asphaltic Concrete (General), and Soil Cement, in accordance with these Specifications and in conformity with the lines, grades, thickness, and typical cross-section shown on the Plans or as directed by the Owner.

PART 2 – Materials

2.01. Submittals

- A. Before any soil cement aggregate base course or cement stabilized aggregate base are applied the following submittals shall be submitted for review to the Engineer: a geotechnical report describing and classifying the soil, previously prepared soil cement mix designs covering durability tests such as wet-dry and freeze thaw report which are less than one year old and which specify a recommended cement content by volume for the type of soil. In general ranges of cement content by volume shall be applied to differing types of soil (classified as per AASHTO) as follows:

Soil Groups A-1, A-2-4, A-2-5, and A-3 not over 14 percent
Soil Groups A-2-6, A-2-7, A-4 and A-5, not over 10 percent
Soil Groups A-6 and A-7, not over 7 percent.

Compressive strengths should increase both with age and with increases in cement content within the ranges of cement content producing results that meet requirements of the freezer-thaw and the wet-dry test. The 14 days unconfined compressive strengths shall be used to determine the design cement content. The design cement content shall produce a minimum unconfined compressive strength of 300 psi within fourteen (14) days.

- B. Pavement and Base Design Criteria

To facilitate the structure design process, several standard combinations of pavement and base courses are provided below.

Projected Traffic ADT	Pavement Type and Thickness	Bituminous Surfacing Course over Binder Course over Cement Treated Course Thickness
Under 1000	Dbl Bituminous Surface Tr	1 ½ inches over 2 inches over 6 inches
1000 to 2000	Dbl Bituminous Surface Tr	1 ½ inches over 2 inches over 8 inches
2000 to 4000	Dbl Bituminous Surface Tr	1 ½ inches over 2 inches over 8 inches

2.02 Materials

A. Cement Stabilized Aggregate Base

1. Aggregate

- a. Aggregates for Graded Aggregate Base Course shall be crushed stone or crushed or uncrushed gravel together with such material as manufactured sand or other fine materials naturally contained or added thereto as needed to conform with one of the three gradations shown in the table below, as specified

Grading Table for Graded Aggregate Base Course
Total Percent, by Dry Weight, Passing Each Sieve (U.S. Standard)

Size No.	2 ½ “	2”	1 ½ “	1”	3/8”	No. 40	Clay*
1	100	95-100			35-65	10-30	1-12
2		100	95-100		40-65	10-30	1-12
3			100	90-100	45-65	10-35	2-12

* Clay content shall be determined by the Hydrometer Test – AASHTO T 88 4. Clay content may exceed 12 percent with the written permission of the Owner.

- b. Mineral aggregate for graded aggregate base course shall consist of hard durable particles or fragments of stone or gravel and other finely divided mineral matter. Individual materials shall meet the requirements specified hereinafter.
 - i. Crushed Stone - Crushed stone shall be free of silt and clay. The coarse aggregate portion of the stone shall have a percentage of wear of not more than 50, and when subjected to five (5) alternations of the sodium sulfate soundness test, the weighted percentage of loss shall not exceed fifteen (15).

- ii. Gravel - Gravel shall be screened and all oversize material may be crushed and fed uniformly back over the screen. The coarse aggregate portion (retained on the No. 4 sieve) shall have a percentage of wear of not more than 50, and when subjected to five (5) alternations of the sodium sulfate soundness test, the weighted percentage of loss shall not exceed fifteen (15). The portion of the material passing the No. 40 sieve shall be nonplastic or shall have a liquid limit of not more than thirty (30) and plasticity index of not more than eight (8).
- iii. If fine aggregate, coarse aggregate, or binder, in addition to that present in the base material, is needed in order to meet the gradation or density requirements or for satisfactory bonding of the material, it shall be uniformly blended with the base course material at the mixing plant by a mechanical feeder to maintain a uniform flow on the belt to the mixer. Blending of materials on the stockpiles or in the pits by bulldozer, clamshell, dragline, or similar equipment will not be permitted. The composite gradation of aggregate shall be the grading specified.

2. Portland Cement

- a. Portland Cement shall comply with the latest specifications for Portland Cement, AASHTO M 85 or AASHTO M 240 for the type specified.

3. Water

- a. Water shall be free of injurious quantities of oil, salt, acid, alkali, sugar, vegetable matter, or other substances detrimental to hardening of the treated base.

4. Bituminous Material

- a. Bituminous material for curing shall be Emulsified Asphalt Type SS-1, RS-2, or Cut-Back Asphalt, Grade RC-250.

B. Soil Cement Base

1. Soil.

- a. Soil for soil-cement base shall be of such general character as to be classified as Group A-1 or A-2, AASHTO M 145. The material shall be of such size that all will pass the standard two (2) inch sieve. Samples shall be tested by the Owner before work is started for determination of cement application rates and optimum moisture content.

2. Portland Cement.

- a. Portland Cement shall comply with the latest specifications for Portland Cement, AASHTO M 85 or AASHTO M 240 for the type specified.

3. Water.

- a. Water shall be free of injurious quantities of oil, salt, acid, alkali, sugar, vegetable matter, or other substances detrimental to hardening of the treated base.
4. Bituminous Material.
- a. Bituminous material for curing shall be Emulsified Asphalt Type SS-1, RS-2, or Cut-Back Asphalt, Grade RC-250.
5. Hydraulic Cement
- a. Hydraulic Cement shall comply with the latest specifications for Hydraulic Cement, ASTM C1157 for the type specified.
- C. Portland Cement Concrete Base (Plain)
1. Concrete Material
- a. Concrete materials shall meet the requirements of Specification Section 03050, Portland Cement Concrete, for Class B concrete.
2. Curing Materials
- a. Curing materials shall conform to the applicable provisions of Specification Section 02750 Paragraph 2.03.
3. Chemical Additives
- a. Chemical additives shall conform to the applicable provisions of Specification Section 02750 Paragraph
- D. Asphaltic Concrete (General)
1. Aggregates, Filler, and Bituminous Material
- a. Aggregates, filler if required, and bituminous material for the various types of hot mix asphaltic concrete will be stipulated in the applicable Section of these Specifications.
 - b. Each size and type of aggregate shall be stocked in a separate bin or stall in a manner that will prevent segregation. The mineral aggregate will be accepted for quality in the stockpile and for gradation immediately preceding addition of bituminous material. This acceptance will be based on periodic samples of the various sizes of aggregate taken as they are weighed from the bins, of the combined aggregate as it is fed to the pugmill, or of batches to which the bituminous material has not been added. The bituminous material may be conditionally accepted at the source.
 - c. The plant mixed material will be accepted after blending and mixing at the plant.

E. Asphaltic Concrete Base (Black Base)

1. Asphalt Cement

- a. Asphalt cement for this construction shall be penetration grade AC-20 or AC-10, or as directed by the Owner if these grades are not available. The proportion by weight of asphalt cement to the total mixture shall be between 3.5 percent and 5.5 percent as approved by the Owner.

2. Course Aggregate

- a. Course aggregate (aggregate retained on the No. 4 sieve) shall be crushed limestone conforming to the quality requirements of AASHTO M 62 or washed gravel, as approved by the Owner.

3. Fine Aggregate

- a. Fine aggregate shall consist of natural sand consisting of hard, clean, tough grains which will have a maximum weight loss of twelve (12) percent when subjected to the sodium sulfate soundness test.

4. Aggregate Gradation

- a. The aggregate gradation for black base shall conform to the following master range:

Sieve Size	Total % Passing by Weight
2"	100
1-1/2"	75-100
3/4"	45-70
3/8"	30-55
No. 4	20-40
No. 8	10-30
No. 30	5-20

F. Equipment.

- 1. All equipment necessary for the satisfactory performance of this construction shall be on the Project and approved before work will be permitted to begin.

PART 3- Execution

3.01 Construction Requirements For Cement Stabilized Aggregate Base

A. Limitations

- 1. No cement shall be applied when the aggregate base is frozen or contains frost. Before beginning construction operations for the day, the ambient temperature

shall be at least 40° F in the shade and rising. Application of cement, mixing, application of water and moist mixing, compaction, and finishing shall be continuous, and surface finishing shall be completed in daylight hours. Mixing, application of water and moist mixing, and compaction inclusively shall be completed within 6 hours.

B. Preparation

1. Before other construction operations are begun, the area to be paved shall be graded and shaped in accordance with Section 02335 of these Specifications in order to construct the base in conformance with grades, lines, thickness, and typical cross-section shown on the Plans. Unsuitable materials shall be removed and replaced with acceptable aggregate. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

C. Spreading

1. After subgrade preparation is complete, aggregate base material shall be spread over the moistened subgrade. The placement shall be uniform in thickness and surface contour and in such quantity that the completed base will conform to the required grade and cross-section. Aggregate shall be placed and initially compacted to specified thickness before proceeding with pulverization and application of cement.

D. Moisture Content

1. The optimum moisture content of the graded aggregate cement mixture shall be considered to be ten (10) percent unless otherwise determined by laboratory testing by the Owner. The maximum percentage of moisture in the aggregate at the time cement is added shall not exceed the specified optimum moisture content for the aggregate cement mixture. When water application and mixing have been completed, the percentage of moisture in the mixture based on oven dried weights shall not be more than one (1) percentage point below or more than three (3) percentage points above the specified optimum moisture content and shall be such that the mixture will not become unstable during compacting and finishing. During finishing operations, the moisture content of the surface material shall be maintained at not less than the specified optimum moisture content.

E. Application of Cement

1. Before application of the cement, the aggregate shall be pulverized as directed by the Owner. Approved Portland Cement shall then be applied uniformly on the base at the rate as specified below for the type of soil. The Owner reserves the right to increase the rate of cement application where in his judgment additional

cement is desired. When bulk cement is used, adequate equipment for handling, weighing, and spreading the cement shall be provided.

2. The percentage of moisture in the aggregate at the time of cement application shall not exceed the quantity that will permit a uniform mixture of aggregate and cement during mixing operations.

F. Mixing

1. After the cement has been applied it shall be mixed with the aggregate so that the base material shall be a homogeneous aggregate cement mixture. Water shall be added and mixing shall continue until the mixture is sufficiently blended to prevent the formation of cement balls when additional water is added. Aggregate cement mixture shall not remain undisturbed for more than thirty (30) minutes.

G. Application of Water and Moist Misting

1. Immediately after the initial mixing operation, required water shall be applied uniformly and incorporated into the mixture, and excessive concentration of water on or near the surface shall be avoided. A water supply shall be provided that will assure the application within three (3) hours of all water required. After all water has been applied, mixing shall continue until a uniform mixture of aggregate, cement, and water has been obtained.

H. Compaction

1. Prior to the beginning of compaction, the mixture shall be in a loose condition for sufficient depth to produce the specified finished thickness. Compaction will be obtained by use of a sheeps-foot roller which will be followed by rolling with pneumatic-tire rollers or other types of rollers as required to thoroughly compact the base for its full thickness. Shaping may be required to obtain uniform compaction. The aggregate cement mixture shall be compacted to ninety-five (95) percent of maximum density as determined by the applicable method of ASTM D698.

I. Finishing

1. After compaction is completed, the surface of the base shall be shaped to the lines, grades, and typical cross-sections shown on the Plans. During shaping operations, the surface shall be scarified as necessary to loosen any imprints left by the compacting or shaping equipment. The resulting surface shall then be compacted to the specified density with steel wheel or pneumatic tire rollers or both. Rolling may be supplemented by broom dragging if required.
2. Surface compaction and finishing shall be done in such a manner as to produce, within two (2) hours, a smooth, dense surface free of surface compaction planes,

cracks, ridges, or loose material. Any approved surface finishing method may be used provided the above final results are produced.

J. Curing

1. After finishing is completed, the aggregate cement shall be protected against drying for seven (7) days by the application of bituminous material as specified or allowed by the Owner. The bituminous material shall be applied as soon as possible, but no later than two (2) hours after finishing is completed. The finished aggregate cement shall be kept moist until the bituminous material is placed. The bituminous material shall be uniformly applied at the rate of approximately 0.2 gallons per square yard with approved heating and distributing equipment.
2. The exact rate and temperature will be specified by the Owner.
3. During application, the surface shall be dense, free of all loose and extraneous material, and shall contain sufficient moisture to prevent penetration of the bituminous material. If necessary, water shall be applied in sufficient quantity to fill any surface voids immediately before the bituminous material is applied.
4. The curing material shall be maintained by the Contractor during the seven (7) day protection period so that all of the aggregate cement will be covered effectively, and should it be necessary for construction equipment or any other traffic to use the bituminous covered surface before it has dried sufficiently to prevent pickup, sufficient granular cover shall be applied before such use as directed by the Owner. Finished portions of aggregate cement that are traveled on by equipment or other traffic for any reason shall be protected in such a manner as to prevent marring or damaging the completed work.
5. When the ambient temperature may be expected to reach the freezing point, sufficient protection from freezing shall be given the aggregate cement for seven (7) days after finishing is completed.

K. Construction Joints

1. At the end of each day's construction a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face free of loose or shattered material.
2. Aggregate cement for large, wide areas shall be built in a series of parallel lanes of convenient length and width meeting the approval of the Owner. Straight longitudinal joints shall be formed at the edge of each day's construction by cutting back into the completed work to form a true vertical face free of loose or shattered material.

L. Manhole Adjustments

1. Drainage and sanitary sewer manholes owned by the City shall be adjusted and set at final grade by the Contractor as necessary for compliance with the Plans. Adjustments of City owned manholes shall be as specified in Sections 02530 and 02632 of these specifications. Manholes, valve boxes, and other utility structures not owned by the City but within the right-of-way of the Project shall be adjusted as necessary by the owner of such facilities. The Contractor shall be responsible for notifying other owners of any required adjustments and for the accomplishment of that work by the owner of such facilities according to the project schedule.

M. Traffic and Maintenance

1. Completed portions of the base may be immediately opened to construction equipment or local traffic and to all traffic after the seven (7) day curing period, provided the base has hardened sufficiently to prevent damage and provided curing is not impaired.
2. The Contractor shall be required to maintain the base in good condition and in a manner satisfactory to the Owner from the time work first starts until all work has been completed and accepted. Maintenance shall include immediate repairs to any defects that may occur. This work shall be done by the Contractor at his own expense and repeated as often as may be necessary to keep the area continuously intact. This work shall include immediate repairs to any defects that may occur in a manner that will ensure restoration of a smooth, uniform surface and durability of the area repaired. Any faulty work shall be replaced to the full depth of the treatment, rather than adding a thin layer of material to the completed work.

3.02 Construction Requirements For Soil Cement Base

A. Limitations.

1. No soil-cement shall be processed that will not be covered with the succeeding stage of base or pavement during the same construction season. No cement shall be applied when the soil is frozen or contains frost. Before beginning construction operations for the day, the ambient temperature shall be at least 40° F in the shade and rising. All operations shall be continuous, and all operations but final surface finish shall be completed within four (4) hours from the time cement is applied. No uncompacted soil cement mixture shall be left undisturbed for more than thirty (30) minutes.

B. Preparation.

1. Before other operations are begun, the roadbed, including depth of soil for the soil-cement base, shall be graded and shaped in accordance with Section 02335 of these Specifications. After grading operations are complete and approved, any

work and material required to regrade the roadbed to finished grade shall be at the Contractor's expense. The area to receive treatment shall be thoroughly scarified and pulverized for sufficient depth and width to give, after treatment and compaction, the cross-sections shown on the Plans.

C. Moisture Content

1. The optimum moisture content should be established by soil tests or as designated by the Owner on the Plans. The maximum percentage of moisture in the soil at the time cement is added shall not exceed the specified moisture content of the soil-cement mixture by more than three (3) percentage points. When water application and mixing have been completed, the percentage of moisture in the mixture, based on oven dried weights, shall not be more than one (1) percentage point below or more than three (3) percentage points above the specified optimum moisture content and shall be such that the mixture will not become unstable during compacting and finishing. During finishing operations, the moisture content of the surface material shall be maintained at not less than the specified optimum moisture content.

D. Application of Portland or Hydraulic Cement.

1. Before application of the cement, the aggregate shall be pulverized as directed by the Owner. Approved Portland or Hydraulic Cement shall then be applied uniformly on the base at the rate as specified by previously approved mix submittals. The Owner reserves the right to increase the rate of cement application where in his judgment additional cement is desired. When bulk cement is used, adequate equipment for handling, weighing, and spreading the cement shall be provided.
2. Approved Portland Cement shall be applied uniformly on the in-place soil at the rate shown on the Plans or established by the Owner, based on tests of the soil performed before work is begun. The Owner reserves the right to increase the rate of cement where in his judgment additional cement is desired. When bulk cement is used, adequate equipment for handling, weighing, and spreading the cement shall be provided.

E. Mixing.

1. After the cement has been applied it shall be mixed with the soil so that the specified thickness of base shall be a homogeneous soil-cement mixture. Water shall be added and mixing shall continue until the mixture is sufficiently blended to prevent the formation of cement balls when additional water is added.

F. Application of Water And Moist Misting.

1. Immediately after the soil and cement have been mixed, water shall be applied uniformly and incorporated into the mixture. Excessive concentration of water on or near the surface shall be avoided. A water supply and pressure distributing equipment that will assure the application within three (3) hours of all water required. After all water has been applied, mixing shall continue until a uniform and intimate mixture of soil-cement and water has been obtained.

G. Compaction.

1. Prior to the beginning of compaction, the mixture shall be in a loose condition for a depth to produce the specified finished thickness. As a continuation of mixing operations, the loose mixture then shall be uniformly compacted to ninety-five (95) percent of maximum density as determined by ASTM D698 with two (2) hours. Initial compaction shall be obtained by use of a sheeps-foot roller of adequate weight to thoroughly compact the base for the full thickness. During compaction operations, shaping may be required to obtain uniform compaction and required grade and cross.

H. Finishing.

1. After the mixture has been compacted, the surface of the soil-cement shall be shaped, if necessary, to the required lines, grades, and cross-sections shown on the Plans. During shaping operations, the surface shall be lightly scarified as necessary to loosen any imprints left by the compacting or shaping equipment. The resulting surface shall then be compacted to the specified density with steel wheel or pneumatic tire rollers or both. Rolling shall be supplemented by broom dragging if required.
2. Surface compaction and finishing shall be done in such a manner as to produce, within two (2) hours, a smooth, dense surface free of surface compaction planes, cracks, ridges, or loose material. Any approved surface finishing method may be used provided the above final results are produced.

I. Curing.

1. After the soil-cement has been finished as specified herein, it shall be protected against drying for seven (7) days by the application of bituminous material as specified or allowed by the Owner. The bituminous material shall be applied as soon as possible, but no later than two (2) hours after finishing is completed. The finished soil-cement shall be kept continuously moist until the bituminous material is placed.
2. The bituminous material shall be uniformly applied at the rate of approximately 0.2 gallons per square yard with approved heating and distributing equipment. The exact rate and temperature of application to give complete coverage without excessive run-off will be specified by the Owner.

3. At the time the bituminous material is applied the soil-cement shall be dense, free of all loose and extraneous material, and shall contain sufficient moisture to prevent penetration of the bituminous material. Water shall be applied in sufficient quantity to fill any surface voids immediately before the bituminous material is applied.
4. The curing material shall be maintained by the Contractor during the seven (7) day protection period so that all of the soil-cement will be covered effectively.
5. Should it be necessary for construction equipment or any other traffic to use the bituminous covered surface before it has dried sufficiently to prevent pickup, sufficient granular cover shall be applied before such use as directed by the Owner. Finished portions of the soil-cement that are traveled on by equipment or other traffic for any reason shall be protected in such a manner as to prevent marring or damaging the completed work.
6. When the ambient temperature may be expected to reach the freezing point, sufficient protection from freezing shall be given the soil-cement for seven (7) days after finishing and until it has hardened.

J. Construction Joints.

1. At the end of each day's construction a straight transverse construction joint shall be formed by cutting back into the completed work to form a true vertical face free of loose or shattered material.
2. Soil-cement for large, wide areas shall be built in a series of parallel lanes of convenient lengths and width meeting the approval of the Owner. Straight longitudinal joints shall be formed at the edge of each day's construction by cutting back into the completed work to form a true vertical face free of loose or shattered material.

K. Manhole Adjustments.

1. Drainage and sanitary sewer manholes owned by the City shall be adjusted and set at final grade by the Contractor as necessary for compliance with the Plans. Adjustments of City owned manholes shall be as specified in Sections 02530 and 02632 of these specifications. Manholes, valve boxes, and other utility structures not owned by the City but within the right-of-way of the Project shall be adjusted as necessary by the owner of such facilities. The Contractor shall be responsible for notifying other owners of any required adjustments and for the accomplishment of that work by the owner of such facilities according to the project schedule.

L. Traffic And Maintenance.

1. Completed portions of the soil-cement may be opened immediately to construction equipment and local traffic, and to all traffic after the seven (7) day curing period, provided the soil-cement has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic and provided curing specified above is not impaired.
2. The Contractor shall be required to maintain the soil-cement in good condition and in a manner satisfactory to the Owner from the time work first starts until all work has been completed and accepted. Maintenance shall include immediate repairs of any defects that may occur. This work shall be done by the Contractor at his own expense and repeated as often as may be necessary to keep the area continuously intact. This work shall include immediate repairs to any defects that may occur in a manner that will ensure restoration of a smooth, uniform surface and durability of the area repaired. Any faulty work shall be replaced to the full depth of treatment, rather than adding a thin layer of material to the completed work.

3.03 Construction Requirements For Portland Cement Concrete Base (Plain)

A. Proportioning

1. The proportioning of materials for Portland cement concrete base shall be in accordance with the provision of Specification Section 03050 Portland Cement Concrete, for Class B concrete.

B. Mixing Limitations and Placing Concrete

1. Limitations of mixing of concrete due to weather shall be in accordance with limitations specified herein and in Section 03050.
2. The concrete shall be unloaded into an approved spreading device, or deposited on the subgrade or subbase, and spread in such manner as to prevent segregation of the materials. As deposited, the mixture shall be placed where it will require as little re-handling as possible.
3. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels or other approved tools. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or other foreign substances.
4. Where concrete is to be placed adjoining a previously constructed lane of pavement and mechanical equipment will be operated upon the existing lane of pavement, that lane shall meet the requirements for opening to traffic stipulated in Specifications elsewhere. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after 7 days.

5. Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies, by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 5 seconds in any one location.
6. The use of hand operated vibrators will be permitted. Vibrators mounted on a machine shall be operated only while the machine is in motion.
7. Concrete shall be deposited as near to expansion and contraction joints as possible without disturbing them but shall not be dumped from the discharge bucket or hopper onto a joint assembly unless the hopper is well centered on the joint assembly.
8. Should any concrete materials fall on or be worked into the surface of a completed slab, they shall be removed immediately

C. Preparation and Construction Procedures

1. The subgrade shall be prepared in accordance with the provisions of Specification Section 02335.

D. Surface Finish And Tolerances

1. As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a 12 foot steel straightedge provided by the Contractor or other specified device. When the straightedge is placed parallel to the centerline of the pavement, the surface shall not vary more than 1/8 inch from the lower edge of the straightedge. Areas showing high spots of more than 1/8 inch, but not exceeding 1/2 inch in 12 feet, shall be marked and immediately ground down with an approved grinding tool to an elevation where the area will not show surface deviations in excess of 1/8 inch when tested with a 12 foot straightedge.
1. When a bituminous concrete surface is specified, the surface of the base shall be rolled prior to initial set with a roller having projections that will form grooves in the surface approximately one (1) inch wide and one-half (1/2) inch deep at intervals of approximately five (5) inches. These grooves shall form an angle of approximately 60° with the pavement centerline. A tamping device may be used which will produce the same general results.

E. Traffic And Maintenance

2. The Owner will determine when the concrete base has cured sufficiently for the application of bituminous concrete surface material or when local traffic or construction equipment will be allowed on the base.

F. Tolerance In Base Thickness

1. The owner will determine the thickness of the base by average measurements taken at the frequency he determines to be sufficient. When the finished base thickness is not deficient by more than one-quarter (1/4) inch from the Plan thickness, full payment will be made. When concrete base is determined to be deficient by more than one-quarter (1/4) inch, the Contractor shall remove and replace the deficient base at his expense.

G. Manhole Adjustments

1. Drainage and sanitary sewer manholes owned by the City shall be adjusted and set at final grade by the Contractor as necessary for compliance with the Plans. Adjustments of City owned manholes shall be as specified in Specification Sections 02530 and 02632 respectively. Manholes, valve boxes, and other utility structures not owned by the City but within the right-of-way of the project shall be adjusted as necessary by the owner of such facilities. The Contractor shall be responsible for notifying other owners of any required adjustments and for the accomplishment of that work by the owner of such facilities according to the project schedule.

3.04 Construction Requirements For Asphaltic Concrete Pavement (General)

A. Composition of Mixtures

1. The bituminous plant mix shall be composed of a job-mix formula of aggregate, filler if required, and bituminous material approved by the Owner. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that the resulting mixture meets the grading requirements of the job-mix formula. The job-mix formula shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bituminous material to be added to the aggregate, and a single temperature at which the mixture is to be discharged from the plant. All mixtures shall continually conform to the job-mix formula within tolerances established by Subsection 407.03 of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction. When unsatisfactory results or other conditions make it necessary, the job-mix formula may be adjusted by the Owner.

B. Equipment

1. Bituminous Mixing Plants

- a. Bituminous mixing plants, regardless of type, shall conform to the current requirements of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction, Subsection 407.04.

- b. At any time and without notice, the Owner shall have free access to any plant producing hot mix asphaltic concrete for the City of the purpose of checking equipment, materials, scales, or plant mixed material for compliance with these Specifications. He shall be furnished whatever assistance he requests in checking the plant, including the provision of testing equipment to check the mix and materials.
- 2. Trucks
 - a. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds.
 - b. The beds shall have been coated with an approved material not harmful to the mixture to prevent adherence to the beds. Each truck shall have a canvas cover to protect the mixture from the weather, and when necessary to control temperature, truck beds shall be insulated and covers securely fastened.
- 3. Bituminous Pavers
 - a. Bituminous pavers shall be self-contained units, provided with an activated screed or strike-off assembly equipped to be heated and capable of spreading and finishing courses of plant mix material in lane widths according to the typical sections and thicknesses shown on the Plans. Materials for shoulders and similar construction shall be placed by any mechanical spreading equipment approved by the Owner.
 - b. Bituminous pavers shall be equipped with a receiving hopper of sufficient capacity to ensure a uniform spreading operation. The hopper shall be equipped with a distribution system which prevents “cold spots” and which will place the mixture uniformly in front of the screed. The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. When laying mixtures, the paver shall be capable of forward speeds consistent with satisfactory laying of the mixtures.
 - c. All asphalt paving machines shall be equipped with automatic grade and slope controls which shall be in good working order at all times. In the event of mechanical failure of any of the automatic controls, the Contractor will be permitted to complete only the current day’s work using manual controls.
- 4. Rollers

- a. Rollers shall be self-propelled and of the steel-wheel, pneumatic tire, and/or vibratory type. Rollers shall be in good condition, capable of reversing without backlash and shall be operated at speeds slow enough to avoid displacement of the bituminous mixture. All rollers shall be equipped with devices to moisten and clean the wheels as required.
- b. The steel wheel roller shall weigh a minimum of eight tons and may be a three-wheel or tandem type.
- c. The pneumatic tire roller shall meet the requirements of Specification Section 02335.
- d. The use of vibratory rollers will be permitted only after being specifically approved by the Owner.
- e. All required rollers shall be on the job, inspected, and approved before paving operations will be permitted to begin.

5. Platform Truck Scales

- a. Platform truck scales shall meet the requirements of Subsection 109.01 of the Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction.

6. Small Tools

- a. The Contractor shall provide all necessary small tools and suitable means for keeping them clean and free from accumulations of bituminous materials.

C. Weather Limitations

1. Bituminous plant mix may be placed on properly constructed and accepted subgrade, base, previously applied layers of asphaltic concrete, or concrete pavement provided the following conditions are met:
 - a. The area to be paved is not in a frozen condition and is free from snow, ice, and excessive moisture.
 - b. Plant production and paving operations shall be so coordinated that a uniform continuity of operation is maintained.
 - c. The bituminous plant mix shall be placed in accordance with the following:

1. when the compacted thickness of the mix is less than 1-1/2 inch, the minimum air or surface temperature shall be 50°F
2. when the compacted thickness of the mix is 1-1/2 inch or more, the minimum air or surface temperature shall be 40° F.

D. Conditioning of the Existing Surface

1. When bituminous mixes are to be placed upon an existing concrete pavement, with or without a bituminous overlay, all loose or excess bituminous material shall be removed from joints and cracks. Sections of existing pavement that are broken and pumping under traffic shall be removed to subgrade as directed by the Owner. Unsatisfactory subgrade material encountered when existing pavement is removed shall also be removed as directed by the Owner. Materials removed from existing pavement, including base and subbase, and from subgrade shall be replaced with asphaltic concrete Mix No. 2, as specified in Specification Section 02741
2. B. When the bituminous mixture is to be placed upon an existing bituminous pavement, any areas having excess bitumen and any failures in the existing surface and base shall be removed to subgrade as directed by the Owner. Unsatisfactory subgrade material encountered when existing pavement is removed shall also be removed to subgrade as directed by the Owner. Materials removed from existing pavement, including base and subbase, and from subgrade shall be replaced with asphaltic concrete Mix No. 2, as specified in Specification Section 02741, to the level of existing pavement surface or as directed by the Owner. Payment for removal and replacement shall be made as defined for in Specification Section 02741.

E. Prime or Tack Coats

1. A prime coat shall be applied to Graded Aggregate Base Course, Cement-Stabilized Aggregate Base, and Soil-Cement Base uniformly at the rate of 0.25 gallons per square yard. Prime coat shall be grade MC-30. Bituminous material for tack coat shall be applied to concrete or asphaltic concrete bases or surfaces to provide bond for superimposed courses. Tack coat shall be emulsified asphalt, grade SS-1, applied at a uniform rate not to exceed 0.05 gallons of residual bitumen per square year.

F. Preparation of Bituminous Material

1. The bituminous material for hot mixes shall be heated to a temperature between 275° F and 325° F in a manner that will avoid local overheating and provide a continuous supply to the mixer at a uniform temperature at all times.

G. Preparation Of Aggregates

1. The aggregates for hot mixes shall be dried and heated to a uniform temperature between 225° F and 325° F. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid soot on the aggregate.
2. B. On all plants requiring screens, the hot dried aggregate shall be screened into two (2) or more fractions as specified. The separated fractions shall then be conveyed into separate compartments ready for batching and mixing with bituminous material.

H. Mixing

1. The dried aggregates shall be combined within the mixer in the amount of each fraction of aggregates required to meet the job-mix formula. The bituminous material shall be measured or gauged and introduced into the mixer in the amount specified by the job-mix formula.
2. After the required amounts of aggregate and bituminous material have been introduced into the mixer, the materials shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate is secured. Wet-mixing time shall be determined by the Owner for each plant and for each type of aggregate used, but in no case shall the wet-mixing time be less than twenty-five (25) seconds for batch type plants and forty (40) seconds for continuous mix plants.
3. For hot-mix bituminous pavement, the temperature of the completed mixture, determined at the time it is dumped from the mixer, shall be not less than 275° F, except that the temperature of mixtures made with aggregates containing absorbed moisture which causes foaming or boiling in the completed mixtures at these higher temperatures shall be not less than 225° F.
4. Hot-mix bituminous mixtures may be stored in surge or storage silos provided that the mixture as used from the silos meets all the specification requirements for the particular mix involved. When the use of surge or storage silos is permitted, the following additional requirements shall apply:
 - a. The surge and storage systems shall be of such design that there are no appreciable differences between material being discharged from the silo and material being discharged directly from the pugmill.
 - b. The surge and storage silos must be equipped with low and high mix level indicators. The low level indicator shall be placed at a location on the silo that has been predetermined to prevent segregation of the mix.

- c. The conveyor system used with the surge or storage silos shall be arranged in such a manner that samples of the mix or dry material may be conveniently taken from the pugmill.
- d. Storage silos shall be closed, insulated, and heated in such a manner that localized heating (hot spots) does not occur. The storage system shall be capable of sealing the bin to prevent oxidation of the mixture.
- e. Surge silos shall be equipped with a rain cover capable of preventing water from entering the mix in the silo.
- f. Approval of a surge or storage system will be dependent upon inspection and tests which indicate that the system is capable of conveying, retaining, and delivering the bituminous mixture within the tolerance ranges as set forth on the job, mix formula without segregation, and without balling or hardening.
- g. Approval of a surge or storage system may be withdrawn if tests and/or inspections indicate that the system is having a detrimental effect on the bituminous mixture.
- h. Any bituminous mix which, in the judgment of the Owner, is damaged in any way by the use of a surge or storage system will be rejected.
- i. Platform truck scales meeting the requirements of Specification Section 02710 shall be mounted under the loading hopper and shall be capable of recording tare and gross weight.
- j. The storage or surge bin shall be emptied when directed by the Owner in order to check material quantities.
- k. Hours of plant operation, whether for storage or direct shipment to the road, shall be limited to reasonable working hours in order that normal inspection of plant operations may be performed.
- l. Bituminous material in a surge silo must be removed on the same day in which it is placed.
- m. Samples of the stored material may be taken following the period of storage.
- n. Material stored will be subject to the temperature, segregation, and laying requirements as required for normal un-stored plant production.
- o. Excessive segregation, lumpiness, or stiffness of the mix shall be sufficient cause for rejection by the Owner.
- p. Surge and storage silos shall be located in a position that enables the top of the truck bed to be visible to the load operator during the loading operation.

I. Spreading and Finishing

1. Unless otherwise specified or permitted, bituminous mixtures shall be and spread on the roadway in ample time to secure thorough compaction during daylight hours. Its temperature at the time of depositing in the paver hopper shall be not more than 25° F less than the temperature at which it is discharged from the mixer. The mixture shall be laid upon an approved surface to which the appropriate tack coat or prime coat has been applied and spread and struck off to the established line, grade, and elevation by means of approved asphalt paving machines in echelon or by one (1) paver when echelon paving is not permitted. Echelon paving will not be permitted on two (2) lane projects where traffic is being maintained. Alignment of the outside edges of the pavement shall be controlled by preset control string lines. Where multicourse pavements are placed, the longitudinal joint in one (1) layer shall offset that in the layer immediately before by approximately one (1) foot; however, the joint in the top layer shall be at the centerline of the pavement if the roadway comprises two (2) lanes of width or at lane lines if the roadway is more than two (2) lanes in width.
2. Automatic screed controls utilizing either the string line or ski type grade reference systems will be required on all work regardless of the paver width. The string line reference system may be required on new construction. In the event the base has been finished with equipment having automatic grade controls or the Contractor demonstrates that an alternate method of spreading and finishing will result in a satisfactory riding surface, the Owner may conditionally waive the string line requirement and authorize use of the ski type reference system. In any event, the Owner may at any time require the use of a string line reference system even though it may have previously been waived, if in his opinion the use of the string line will result in a superior riding surface. Where the ski type system is used, the ski shall have the maximum practical length and in no case shall it be less than forty (40) feet in length. Pavement lanes previously placed with automatic controls or to form grade may serve as longitudinal control reference for laying adjacent lanes by utilizing a ski or joint matching shoe.
3. The string line reference system shall consist of suitable wire or twine supported by approved devices which will be compatible with the type of automatic paver control systems used. The string line and supports shall be capable of maintaining the line and grade designated by the Plans at the point of support while withstanding the tensioning necessary to prevent sag in excess of ¼ inch between supports spaced fifty (50) feet apart. Additional supports shall then be installed to provide a minimum spacing of twenty-five (25) feet, or less, as directed by the Owner and to remove and deviation of the string line from Plan grade.
4. The Owner will furnish sufficient control reference stakes to enable the Contractor to establish the string line reference system. The Contractor shall furnish all materials, equipment, labor, and incidentals required to construct the string line reference system as described herein and shall maintain same until its use is no longer required.

5. The string line reference system shall be complete in place at least 300 feet in advance of the point where the pavement is being place.
6. Automatic screed controls will not be required on sections of projects where service connections and other conditions interfere with their efficient operation.
7. The cost of erecting and maintaining the string line reference system shall be included in the unit price bid for other items of construction.
8. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be taken from the hopper of the spreading machine and shall be distributed immediately into place by means of suitable shovels and other tools and spread with rakes and lutes in a uniformly loose layer of such depth as will result in a completed course having the required thickness.

J. Compaction

1. After the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly compacted. The method employed must be approved by the Owner and capable of compacting the mixture to the desired density while it is in a workable condition. When no density requirements are specified, a system of compaction for roadway pavements shall be employed which has previously produced required bituminous pavement densities. A control strip and random density samples may be employed to aid the Owner in evaluating the system.
2. In general, compaction shall be accomplished by the use of a combination of the equipment designated in Specification Section 02710. The following are minimum roller requirements; however, the number of rollers shall be increased if the required results are not being obtained.
 1. For each paver up to sixteen (16) feet wide, two (2) rollers shall be required.
 2. For each paver over sixteen (16) feet wide, three (3) rollers shall be required.
3. The minimum number of rollers listed above may, with the approval of the Owner, be reduced to one roller of either the steel-wheel or vibratory type on the following types of construction:
 1. on shoulder construction
 2. on incidental construction such as bridge approaches, driveways, etc.
 3. on projects containing less than 10,000 square yards of bituminous pavement

4. Unless otherwise directed, rolling shall begin at the low side and proceed longitudinally parallel to the road centerline. When paving in echelon or abutting a previously placed lane, the longitudinal joint shall be rolled first, followed by the regular rolling procedure. When paving in echelon, rollers shall not compact within six (6) inches of an edge where an adjacent lane is to be placed. Rollers shall move in a slow uniform speed with the drive wheels nearer the paver and shall be kept as nearly as possible in continuous operation. Rolling shall continue until all roller marks are eliminated.
5. To prevent adhesion of the mixture to the rollers, the wheels shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. An excess of liquid shall not be used.

K. Density Requirements

1. Asphaltic Concrete Surface Course, Mix No. 1 as specified in Specification Section 02741, shall be compacted to 93 percent of laboratory density as determined by the Marshall Method, 75 blow.
2. Asphaltic Concrete Binder Course (Leveling or Bushing), Mix No. 2 as specified in Specification Section 02741, shall be compacted to 90 percent of maximum theoretical density.
3. Asphaltic Concrete Base (Black Base), as specified in Specification Section 02710, shall be compacted to 90 percent of maximum theoretical density.
4. It is intended that acceptance density testing will be accomplished while the bituminous mixture is hot enough to permit further densification if such is shown to be necessary.
5. If the density does not conform to the requirement stated herein above, the Contractor shall continue his compactive effort until the required density is obtained.
6. Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be compacted thoroughly with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller of cleated compression strips may be used to compact the mix.
7. Any mixture that becomes loose or broken, mixed with dirt, or is in any way defective shall be repaired with rakes and the addition of fresh mix or shall be removed and replaced with fresh mix which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of bituminous material shall be removed and replaced.

L. Density by Control Strips

1. When approved by the Owner, the required density may be determined by the control strip method. The target density obtained by the control strip method shall be used in lieu of theoretical or laboratory densities.
 - a. When this method is used, the density of all paving shall be at least 96 percent of the density obtained on the control strip. Construction of the control strip shall be as follows:
 - a. The base course or other pavement structure course upon which a control strip is constructed shall have been approved by the Owner prior to the construction of the control strip.
 - b. Equipment proposed for use in the compaction of control strips meet the requirements set forth in Specification Section 02710.
 - c. To determine the target density, a control strip shall be constructed at the beginning of work on the pavement course. New control strips shall be required when
 1. a change in the Job Mix Formula is necessary
 2. a change in the source of materials occurs
 3. a change in the material from the source is observed
 4. a change in the paving or rolling equipment occurs
 5. there is reason to believe that the control strip density is not representative of the bituminous mixture being placed
2. With the approval of the Owner, the Contractor may be permitted to construct additional control strips.
3. Each control strip shall be constructed with approved bituminous mixture and shall remain in place as a section of the completed work. Each control strip shall be one paver width wide and have an area of at least 400 square yards and shall be of the depth specified for the pavement structure course concerned.
4. Compaction of the control strip shall commence immediately after placement of the bituminous mixture and be continuous and uniform over the entire control strip.
5. The compaction of the control strip shall be continued until no appreciable increase in density (1.0 lbs/ft³) can be obtained by additional roller coverage.
6. During the rolling process, the density of the control strip will be determined by the Owner from randomly selected tests within the control strip.

M. Surface Requirements

1. The surface shall be tested with a twelve (12) foot steel straightedge, furnished by the Contractor, applied parallel to the centerline of the pavement. The deviation of the surface from the testing edge of the straightedge shall not exceed that specified for the respective types of bituminous construction as follows:
 - a. Surface Courses shall not deviate more than 1/4"
 - b. Base Courses shall not deviate more than 3/8"
2. The Contractor shall be required to repair all straightedge deviations as approved by the City Engineer.
3. The transverse slopes of tilted pavements shall be tested with a string line and string level applied at right angles to the centerline of the pavement and the percent of slope, when computed for the full width of the pavement, shall not deviate more than one-half (1/2) of one percentage point from that specified on the Plans.
4. The crown in crowned pavements shall be tested with a string line applied at right angles to the centerline of the pavement, and the crown shall not deviate more than one-half (1/2) inch from that specified on the Plans.
5. Deviations greater than the specified tolerances shall be corrected by methods best suited for the purpose. Pavement that cannot be corrected to comply with the specified tolerances shall be removed and replaced at the Contractor's expense.

N. Blotting Sand

1. When directed by the Owner in order to control tracking of excess bituminous material from curing of base materials or from application of prime coat, a protective cover of blotting sand shall be spread over the bituminous material at a rate specified by the Owner, but not to exceed ten (10) pounds per square yard. Application of blotting sand shall be considered incidental to the work and no separate payment will be made.

3.04 Construction Requirements For Asphaltic Concrete Base (Black Base)

A. General

1. The general construction requirements for black base shall be as prescribed in the applicable portions of Specification Section 02710.

B. Preparation of Subgrade or Surface

The surface upon which black base is to be placed shall meet the requirements of Specification Section 02335 or 02710, whichever is applicable. Black base shall be placed only upon a surface that is dry and cleaned of all loose particles.

C. Thickness and Surface Requirements

1. Thickness shall be controlled during the spreading operations by frequent measurements taken of the freshly spread mixture to establish a relationship between the uncompacted and compacted material. This thickness shall remain in conformity with that specified on the Plans. The surface of the base shall meet the requirements specified under Specification Section 02710 and when tested in accordance with the provisions of Specification Section 02710, the deviation of the surfaces from the testing edge of the straightedge shall not exceed 3/8 inch.

D. Manhole Adjustments

1. Drainage and sanitary sewer manholes owned by the City shall be adjusted and set at final grade by the Contractor as necessary for compliance with the Plans. Adjustments of City owned manholes shall be as specified in Specification Sections 02530 and other utility structures not owned by the City but within the right-of-way of the Project shall be adjusted as necessary by the owner of such facilities. The Contractor shall be responsible for notifying other owners of any required adjustments and for the accomplishment of that work by the owner of such facilities according to the project schedule.

E. Traffic And Maintenance

1. The Owner will determine when the base has sufficient compaction and has cured sufficiently to allow construction equipment, local traffic, and/or normal traffic on the base.

END OF SECTION

SECTION 02741

ASPHALTIC CONCRETE PAVEMENT

PART 1 – Description

This work shall consist of an asphaltic concrete pavement constructed in one or more layers for surface course(s) and binder course(s). The binder course may also be used as a leveling or bushing course. Binder course shall consist of a hot mixture of aggregate and asphalt prepared in a hot bituminous mixing plant. The binder course shall be constructed on a prepared subgrade, subbase, or base conforming to the lines, grades, thicknesses, and cross-sections shown on the Plans or as directed by the Engineer. The surface course shall consist of an asphaltic concrete pavement composed of a mixture of coarse aggregate, fine aggregate, mineral filler, and asphalt cement, constructed on a prepared roadbed in conformity with the lines, grades, thicknesses, and cross-sections shown on the Plans or directed by the Owner.

PART 2 – Materials And Equipment

2.01 MATERIALS

- A. Asphalt Cement. Asphalt cement shall conform to the requirements of ASSHTO M 226, Table 2, for the grade specified. Unless otherwise directed, asphalt shall be Viscosity Grade AC-20, PG64-22, or PG 64-28. The type and grade of bituminous material may be changed one step by the Engineer during construction, at now change in unit price.
- B. Course Aggregate. Course aggregate (aggregate retained on the No. 4 sieve) shall be crushed stone meeting the quality requirements of ASTM D 692 with the following exceptions:
 - 1. Crushed limestone shall have a sodium sulfate soundness loss not exceeding 9 percent.
 - 2. For Mix No. 1, material retained on the No. 4 sieve shall have a maximum of 20 percent elongated pieces (length greater than five times the average thicknesses).
 - 3. For Mix No. 2, the aggregate shall contain no more than 5 percent soft or nondurable particles.
 - 4. For Mix No. 3, the aggregate shall contain no more than 5 percent soft or nondurable particles.
- C. Fine Aggregate. The fine aggregate shall consist of natural sand consisting of hard, clean, tough grains which will have a maximum loss of 12 percent when subjected to the sodium sulfate soundness test.
- D. Composition of Mixtures

1. Asphaltic Concrete Surface, Mix No. 1, shall be laid in one course to the thickness shown on the Plans.
2. Asphaltic Concrete Binder, Mix No. 2, shall be laid in one or more courses to the thicknesses shown on the Plans. Mix No. 2 may also be used as a leveling course or bushing course.
3. Asphaltic Concrete Binder, Mix No. 3 shall be laid in one or more courses to the thickness shown on the plans.
4. The composition of the mixes shall be as follows:

Sieve Size	Total Percent Passing by Weight		
	Mix No. 1	Mix No. 2	Mix No. 3
2"	100	100	100
1-1/2"	100	100	90 - 100
3/4"	100	100	65 - 90
3/8"	76 - 96	65 - 95	-----
No. 4	51 - 76	45 - 70	30 - 55
No. 8	36 - 60	25 - 50	20 - 45
No. 30	16 - 40	12 - 30	8 - 25
No. 100	3 - 12	2 - 12	2 - 12
No. 200	2 - 8	1 - 6	1 - 6

5. The proportions of the total mixture, in percent by weight, shall be as follows:

Courses	Combined Mineral Asphalt		Aggregate Cement
	Mix No. 1, Surface(Limestone)	92.0 - 96.0	
Mix No. 2, Binder	93.0 - 97.5	2.5 - 7.0	
Mix No. 3, Binder	93.0 - 97.5	2.5 - 7.0	

6. It is the intent of this Section of the Specifications that the above described mixes shall conform to the following mixtures specified in the Tennessee Department of Transportation Standard Specifications for Road and Bridge construction.

Mix No. 1 - Section 411, Asphaltic Concrete Surface (Hot Mix), Aggregate Grading E.
 Mix No. 2 - Section 307, Bituminous Plant Mix Base (Hot Mix), Aggregate Grading C.

Mix No. 3 – Section 307, Bituminous Plant Mix Base (Hot Mix),
Aggregate Grading B.

7. For multiple layer construction, succeeding layers shall not be laid until the previous layer has cooled sufficiently to support the construction equipment
8. When Mix No. 1 is to be used as a surface for traffic lanes, the mineral aggregate shall be composed of not less than 50 percent nor more than 80 percent crushed limestone and not more than 50 percent nor less than 20 percent natural sand. When Mix No. 1 is used for surfacing of shoulders or other non-traffic lane construction, the mineral aggregate may be composed entirely of limestone, including screening and manufactured sand, but in no case shall the mineral aggregate for this construction consist of less than 50 percent limestone. The natural sand shall be so graded that not more than 5 percent will be retained on the No. 4 sieve.

2.02 EQUIPMENT

- A. All equipment necessary for the satisfactory performance of this construction shall be on the Project and approved of before work will be permitted to begin. The equipment shall meet the requirements of Specification Section 02710.

PART 3 – Execution

3.01 General

- A. The general construction requirements for surface and binder courses shall be as prescribed in the applicable portions of Specification Section 02710

3.02 Preparation of Base or Existing Surface

- A. The designated surface upon which asphalt concrete courses are to be placed shall meet the applicable requirements of Specification 02710 and be thoroughly cleaned of all dirt and other foreign or loose matter prior to the application of the Tack Coat or Prime Coat, as specified in TDOT Specification Sections 402 and 403.

3.03 Thickness And Surface Requirements

- A. Thickness shall be controlled during the spreading operations by frequent measurements taken of freshly spread mixture to establish a relationship between the un-compacted and compacted material. This thickness shall remain in conformity with that specified on the Plans. The surface of all courses shall meet the requirements specified under Specification Section 02710 and when tested in

accordance with the provisions of Specification Section 02710 the deviation of the surfaces from the testing edge of the straightedge shall not exceed 1/4 inch for Mix No. 1 or 3/8 inch for Mix No. 2 and Mix No. 3.

3.04 Manhole Adjustments

- A. Drainage and sanitary sewer manholes owned by the City shall be adjusted and set at final grade by the Contractor as necessary for compliance with the Plans. Adjustments of City owned manholes shall be as specified in Section 02530 or 02632 of these Specifications. Manholes, valve boxes, and other utility structures not owned by the City but within the right-of-way of the project shall be adjusted as necessary by the owner of such facilities. The Contractor shall be responsible for notifying other owners of any required adjustments and for the accomplishment of that work by the owner of such facilities according to the project schedule.

3.05 Traffic And Maintenance

- A. The Owner will determine when the surface course has sufficient compaction and has cured sufficiently to allow construction equipment, slow moving local traffic, or normal traffic to use the completed surface.

END OF SECTION

SECTION 02770

CONCRETE CURB, CURB AND GUTTER, VALLEY GUTTERS, SIDEWALK, AND DRIVEWAYS

PART 1 - Description

The work covered by this section consists of furnishing all equipment, labor, and materials necessary for constructing concrete curb, curb and gutter, valley gutters, sidewalks, and driveways on natural or prepared subgrades and bases, completed in accordance with the following specifications and dimensions shown on the plans.

PART 2 – Materials

2.01 Materials

A. Portland Cement Concrete

1. Portland Cement Concrete shall conform to the requirements specified under Section 03050 Portland Cement Concrete

B. Reinforcing Steel and Fibers

1. Reinforcing steel for concrete reinforcement shall meet the requirements of ASTM A615, Grade 60.
2. Welded wire fabric for concrete reinforcement shall meet the requirement as ASTM A185. Mesh shall be welded plain cold-drawn steel wire fabric.
3. Reinforcing Fibers
 - a. Concrete reinforcing fibers shall be polypropylene collated, fibrillated fibers designed and engineered specifically for use as secondary reinforcement for concrete, shall be three-quarter inch (3/4") (20mm) to one inch (1") (25mm) in length and be manufactured by Fibermesh Company, Forta Corporation, or approved equal.

C. Preformed Expansion Joint Material

1. Preformed joint material shall comply with the requirement of ASTM D994, ASTM D1751, or ASTM D1752.

D. Leveling Base Course

1. Base course materials, if specified, shall conform to the requirements of sand with less than 10% passing No. 200 sieve.

E. Forms

1. Concrete forms shall be wood, steel, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal.
2. Forms shall be coated with a non-staining agent that will not discolor or deface surface of concrete.

F. Curing Compound

1. Curing compound shall be poly-alpha-methyl-styrene (PAMS) meeting AASHTO 148 Class B, or engineer approved equivalent.

G. Foundation Material

1. Refer to Section 02632 for Foundation Material

H. Aggregates

1. Course and fine Aggregates shall meet the requirements of ASTM C33 Article 2. Concrete mix under this Section shall meet one and one half inch (1½") (37.5 mm) sieve size, as specified in Division 300, Section 301.

2.03 Subgrade and Base

A. Natural Subgrades.

1. Subgrade shall be cut to the grade to accommodate concrete improvement being specified. The upper eight inches (8") (200mm) of the subgrade shall be compacted to a dry density of at least 95% of maximum dry density as determined by ASTM D698 at a moisture content of $\pm 2\%$ of optimum. The finished surface of the subgrade shall be smooth, free from surface irregularities, and true to line and grade as established by grade hubs or pins.
2. Compaction tests shall be performed a minimum of every one hundred fifty feet (150') (45m) of curb walk or side walk, once for each valley gutter, and once for each driveway not part of a section of curb walk being tested. This testing requirement is only applicable for new subdivision construction.

- B. Trenches crossing curbwalk, valley gutters, or other concrete paving within the City right-of-way shall be compacted the full depth of the trench and shall be compacted to a dry density of at least 95% of maximum dry density as determined by ASTM D698 at a moisture content of $\pm 2\%$ of optimum. This applies to all trenches installed for any purpose. Prepared Subgrades with

Foundation Material

1. Where spongy, organic, or otherwise unsuitable material is encountered, which, in the opinion of the Engineer is unsuitable for subgrade, such unsuitable material shall be removed to a minimum of twelve inches (12") (300mm) below the four inch (4") (100mm) thick leveling base course, and replaced with foundation material. The Engineer may direct the Contractor to excavate deeper than the specified twelve inches (12") (300mm).
2. All foundation material shall be compacted to 95% of maximum dry density, as determined by ASTM D698 at a moisture content of $\pm 2\%$ of optimum. Tree roots shall be removed at least one foot (1') (300mm) laterally and twelve inches (12") (300mm) vertically below all prepared subgrades.

C. Proof Rolling

1. Subgrades shall be proof rolled after compaction testing requirements have been passed and prior to placement of the leveling base course.
2. Proof rolling shall be performed in the presence of the Engineer and a representative of the City Engineer's office.

D. Leveling Base Course.

1. Just prior to placement of concrete, the four inch (4") (100mm) thick leveling base course shall be accurately graded to conform to the grade of the forms, and sprinkled if necessary until the moisture content is at or near optimum moisture content. Optimum moisture content shall be determined by the Engineer in accordance with ASTM D698. In no case shall concrete be placed on a saturated base or if free water is standing on the base. This paragraph applies in areas where spot concrete improvements are scheduled such as short runs of new curb and gutter and in areas where valley gutters are removed and replaced and or where concrete is placed manually in lieu of machine placement.

2.04 Forms

- A. When using forms, they shall be of wood or metal, straight, free from warp, and of sufficient strength when staked to resist the pressure of the concrete without springing, and the upper edge shall form a true line. Outside forms for the curbside shall be of a depth equal to the full depth of the sidewalk, and the inside forms shall be of the depth of the gutter and shall be so designed as to permit secure fastening to the outside form. All forms shall be cleaned thoroughly and greased or oiled before concrete is placed against them. Forms that have become worn, bent, or broken shall not be used. Forms shall be securely set true to line and grade.
- B. On short radii curves, steel plates, which can be readily formed to the desired radii, shall be used. Face forms, if used, shall be preshaped to the proper radii. Care shall be exercised to insure the maintenance of the required cross-section around the entire radius.

- C. The Contractor shall provide an approved metal straight edge, ten feet (10') (3m) in length for use in checking the alignment of the forms prior to placing the concrete and also to check the concrete surface during the finishing operation. Forms and the final product shall not deviate more than one-quarter inch (1/4") (6.25mm) from a straight edge ten feet (10') (250mm) in length and shall be sloped to achieve complete drainage without "bird baths."
- D. Forms shall remain in place at least twelve (12) hours after concrete has been placed against them or for a longer period if so directed by the Engineer. Crowbars or other heavy tools shall not be used against green concrete in removing the forms. Forms shall be well cleaned before reoiling and reuse.
- E. Screed guide templates shall be pulled prior to the concrete taking initial set. In those cases where initial set takes place prior to pulling of the templates, the joint shall be sealed with an asphaltic sealing compound approved by the Engineer.

2.05 Protection

- A. Protect fresh concrete from deleterious effects of weather and from traffic until adequately cured.
- B. Concrete shall not be placed on frozen subgrade or when weather is stormy, dusty, or otherwise inclement to the point that it precludes good workmanship. Air temperature shall be a minimum of 40° F (4°C) and rising when the pour is started. Adequate measures shall be employed to protect the concrete from freezing for a period of at least seventy-two (72) hours after it is poured.

2.06 Joint Construction

A. Expansion Joints

- 1. All expansion joints shall be constructed straight, plumb, and shall extend through the full width and depth of the section. Expansion joint material shall be flush with the finished surface to three-quarters inch (3/4") (20 mm) below the finished surface. Edges adjacent to expansion joint material shall be tooled.
- 2. Expansion joints shall be constructed at the intersection with any existing curbwalk or curb and gutter, at the tangent point of curb radii, at alley returns, adjacent to inlet structures and at intermediate intervals of not more than sixty feet (60') (18m) or at such lesser spacing as may be determined by the Engineer.

B. Contraction Joints

- 1. Transverse weakened-plane contraction joints shall be constructed at right angles to the curb line at intervals of ten feet (10') (3.1m). Joint depth shall average at least one-fourth (1/4) of the cross- section of the concrete.
- 2. Contraction joints may be sawed, hand formed, or made by one-eighth inch (1/8") (3mm) thick

division plates in the formwork. Sawing shall be done early after the concrete has set to prevent the formation of uncontrolled cracking. The joints may be hand formed either by 1) using a narrow or triangular jointing tool or a thin metal blade to impress a plane of weakness into the plastic concrete; or, 2) inserting one-eighth inch (1/8") (3mm) thick steel strips into the plastic concrete temporarily. Steel strips shall be withdrawn before final finishing of the concrete.

3. After removal of templates and finishing, contraction joints shall be reopened with a mason's trowel to a depth of one-fourth (1/4) the thickness of the section, the line of cut coinciding with and extending into the joint formed by the template. The joints shall be finished with a jointer.

C. Construction Joints

1. At end of day's run, or in case of an interruption which would result in cold joint, construction joints shall be made at right angles to the longitudinal axis of the curbwalk and shall be located at the regular five foot (5') (1.5m) spacing designated for contraction joints unless otherwise specifically permitted by the Engineer. In no case shall any length of curbwalk be less than five feet (5') (1.5m) between joints.
2. Construction joints shall be formed by use of a bulkhead or divider which shall be removed before continuing with the next run. Edges of construction joints shall be edge tooled to form a recess for sealing compound.

2.07 Concrete Placement

A. Concrete shall be placed either by an approved slipform/extrusion machine, by the formed method, or by a combination of these methods. Concrete shall not be placed until base courses and forms have been checked for depth and alignment. The method used shall adequately vibrate and compact the concrete to achieve a homogeneous dense concrete free from honeycomb and pockets of segregated aggregate.

B. Machine Placement

1. The slipform/extrusion machine approved shall be so designed as to place, spread, consolidate, screed, and finish the concrete in one complete pass in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous concrete section.
2. The machine shall shape, vibrate, and/or extrude the concrete for the full width and depth of the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible.
3. All operations of mixing, delivery, and spreading concrete shall be so coordinated as to provide uniform progress, with stopping and starting of the machine held to a minimum.

C. Formed Method

1. Construct forms to the shape, lines, grades, and dimensions called for in the Drawings. Set wood or steel forms securely in place, true to line and grade. Forms shall be braced to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement. Tops of forms shall not depart from grade line more than one-fourth inch (1/4") (6.25mm) when checked with a ten-foot (10') (3m) straightedge. Alignment of straight sections shall not vary more than one-fourth inch (1/4") (6.25mm) in ten feet (10') (3m).

2.08 Finishing

- A. Finishing shall be done with a metal screed or mule designed to give proper shape to the section as detailed. Particular care shall be used to finish the gutter flow line to a true, uniform grade that will drain completely without "bird baths". The back of the curbwalk and toe of the gutter shall be edge tooled. Traffic surfaces shall be broom finished at 90° to the direction of traffic. All honeycombed areas or small defects shall be patched with 1:2 mix mortar.
- B. After stripping forms, exposed concrete surfaces shall be finished smooth and even by means of a moist wood float or a moist brick.
- C. Sides of concrete exposed by the removal of forms shall be protected immediately to provide continuance of curing and preventing injury to the edge and the underlying subgrade. After the forms have been removed, suitable fill material shall be placed along the edge of the walk and tamped by either hand or mechanical tampers to a density at least equal to that of the adjacent ground. The finish grade and section shall be as indicated on the drawings and to the satisfaction of the Engineer.
- D. Protection And Repairs
 1. Protection: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 2. Maintain concrete with minimum moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 3. Random Cracks in Pavement Slabs on Grade: When cracks occur within 2 feet (0.61 meters) of expansion or construction joints, remove and repair, otherwise grout with epoxy adhesive grout. Use saw cuts and dowels in all cut planes.
 4. Random Cracks in Curb and Gutter: When concrete cracks larger than hairline cracks appear in curb and gutter and are the width of a penny standing on edge, Engineer shall direct Contractor to remove and replace concrete curb and gutter sections. Sections to be replaced shall be a minimum of five feet in length. When cracks are hairline in width, repair with epoxy adhesive grout.

2.09 Curing

- A. Concrete shall be sprayed uniformly with curing compound immediately after finishing of the surface and before the set of the concrete has taken place. Curing compound shall be applied at the manufacturer's recommended rate.
- B. Curing compound shall also be applied immediately to the exposed concrete once forms have been removed.
- C. See section **2.02 F** for approved curing compounds.

2.05 Jointing New and Existing Curb Sections

Where the new concrete sections will join existing concrete sections with a different cross-section, five foot (5') (1.5m) long minimum transition section shall be constructed.

2.11 Fiber Reinforced Concrete

- A. Where specified or approved by the Engineer, provide polypropylene fibers added to the concrete mix to control shrinkage cracks.
- B. Polypropylene fibers shall be added at the rate of three pounds (3#) (1.4 kg) of fiber per cubic yard of concrete. Fibers shall be added to the concrete in accordance with the manufacturer's recommendations.

2.13 Cutting and Patching of Asphalt Paving.

- A. When curb cuts, or other concrete structures are installed adjacent to existing asphaltic concrete paving, the asphalt paving shall be saw cut parallel to and a minimum of eighteen inches (18") (450mm) away from the edge of the concrete.
- B. The excavation between the concrete and the asphalt paving shall be backfilled with a minimum of two and one-half inches (2.5 inches) of asphalt over a specified base course. Base course and asphaltic concrete paving shall comply with City of Lakeland standard specification.
- C. Where the existing pavement and base course sections exceed the minimums specified above, the replacement thickness shall match the existing.

END OF SECTION

SECTION 02830

IRRIGATION STANDARD SPECIFICATIONS

PART 1 - DESCRIPTION

1.01 General

Work in this section consists of all labor, materials, and equipment necessary to install the irrigation system as indicated on the plans and includes, but not necessarily limited to: Lawn and shrub sprinkler system automatic controller and remote control valves, the proper execution of the work, including trenching, boring under driveways, walks, and curbs, installation of pipe sleeves, and backfilling.

PART 2 - MATERIALS

2.01 Submittals

- A. Before any irrigation system materials are delivered to the job site, submit to the Owner a complete list of all irrigation system materials proposed to be furnished and installed. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to method of installation.
- B. Provide at least one person who shall be present at all times during execution of this portion of the work, and who shall be thoroughly familiar with the type of materials being installed, and material manufacturer's recommended methods of installation, and who shall direct all work performed under this section. The Contractor shall have a minimum of 5 years experience in commercial or residential lawn irrigation installation

2.02 Materials

- A. Polyvinyl Chloride (PVC) Pipe
 - 1. All mainlines and transmission lines shall be Schedule 40 PVC; laterals shall be Class 200 PVC. Pipe shall be rigid unplasticized conforming to ASTM D-1784 and D-2241 standard specifications for PVC pipe. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious wrinkles, and dents.
 - 2. All pipe shall be continuously and permanently marked with the following information: Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73°F (23°C), and National Sanitation Foundation (N.S.F.) approval.
- B. Risers

1. All stationary spray heads shall have risers of high density polyethylene plastic pipe (“funny pipe”) with spiral barbed ell fittings. Minimum length of “funny pipe” shall be eighteen inches (18”) (450mm).
2. All rotor pop-up sprinklers shall have an adjustable pre-assembled double swing joint riser. Swing joints shall be Lasco or Spears Marlex ells MIPT x FIPT or equal approved in advance by the City. Swing joints shall be twelve inches (12”) (300mm) long and shall be threaded on both ends. The swing joint riser shall be of proper pipe size to match head threads.

C. Manual Valves

1. All manual ball valves, sizes three-inch (3”) (75mm) and smaller, shall be full ported ball valves with maximum working pressure of 175 psi (1200kPa) and 350 psi (2400kPa) hydrostatic test pressure.
2. All manual gate valves of four-inch (4”) (100mm) size or larger shall be iron body, brass trimmed, double disc wedge type with integral taper seats and with non-rising stems, and shall be Mueller A-2360 resilient wedge gate valves with mechanical joints or equal accepted in advance by the City. All manual gate valves shall be 200 psi (1380kPa) rated.

D. Valve Boxes

1. All remote control valves, manual control valves, zone shut-off valves, ball valves, or globe valves unless otherwise indicated, shall be installed in valve access box of proper size as required for easy access to the valve.
2. Valve boxes shall not be located within a playing field. Valve boxes shall be placed with a minimum of five feet (5’) (1.5m) separation between each valve box.

E. Sprinkler Heads

1. All heads of a particular type and for a particular function in the system shall be of the same manufacture and shall be marked with the manufacturer’s name and identification, in such a position that they can be identified without being removed from the system.

F. Automatic Irrigation Controllers

1. Field controllers shall be model numbers and manufacturers as shown on the plans or an acceptable equal.
2. Field controllers shall be installed on approved concrete bases in accordance with the manufacturer’s recommendations as shown on the drawings.
3. Field controllers shall be installed with manufacturer’s lightning and surge protection.

4. Central controller shall be model number and manufacturers as shown on the plans, or acceptable equal. Central controller shall be located as shown on the drawings.
5. On site lockable disconnects or lockable fuse block and a 110 volt outlet shall be installed at each controller in a separate lockable water-tight enclosure.

G. Automatic Remote Control Valves

1. All remote control valves shall be two-inch (2") (50mm) Toro 216, two-inch (2") (50mm) Rainbird GB globe pattern, or approved equal. All valves shall be 24-volt, with epoxy-sealed solenoid coils and throttling stem. All splices shall be installed with 3M DBY and DBR types and all splices shall be made inside the valve box.

H. Control Cable

1. All electric control and ground wire shall be irrigation control cable or approved equal, 14-gauge unless otherwise indicated on the drawings. All wiring to be used for connecting the automatic remote control valve to the automatic controllers shall be Type "UF", 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.
2. Insulation shall be 4/64-inch (1.6mm) thick minimum covering of ICC-100 compound for positive waterproofing protection. All control or "hot" wires shall be of one color (black) and all common or "ground" wires shall be white. When more than one valve is operated by a single controller station, provide separate control wire from the controller to each valve, and one valve per box. Each valve should have no less than twenty-four inches (24") (600mm) of control cable inside valve box. Each wire shall be labeled at the valve box and at the controller to what zone each wire controls.
3. Verification of wire types and installation procedures shall be checked to conform to local codes.

I. Fittings

1. All plastic pipe fittings shall be permanently marked with the following information: Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73°F (23°C), and National Sanitation Foundation (N.S.F.) approval.
2. All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld or screwed connections.
3. Slip fitting socket taper shall be so sized that a dry unsoftened pipe end, conforming to these special provisions, can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only schedule 80 fittings may be threaded.
4. When connection is plastic to metal, plastic male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon Tape and Teflon paste. No oil based products permitted.

5. Solvent weld fittings shall be manufactured by Lasco, Spears, or acceptable equal. All lateral line fittings and mainline fittings two inches (2") (50mm) and smaller shall be schedule 40 solvent weld fittings.

J. Pipe Sleeves

1. Pipe sleeves shall be Schedule 40 PVC pipe, or equal.

K. Concrete

1. All concrete shall be 3,000 psi (20,700kPa) at 28 days, transit mixed. Provide certifications with each delivery.

L. Other Materials

1. All other materials, not specifically described, but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of the City.

PART 3 - EXECUTION

3.01 Product Handling

- A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installed work and materials of all other trades.
- B. In the event of damage, immediately make all repairs and replacements necessary to the approval of the City and at no additional cost to the Owner.

3.02 Surface Conditions

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that trenching may be completed in accordance with the original design and the referenced standards.
3. In the event of discrepancy, immediately notify the City. Do not proceed with installation in areas of discrepancy until all discrepancies have been fully resolved.

3.03 Trenching

- A. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these Specifications.

- B. Make all trenches in accordance with OSHA Requirements with sufficient width to provide free working space at both sides of the trench and around the installed item as required for gluing, joining, backfilling, and compacting while minimizing width of trenches.
- C. All mainline shall have a minimum cover of fourteen inches (14") (350mm) and a maximum cover of twenty inches (20") (500mm) above the pipe. All laterals shall be the same depth as the mainline. All lateral and main lines shall be installed in a straight line with no arching or bending of pipe. Change in direction of pipe shall occur only with the use of proper fittings only.
- D. Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by the City and then compact to provide a firm and unyielding subgrade to the approval of the City and at no additional cost to the Owner.
- E. Trench Bracing
 - 1. Properly support all trenches in strict accordance with all pertinent rules and regulations.
 - 2. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind will be fully protected from damage.
 - 3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the City and at no additional cost to the Owner.
 - 4. Arrange all bracing, sheeting and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.
 - 5. Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported.
- F. Grading and Stockpiling Trenched Material
 - 1. Control the stockpiling of trenched material in a manner to prevent water running into the excavations.
 - 2. Do not obstruct surface drainage but provide means whereby storm and waste waters are diverted into existing gutters, other surface drains, or temporary drains.
- G. All trench excavation shall be made by open cut. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading, and to prevent slides or cave-ins. The Contractor shall remove all material not required for backfill or not suitable for backfill, from the site. Banks of trenches shall be kept as nearly vertical as possible, and shall be properly sheeted and braced as may be necessary to prevent caving.

- H. Trench widths in paved streets or in areas where proximity to other structures require vertical cuts, shall not be wider than is required for proper handling, jointing and bedding of the pipe.
- I. The bottom of the trenches shall be accurately graded to line and grade, and provide uniform bearing and support for each section of the pipe on undisturbed soil, at every point along its entire length. Depressions for joints shall be dug after the trench bottom has been graded, and shall be only of such length, depth and width as required for properly making the particular type joint. Care shall be taken not to excavate below the depths indicated.
- J. Where rock occurs in trench excavation, the rock shall be removed to a depth of six inches (6") (150mm) below the established grade line, and to a width of twelve inches (12") (300mm) greater than the outside diameter of the pipe to be installed in the trench.
- K. Where excavation of trenches requires the removal of asphalt pavement, the pavement shall be cut in a straight line along the edge of the excavation by use of a spade-bitted air hammer, concrete saw, or similar approved equipment to obtain straight, square and clean break; and, after backfilling and subgrade preparations are completed, hot plant mix asphalt concrete shall be replaced and compacted in accordance with the appropriate standard specification. Replaced base course and asphalt shall match removed sections, with minimum of two inches (2") (51mm) asphalt concrete over eight inches of suitable (8") (203mm) base course.
- L. Excess material, including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill, shall be removed from the site and disposed of by the Contractor.

3.04 Boring

- A. Boring shall be used to route pipe, wiring, or both under concrete structures such as walks or curbs where trenching is impractical. Sleeves shall be installed in all bored holes.
- B. Boring shall be accomplished with a drill, auger, water jet, or any other instrument approved by the City capable of producing a precise hole. Boring shall not disturb overlaying structures or cause settlement and damage to those structures.

3.05 Sleeves

- A. Sleeves shall be installed wherever routing of a pipe, wiring, or both crosses a paved area or passes through a bored hole.
- B. Sleeves laid in open trenches shall be uniformly and evenly supported by undisturbed soil on the trench bottom. Backfill shall conform to standards hereinafter specified.
- C. Sleeves installed in borings shall be forced through and shall have a snug fit throughout the length of the bored hole. Sleeves cracked or broken shall not be accepted.

3.06 Backfill

- A. The trenching shall not be backfilled until inspection by the City has been completed and the pipe installation, including the grade, alignment, and jointing has been found to be in compliance with the requirements of the plans and specifications.
- B. Select backfill material consisting of sand, fine gravel or select earth, free of large lumps or rocks larger than one inch (1") (25mm) shall be used in backfilling around and over the installed pipe.
- C. The select material shall be obtained from the excavation material removed from the trench and shall be processed by screening, sifting, or selective sorting, so as to produce the type of backfill herein specified. The Contractor may at his option and own expense provide an acceptable imported material.
- D. This backfill material shall be carefully deposited around and over the pipe in layers not more than six inches (6") (150mm) thick, loose measurement, unless otherwise permitted by the City, wetted to optimum moisture content and uniformly compacted to at least 95 percent of the maximum density obtainable at optimum moisture content as determined by AASHTO T99 Method A or D (latest revision), until the pipe has a cover depth of at least 14 inches (14") (350mm).
- E. The remaining depth of the trench shall be backfilled with excavation material removed from the trench, which shall be wetted or dried to near optimum moisture content.

3.07 Field Measurements

- A. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design.

3.08 Installation of Piping

- A. Perform all trenching and backfilling as specified by the specifications in this Section.
- B. Lay out the piping system in strict accordance with the plans. Where piping is shown on the plans to be under paved areas, but running parallel and adjacent to planted areas, the intention is to install the piping in the planted areas.
- C. All mainlines and laterals shall be installed with twelve inches (12") (304 mm) minimum cover, and a maximum of eighteen inches (18") (457 mm) cover, over the pipe.
- D. All lines shall have a minimum clearance (horizontal and vertical) of four inches (4") (100mm) of adjacent pipe from each other, and six inches (6") (150mm) from lines of other trades, except through pipe sleeves. Parallel lines shall not be installed directly over one another.
- E. Carefully inspect all pipe and fittings before installation, removing all dirt, scale, and burrs and reaming as required; install all pipe with all markings up for visual inspection and verification.

F. PVC Pipe

1. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
2. All plastic joints shall be solvent-weld joints. Only the solvent cement recommended by the pipe manufacturer shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the Contractor's responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The Contractor shall assume full responsibility for the correct installation.
3. All plastic to metal joints shall be made with plastic adapters.
4. The solvent-weld joints shall be made dry.
5. The solvent-weld joints shall be allowed to set at least 24 hours before pressure is applied to the system on PVC pipe.
6. Swing joints shall be installed on the same side of the pipe as the head. Swing joints may not cross pipe laterally.

G. Thrust Blocks

1. Provide concrete thrust for all pipe as required by the following schedule:

Sizes		Pipe Tees and Dead Ends				Elbows											
						22 ½ degrees				45 degrees				90 degrees			
		Length		Height		Length		Height		Length		Height		Length		Height	
In	Mm	In	Mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm	In	mm
3-4	75-100	24	600	12	300	9	225	12	300	17	425	12	300	21	525	18	450
6	150	33	825	18	450	12	300	18	450	24	600	18	450	32	800	24	600
8	200	40	1000	24	600	16	400	24	600	30	750	24	600	45	1125	30	750
10	250	50	1250	30	750	20	500	30	750	40	1000	30	750	61	1525	36	900
12	300	61	1525	36	900	28	700	30	750	56	1400	30	750	87	2175	36	900

2. All thrust blocks shall bear directly on undisturbed earth. Pipe shall be centered in the middle of thrust block. Contractor shall install a plastic barrier between the thrust block and the pipe and/or wires, so as not to encase them in the concrete thrust block.

3.09 Installation of Equipment

- A. All fittings, valves, etc. shall be carefully placed in the trenches as shown on the plans.
1. All control wires shall be clearly labeled, by station, using weatherproof material, both at the controller and at the valve. The outside cover of all automatic valve boxes shall also have the station number clearly stamped on the cover.
 2. All sprinklers, having adjustable nozzles, shall be adjusted for proper and adequate distribution of the water over the coverage pattern of the sprinkler.

3. All nozzles on stationary pop-up sprinklers or stationary spray heads shall be tightened after installation. All sprinklers having an adjusting screw, adjusting stem or adjusting friction collars shall be adjusted as required for the proper arc of coverage, radius, diameter and/or gallonage discharge.

B. Lawn Sprinkler Heads

1. Install lawn sprinkler heads where indicated on the plans and in strict accordance with the manufacturer's recommendations.
2. Along walks and driveways where finished grade is established, set all heads one-quarter inch (1/4") (5mm) below surface of pavement at time of installation and one and one-half inches (1-1/2") (40mm) from pavement. Stake all temporary risers.
3. Set all heads to final grade where sod lawn will be installed.
4. Upon completion of maintenance period, reset all lawn sprinkler heads flush with grade and firmly anchor with soil.

3.10 Testing and Inspection

A. Closing-in Work

1. Do not allow or cause any of the work in this section to be covered up or enclosed until it has been inspected, tested, and approved by the City.
2. Where trenches are not closed at the end of the day Contractor shall accept all liability for any damage or injury that may result from open trenches. Provide barricades and warning tape as necessary around all open trenches.

- B. Before backfilling the mainline, and with all control valves in place, completely flush and test the mainline and repair all leaks; flush out each section of lateral pipe before sprinkler heads are attached.

C. Testing

1. Make all necessary provisions for thoroughly bleeding the line of air and debris.
2. Before testing, fill the line with water for a period of at least 24 hours.
3. After valves have been installed, test all installed irrigation lines for leaks at a pressure of 150 psi (1035 kPa) for a period of two hours, with all couplings exposed and with all pipe sections center loaded.
4. Furnish all necessary testing equipment and personnel.
5. Correct all leaks and retest until acceptance by the Engineer.

D. Final Inspection

1. Thoroughly clean, adjust, and balance all systems.
- E. Demonstrate the entire system to the Engineer, proving that all remote control valves are properly balanced, that all heads are properly adjusted for radius and arc of coverage, and that the installed system is workable, clean, and efficient.

3.11 Record Drawings

- A. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Locations shown on as-built drawings shall be kept day to day as the project is being installed. All dimensions noted on drawings shall be neat and legible.

Show locations and depths of the following items:

- Point of connection
- Routing of sprinkler lines
- Ball valves
- Sprinkler control valves
- Quick coupling valves
- Routing of control and power wires
- Sprinkler heads
- Other related equipment

- B. Record drawings must be delivered to the Owner upon completion.

3.12 Operations and Maintenance Manuals

- A. Prepare and deliver to the Owner within ten calendar days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in four individually bound copies of the operations and maintenance manual. The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, bound manual shall include the following information:

1. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment with names and addresses of local manufacturer representatives.
2. Complete operating and maintenance instructions on all major equipment.

- B. In addition to the above maintenance manuals, provide the maintenance personnel with instructions for system operation and show written evidence to the Owner at the conclusion of the project that this service has been rendered.

- C. Final payment will not be made until record drawings and operation and maintenance manuals have been submitted and approved.

3.13 Warranty

- A. Warranty requirements will be submitted to Owner upon substantial completion of work.
- B. The Contractor shall winterize the system and perform spring start-up of the system during the guarantee period. These functions shall be coordinated in advance with the Owner, and the Owner's personnel shall be encouraged to participate.
 - 1. Upon re-energizing the system, the Contractor shall repair any leaks or breaks and shall check each head and valve, making any adjustment necessary.

3.14 Crossing and Repairing Existing Irrigation Systems

- A. The Contractor shall coordinate all work with the City of Lakeland for locating the existing irrigation pipelines. The ends of the pipe shall be cleaned and plugged with a solvent weld cap. The pipeline shall be kept clean and free of debris.
- B. After installation and backfilling the Contractor shall expose the irrigation crossings and repair the pipeline in accordance with this specification. The Contractor shall coordinate his activities with the City of Lakeland to ensure that the lines are adequately flushed and leak tested at static pressure following the repairs.

END OF SECTION

SECTION 02835
SEEDING AND LAWN RESTORATION

PART 1 - DESCRIPTION

1.01 General

The work covered in this article includes the furnishing of all materials, labor, tools and equipment for seeding and lawn restoration as described in the specifications.

PART 2 - MATERIALS

2.01 Materials

A. Type A – Native Seed

1. Priority should be given to native species in any mixture due to the level of damage that non-native species are currently exhibiting within the City as noted by the Natural Resources Inventory. Suggested native seed mixes are shown below but can be modified to include a variety of native warm season grasses and native forbs. Suggested native warm season grasses include:
 - (a) Big bluestem (*Andropogon gerardii*)
 - (b) Little bluestem (*Schizachyrium scoparium*)
 - (c) Indiangrass (*Sorghastrum nutans*)
 - (d) Broomsedge bluestem (*Andropogon virginicus*)
 - (e) Sideoats grama (*Bouteloua curtipendula*)
 - (f) Switchgrass (*Panicum virgatum*)
 - (g) Eastern gamagrass (*Tripsacum dactyloides*)

2. Any native warm season grass mixture should contain no more than 30% of one species. Native forbs may be included in the seed mixture including but not limited to:
 - (a) partridge pea (*Chamaecrista fasciculata*)
 - (b) Illinois bundleflower (*Desmanthus illinoensis*)
 - (c) roundhead lespedeza (*Lespedeza capitata*)
 - (d) perennial sunflowers (*Helianthus salicifolius*)
 - (e) purple prairieclover (*Dalea purpurea* var. *purpurea*)
 - (f) purple coneflower (*Echinacea purpurea*)
 - (g) Tennessee Coneflower (*Echinacea tennesseensis*)
 - (h) black-eyed susan (*Rudbeckia hirta*)
 - (i) blazing star (*Liatris spicata* / *Liatris squarrulosa*)
 - (j) lance-leaved coreopsis (*Coreopsis lanceolata*)
 - (k) joe pyeweed (*Eupatorium purpureum* var. *purpureum*)
 - (l) evening primrose (*Oenothera biennis*)

- (m) New England aster (*Symphyotrichum novae-angliae*)
- (n) Indian blanket (*Gaillardia pulchella* var. *pulchella*)

Suggested Type A Seed Mixes With Planting Dates

Native Grass Mixture	Little Bluestem Indian Grass Side Oats Grama Big Bluestem Switchgrass (native) (<i>Panicum virgatum</i>)	April 1 – June 30
Southeast Native Mixture	Indiangrass Little Bluestem Switchgrass Big Bluestem Lovegrass (Native only)	March 1 – June 15
Songbird Native Grass /Wildflower Mixture (Useful near conservation easements or natural areas for establishment of wildlife habitat)	Side Oats Grama Little Bluestem Indian Blanket Lance-leaved Coreopsis Purple Coneflower Goldenrod Joe Pyeweed Evening Primrose New England Aster Black-Eyed Susan	April 1 – June 15 August 15 – October 15
Wetland Mixture	Red Top (Native only) Virginia Wild Rye Fox Sedge Woolgrass Soft Rush Lurid Sedge Joe Pyeweed	March 15 – June 15 August 15 – October 15
Native Rough Mixture (Fescue mix may not be appropriate in all locations due to invasive nature)	Hard Fescue Little Bluestem Chewings Fescue Blue Fescue	March 15 - June 1 August 15 – October

3. Some of the above mixtures may not be appropriate near natural areas due to the inclusion of non-natives and plants that are invasive by nature. Mowing should only be done in late October and late February to early March. Other forms of maintenance (that closely resemble natural disturbance) may be needed to exclude undesirables and to further promote the growth and spread of the native grasses.
4. Type A seed mix should be sown at approximate rates of 4-8 pounds pure live seed (PLS) per acre. Seed purity should be no less than 50% PLS.

A. Type B – Lawn Seed

1. Bermuda, Zoysia, and Fescue shall be used in areas where frequent mowing occurs. An established mowing schedule shall be in place in order to prevent species from becoming invasive.
- B. Grass seed mixtures under brand names may be acceptable if they approach the above specifications and if accepted by the City Engineer. All seed types shall meet the requirements of the Tennessee Department of Agriculture and no Below Standard seed will be accepted. Grass seed furnished under these specifications shall be packed in new bags or bags that are sound and not mended. The vendor shall furnish the Engineer a certified laboratory report from an accredited commercial seed laboratory or from a State seed laboratory showing the analysis of the seed to be furnished.

C. Tackifiers

1. Tackifiers shall be a synthetic polyacrylamide tackifier. The tackifier shall water soluble and anionic in nature. Cationic tackifiers shall not be permitted. Organic tackifiers such as starch based compounds may be substituted upon approval of the engineer.

D. Mulch

1. Hay or straw mulch materials shall be air dried and reasonable free of noxious weeds and weed seeds or other materials detrimental to plant growth. Hay shall be stalks of approved grasses, sedges or legumes seasoned before bailing or loading. Straw shall be stalks of rye, oats, wheat, or other approved grain crops. Both hay and straw shall be suitable for spreading with standard mulch blower equipment.
2. Wood fiber mulch shall be in accordance with Section 02925.

PART 3 - EXECUTION

3.01 Restoration of Lawn and Grassed Areas.

- A. Any sod which is disturbed during the project or its appurtenances shall be replaced with similar sod including necessary topsoil, by the Contractor.
1. Top soil shall be replaced to a thickness equal to that removed up to a maximum of six inches (6") (150mm). No sod or seed shall be laid on less than four inches (4") (100mm) of topsoil. Topsoil shall be light friable loam containing a liberal amount of humus and shall be free from heavy clay, coarse sand, stones, plants, roots, sticks, and other foreign materials.

2. Sod shall be rolled within 24 hours after its placement with a roller that leaves the sod smooth and the joints properly closed. The new sod shall be trimmed neatly to match old sod, curbs, and walks. In all sod areas, the Contractor shall be responsible for ensuring adequate moisture until the new sod has properly established itself.
- B. In other areas, the Contractor shall reseed as specified in the City's Standard Specifications.
1. In general, Type A seeding shall be used in undeveloped areas having a "native" grass vegetation. After the disturbed area has been backfilled as specified, the Contractor shall place four inches (4") inches (100mm) of topsoil over the disturbed area, prior to Type A, seeding. The area to be seeded shall be made smooth and uniform and shall conform with the finished grade. Type B seeding shall be used in developed areas where the disturbed vegetation would not be classified as sod. For temporary seeding of disturbed areas, Type A seed shall be used.
 2. The seedbed, if not loose, shall be loosened to a depth of from 1 to 2 inches (25-50mm) below finished grade. Seeds and fertilizers can be sown with standard agricultural drills, or other approved methods. Grass seeds may be sown broadcast or with a special seeder attachment on agricultural drills, but shall not be covered with more than 1/2-inch (12mm) of soil, whether drilled or raked in. If not covered by the drill, all uncovered seed shall, immediately after sowing, be slightly raked or harrowed to cover the seed. No seed shall be broadcast during high wind.
 3. Seeding shall be done in accordance with the manufacturers recommendation and approved of by the City Engineer. During other periods, the time of sowing shall be determined by the Engineer, whose decisions will be based on the moisture content of the soil and weather conditions.

3.02 Fertilization, Mulching and Tackifier

- A. Fertilizer shall be applied in accordance to the soils analysis recommendation. Cellulose hydromulch shall be applied according to manufacturer's recommendation.

3.03 Warranty

- A. Weed control in planted areas shall be the responsibility of the Contractor. Watering schedules of City-owned property shall be the responsibility of the Contractor during the warranty period.

END OF SECTION

SECTION 02925

HYDROMULCHING

PART 1 - DESCRIPTION

1.01 General

This section specifies a spray-applied wood fiber mulch used to prevent soil erosion and promote seed germination in hydroseeding.

1.02 Related Sections

Section 02340 Geotextile Fabrics and Membranes

Section 02481 Hydroseeding

PART 2 - MATERIALS

2.01 Submittals

- A. Product Data: Submit manufacturer's product data and installation instructions. Include required substrate preparation, list of materials, and application rate.
- B. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.
- C. Acceptable manufacturer
 - 1. Profile Products LLC, 750 Lake Cook Road—Suite 440, Buffalo Grove, IL 60089, 800-366-1180 (Fax 847-215-0577)
 - 2. Central Fiber Corporation, 4814 Fiber Lane, Wellsville, KS 66092, 800-654-6117
 - 3. Profile Products LLC, 750 Lake Cook Road—Suite 440, Buffalo Grove, IL 60089 800-654-8793 (Fax 847-215-0577)
 - 4. Nu-Wool, Inc., 2472 Port Sheldon Road, Jenison, MI 49428, 800-748-0128 (Fax 616-669-2370)
 - 5. City Engineer approved

2.02 Materials

- A. Bonded Fiber Matrix

1. Conwed Fibers 2500 BFM by Profile Products LLC with the following characteristics:
 - a. Materials: Wood fiber, Polysaccharide cross-linked hydro-colloid tackifier, dark green dye.
 - b. pH Range: 4.8 plus or minus 2.
 - c. Moisture Content: 132+-3% percent maximum.
 - d. Wood fiber Content: 90 percent maximum.
 - e. Polysaccharide Cross linked Hydro-colloid Polymer Tackifier: 10+-1%
 - f. Organic Content: 99 percent, plus or minus 1.
 - g. Ash Content: 1 percent, plus or minus 1.
 - h. Water Holding Capacity: 1,350 percent minimum.
 - i. Fiber Mulch Slurry Viscosity: Minimum 2.85 cps (Test Method: Falling Ball Viscometer) Test condition 1500 lbs of fiber mulch per 3000 gallons of water, evaluated immediately after mixing.
 - j. Packaging: 50 pound UV resistant bags, with UV resistant pallet cover.
1. Spray Matt by Central Fiber Corporation
 - a. Materials: Wood fiber tackifier, emerald green dye.
 - b. pH Range: 6.5 plus or minus 1.
 - c. Moisture Content: 12+-3% percent minimum.
 - d. Wood Fiber Content: 90 percent minimum.
 - e. Tackifier: maximum 10%
 - f. Organic Content: 99 percent, plus or minus 1.
 - g. Water Holding Capacity: 1,300 percent minimum.
 - h. Packaging: 50 pound UV resistant bags, with UV resistant pallet cover.

A. Wood Cellulose Fiber

1. Profile Jet-Spray w/ Poly-fibers by Profile Products LLC with the following characteristics:
 - a. Materials: Cellulose fiber, clean raw lumber wood chips, polyester fibers, dark green dye.
 - b. pH Range: 7.0 plus or minus 2.
 - c. Moisture Content: 12% +-3% percent minimum.
 - d. Wood Fiber Content: 20% +-2%.
 - e. Paper Fiber Content: 78% +-2%.
 - f. Photo Degradable Polyester Fibers: 2% +-0.1% ($\frac{1}{2}$ to $\frac{3}{4}$ inch staple lengths: 1.5 denier)
 - g. Organic Content: 95.0% +-3%.
 - h. Ash Content: 5.0%+-3%.
 - i. Water Holding Capacity: 850% minimum.
 - j. Fiber Mulch Slurry Viscosity: 1.25 cps +-0.10 (Test Method: Falling Ball Viscometer) Test condition 1500 lbs of fiber mulch per 3000 gallons of water, evaluated immediately after mixing.
 - k. Packaging: 40-pound UV resistant bags, with UV resistant pallet cover.
2. HydroGreen Plus by Nu-Wool, Inc. with the following characteristics:
 - a. Materials: Wood fibers with recycled paper, dark green dye.
 - b. pH Range: 7.0 plus or minus .4.
 - c. Moisture Content: 8% +-2% percent maximum.
 - d. Ash Content: 1.7% maximum.
 - e. Water Holding Capacity: 900% minimum.
 - f. Packaging: 40-pound UV resistant bags, with UV resistant pallet cover

PART 3 - EXECUTION

3.01 Substrate Preparation

- A. Examine substrates and conditions where materials will be applied. Do not proceed with installation until unsatisfactory conditions are corrected.
- B. Only apply product to geotechnically stable slopes that have been designed and built to divert the water shed away from the face of the slope, therefore eliminating surface flow energy from above from damaging the slope face.

3.01 Installation

- A. Strictly comply with manufacturer’s installation instructions and recommendations. Use approved hydro spraying machines.
- B. Apply from opposing directions to soil surface, reducing the “shadow effect” and assures soil surface coverage of a minimum of 99%. Do not exceed maximum slope length of 70 feet when slope gradients are steeper than 4 to 1.
- C. Install materials at the following application rate:

1. Hydroseeding Using Bonded Fiber Matrix

- a. Apply from opposing directions to soil surface, reducing the “shadow effect” and assures soil surface coverage of a minimum of 99%. Do not exceed maximum slope length of 70 feet when slope gradients are steeper than 4 to 1.
- b. Install materials at the following application rate:
Add 30 to 50 pounds of bonded fiber matrix per 100 gallons of water when hydroseeding; confirm loading rates with equipment manufacturer.

Mod to 3 to 1 slope:	3000 pounds per acre
2 to 1 slope:	3500 pounds per acre
Greater than 1 to 1 slope:	4000 pounds per acre

2. Hydroseeding Using Wood Cellulose Fiber

- a. Do not exceed maximum slope length of 35 feet when slope gradients are steeper than 4 to 1.
- b. Install materials at the following application rate:
Add 35 to 50 pounds per 100 gallons of water when hydroseeding; confirm loading rates with equipment manufacturer.

Mod to 4 to 1 slope:	1500 pounds per acre
3 to 1 slope:	2000 pounds per acre

3 to 1 to 2 to 1 slope: 2500 pounds per acre

2 to 1 to 1 to 1 slope: 3000 pounds per acre

END OF SECTION

SECTION 03050

PORTLAND CEMENT CONCRETE

Part 1-Description.

The work covered in this section includes the classification, materials, proportioning of materials, equipment, mixing requirements, and testing for Portland Cement Concrete to be used for curbs, curb and gutter, and sidewalks, streets, bridges, and miscellaneous structures.

Part 2 - Materials

2.01. Classes of Portland Cement Concrete. Portland cement concrete used for construction of the various items specified elsewhere in these Specifications shall be classified by usage as follows:

A. Class A.

Class A concrete shall be used as specified for such items as directed by the Engineer and other uses as noted in the Special Provisions.

B. Class AS.

Class AS concrete shall be used for storm and sanitary structures, concrete curb, curb and gutter, valley gutters, sidewalks, ditch paving, and similar structures unless otherwise noted in the Special Provisions.

C. Class B.

Class B concrete shall be used for roadway base, soil cement, and pavement.

D. Class C.

Class C concrete shall be used as specified for such items as concrete cradles, encasements, embankment slope paving at bridge abutments, and other low strength applications.

E. Class P.

Class P concrete shall be used for cast-in-place box culverts and precast and precast-prestressed concrete structures or structural members. High-early-strength concrete shall be as specified in Specification Section 03050 Paragraph 6.05.

2.02 Materials.

A. Portland Cement.

1. Type I or Type I-SM cement shall be used unless otherwise specified. Different types of cement shall not be mixed. Portland Cement shall conform to all requirements of the "Standard Specifications for Portland Cement," AASHTO M 85. M. Specification C150

for Class Type I, except that for high early strength concrete, Type III cement may be used.

B. Fine Aggregate.

1. Fine aggregate for concrete shall consist of sand and shall conform to the following ASSHTO M6 with the following exceptions.

i. General Composition. Concrete sand shall be composed of clean (washed), hard, durable, uncoated grains, free from injurious amounts of clay, dust, soft flaky particles, loam, shale, alkali, organic matter, or other deleterious matter. Fine aggregate shall not contain appreciable materials which have unsatisfactory expansive properties when combined with Portland Cement and water.

ii. Sieve Analysis. Fine aggregate shall be graded within the following limits:

Sieve	% Passing by Weight	
	Min.	Max.
3/8" (9.5mm)	100	---
No. 4 (4.75mm)	95	100
No. 8 (2.36mm)	80	100
No. 16 (1.18mm)	50	90
No. 50 (330um)	5-30	
No. 100 (150um)	0	10
No. 200 (75um)	0	3

. Deleterious Substances. The fine aggregate shall not contain more than the following maximum amounts of deleterious substances:

	Max. % of Weight
Clay lumps.	0.5
Coal, lignite, or shale.	0.5
Material passing the No. 200 Sieve.	3.0
Other deleterious substances such as Shale, alkali, mica, coated/grains soft and flaky particles.	3.0

If the fine aggregate is manufactured from limestone or dolomite and if the material finer than the No. 200 sieve consists of dust of fracture, essentially free from clay or shale, this limit may be increased from 3% to 5%

iv. Organic Impurities. Fine aggregate subjected to the colorimetric test as per ASTM C40 for organic impurities and producing a color darker than the standard shall be rejected unless it passes the mortar strength test as specified herein, Organic Impurities ASTM

C40.

C. Coarse Aggregate. Coarse aggregate for concrete shall consist of crushed stone or gravel or crushed or uncrushed gravel and shall conform to the following requirements:

1. Coarse aggregate for Class A, Class B, or Class C concrete shall be furnished in two sizes: Size No. 4 and Size No. 67 as shown hereinafter in the attached Table Coarse Aggregate Gradation Table.

2. The two sizes shall be manufactured, within the specified limits, to produce Size No. 467 when combined in the proper proportions at the batching plant. If the supplier provides a proper stockpile to prevent segregation, then a combined Size No. 467 can be used in lieu of blending Size No. 4 and Size No. 67.

3. Coarse aggregate for Class AS concrete shall be Size No. 57. Only limestone coarse aggregate will be used for Class AS concrete; gravel coarse aggregate will not be permitted.

4. Coarse aggregate for Class P concrete shall be size No. 57 or Size No. 67 as may be specified or directed. Only limestone coarse aggregate shall be used for Class P concrete; gravel coarse aggregate will not be permitted.

5. Coarse aggregate for concrete curbing placed by machine extrusion methods shall be Size No. 57 or Size No. 67.

6. The coarse aggregates shall otherwise conform to the requirements of AASHTO M 80 and ASTM C 33 with the following exceptions and stipulations:

a. Deleterious Substances. The coarse aggregate shall not contain more than the following maximum amounts of deleterious substances:

	<u>Max. % of Weight</u>
Clay lumps	0.25
Material passing No. 200 sieve	1.0
Coal or Lignite	1.0
Other deleterious substances such as	
friable, thin, elongated, or laminated pieces	10.00
Other Local deleterious substances	1.00
Soft or nondurable fragments (fragments which	
Are structurally weak such as shale, soft	
Sandstone, limonite concretions, gypsum,	
Weathered schist, or cemented gravel.	3.0

7. The sum of the above, excepting thin or elongated pieces, shall not exceed 5% by weight.

8. Soundness. When subjected to 5 cycles of the soundness test, as set forth in ASTM C88, the loss in weight of coarse aggregate weighted in accordance with the grading of a sample complying with the grading requirements specified, shall not exceed nine (9) percent for sodium sulfate.
9. Abrasion. The coarse aggregate shall not have an abrasive loss greater than 40% as determined by AASHTO T96.
10. In the case of crushed aggregate, if all the material finer than the 200 mesh sieve consists of the dust of fracture essentially free of clay or shale, Item 4, Maximum Per Cent by Weight, may be increased to 1.5.

COARSE AGGREGATE GRADATION TABLE
Amounts Finer than Each Lab. Sieve (Sq. Opening), %By Weight

SIZE NO.	2"	1-1/2"	1"	3/4"	1/2"	3/8"	NO. 4	NO. 8
4	100	90-100	20-55	0-15	-----	0-5	----	----
467	100	95-100	-----	35-70	-----	10-30	0-5	----
57	-----	100	95-100	----	25-60	----	0-10	0-5
67	----	----	100	90--100	----	20-55	0-10	0-5

- D. Water for Concrete. The water shall be clean and free from objectionable amounts of oil, acid, alkali, organic matter, or other deleterious materials and shall not be used until the source of supply has been approved. If at any time the water from an approved source becomes of unsatisfactory quality or insufficient quantity, the Contractor will be required to provide satisfactory water from another source. Water of questionable quality shall be subject to the acceptance criteria of Table I, as specified in ASHTO T26.
- E. Air-Entraining Admixture. The Contractor shall use a regular Portland Cement with the addition of an air-entraining admixture meeting requirements of AASHTO M 154. Air-entraining admixtures to be used in air-entrained concrete shall be Darex AEA, Neutralized Vinsol Resin, and Protex, or any other air-entraining agent meeting the approval of the Engineer. Air-entraining admixtures shall contain no chlorides. The air-entraining characteristics of the admixture, in suitable proportions in combination with Portland Cement, fine aggregate and water, within the limits of the proportion specified, shall be such that the resulting concrete will have a satisfactory workability, and the total air content shall be as provided below in the following table.

Nominal Max Size of Coarse Aggregate	Total Air Content Percentage by Volume Concrete
3/8 inch	6 to 10
1/2 inch	5 to 9
3/4 inch	4 to 8
1 inch	3 1/2 to 6 1/2
1 1/2 inch	3 to 6
2 inch	2 1/2 to 5 1/2
3inch	1 1/2 to 4 1/2

- F. Chemical Admixtures. Chemical admixtures shall conform to ASTM C494, except TYPE C accelerating admixtures shall contain no chlorides, shall be non-toxic after thirty (30) days, and shall be compatible with air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations.
- G. Pozzolan Admixture. Pozzolan admixture shall conform to the requirements of ASTM C311 and ASTM C618-85 (including Table IA) for either Class C or Class F. Class C fly ash may be used as a replacement for Portland cement if approved in writing by the Owner. The maximum amount of cement being replaced by fly ash shall not exceed 15 percent. When a specific air content has been required and fly ash is being used, the air content shall be tested on each truck load of concrete at the batch plant and the tested value shall be indicated on the ticket.
- H. Fiber-Reinforced Concrete shall conform to ASTM C1116 material requirements and classifications. Concrete containing fibers (steel, glass fibers, or synthetic fibers) shall conform to the manufacturers addition rate and shall be included in the mix design approved by the Engineer. Glass Fiber and synthetic fiber reinforced concrete shall not be used to replace structural reinforcement, and shall be added at the batch plant.

PART 3 – Execution

3.01 Sampling and Testing and Storage of Materials.

- A. Cement. Cement may be accepted on the basis of mill tests and the manufacturer's certification of compliance with the specifications, provided the cement is the product of a mill with a record for production of high quality cement. Certificates of compliance shall be furnished the Engineer by the Contractor, for each lot of cement furnished prior to use of cement in the work. This requirement is applicable to cement for job- mixed, ready-mixed, or transit-mixed concrete. Cement proposed for use where no certificate of compliance is furnished, or where,

in the opinion of the Engineer, the cement furnished under certificate of compliance may have become damaged in transit or deteriorated because of age or improper storage, will be sampled at the mixing site and tested for conformance to the specifications.

1. Cement will be approved for use if it satisfactorily passes the fineness, soundness, and time of set test requirements specified, provided the general run of materials has been satisfactorily meeting the 28-day strength requirements. Any approved cement failing to pass the 28-day strength requirements, if unused, shall be rejected. If, in the judgement of the Engineer, it is considered necessary, other lots of shipments from the same mill may be held for the results of tests before being used.
 2. If cement is supplied from a new source or from a source of unknown quality, it may be held for the results of strength test before being approved.
- B. Fine and Coarse Aggregate. At least two (2) weeks in advance of the beginning of concrete work the Contractor shall submit to an approved materials testing laboratory approximately five hundred pound (500#) (225kg) samples of each concrete aggregate proposed for use unless otherwise waived by the Engineer in writing. All tests which are necessary to determine the compliance of the concrete materials with these specifications shall be performed on these samples. These samples shall also be used by the laboratory as the basis for a concrete mix design. The results of all tests and the concrete mix design shall be submitted to and approved by the City Engineer prior to the start of any concrete work. Standards shall conform to the latest applicable codes. The sampling and testing shall conform to the following standard procedures:
- C. Cement. The Contractor shall provide adequate protection for the cement against dampness. No cement shall be used that has become caked or lumpy. Accepted cement which has been held in storage more than 90 days after shipment from the mill shall be retested, and if failing to meet the requirements specified herein shall be rejected.
1. Accepted cement which has been stored in approved sealed bins at the mill for not more than six (6) months may be used without further testing unless a retest is specifically requested by the Engineer.
- D. Aggregate. Aggregates shall be handled and stored in separate piles at the site in such manner as to avoid a separation of the coarse and fine particles and contamination by foreign materials. Sites for stockpiles shall be prepared and maintained in such a manner as to prevent the mixing of deleterious materials with the aggregate. The Contractor shall deposit material in stockpiles at the batching plant site until the moisture content becomes uniform. Stockpiles shall be built in layers not to exceed three feet (3') (1m) in height, and each layer shall be completed before beginning the next one.

1. Coning or building up stockpiles by depositing the materials in one place will not be permitted. The storing of aggregates in stockpiles, or otherwise, upon the subgrade or shoulders will not be permitted.

3.02 Concrete Mixture Requirements.

- A. The concrete shall meet the following requirements as outlined in the Concrete Classification Table attached to the end of this Section.
 1. If it is found impossible to produce concrete having the required air content with the materials and mixing procedures that are being used, the Contractor shall make such changes in the materials or mixing procedures, or both, as may be necessary to insure full compliance with the requirements of air content in the concrete.
 2. The total weight of aggregates per sack of cement and the relative proportions of coarse and fine aggregate shall be determined by yield tests made during the progress of the work. The Engineer may, at his discretion, adjust the laboratory mix design to obtain the proper yield, and consistency of concrete.
 3. The Contractor shall receive written permission from the Engineer prior to adding Pozzolan admixture to Portland Cement Concrete.
 4. Any combination of aggregates which requires the use of more than six and one-half gallons (6.5g) (25l) of water per sack of cement to produce a workable mixture, with the brand of cement used will be considered as being unsatisfactory, and all such combinations of aggregate will be rejected.
 5. Concrete shall be uniformly plastic, cohesive, and workable. Workable concrete is defined as concrete which can be placed without honeycomb and without voids in the surface. Workability shall be obtained without producing a condition such that free water appears on the surface when finished. The consistency of the mixture shall be that required for the specified conditions and methods of placement; however, the previously determined maximum water cement ratio shall not be exceeded.

3.03 Proportioning of Materials.

All materials shall be separately and accurately measured by weight, and each batch shall be uniform. The coarse and fine aggregates shall be weighed separately. A sack of cement shall weigh ninety-four pounds (94#) (43kg). When bulk cement is used, ninety-four pounds (94#) (43kg) shall be considered as one sack. The Contractor shall furnish and use approved weighing devices, which, in operation, will give the exact quantity of materials required for the class of concrete. When the cement is in contact with the aggregate, it shall not remain more

than forty-five (45) minutes before being deposited into the mixer.

3.04 Measurement of Aggregate.

- A. Where sack cement is used, the quantities of aggregate for each batch shall be exactly sufficient for one or more sacks of cement. No batch requiring a fraction of a sack of cement will be permitted. All measurements shall be by weight, upon approved weighing scales and shall be such as will insure separate and uniform proportions. Scales shall be of either beam or springless dial types, and shall be suitable for supporting the hopper or hoppers. They shall be set accurately in substantial mountings which will insure a permanent spacing of the knife edges under all conditions of loading and use. They shall be so designed and maintained that they will at all times be accurate to within one-half (1/2) of one (1) percent throughout the entire weight range. Clearance shall be provided between the scale parts and the hopper or the bin structure to prevent displacement of the scale parts due to vibrations, accumulations, or any other cause. The value of the minimum gradations on any scale shall not be greater than five pounds (5#) (2.3kg). The weighing beam or dial shall be so placed that it will be in full view of the operator during the operation of the gate which delivers the material to the hopper. Scales shall be protected from air currents that may affect the accuracy of weighing.
- B. Separate hoppers shall be provided for weighing fine and coarse aggregate. They shall be of suitable size and tight enough to hold the aggregate without leakage, and shall be supported entirely upon the scales. Suitable provisions shall be made for removal of overload from the hopper by the operator while he operates the bin gates.
- C. The Contractor shall provide a sufficient number of fifty-pound (50#) (23kg) standard test weights for calibrating the weighing equipment.
- D. The volume of concrete mixed per batch shall not exceed the manufacturer's guaranteed capacity of the mixer.
- E. When the aggregates are delivered to the mixer in trucks, each batch shall be in a separate compartment of the capacity required by the Engineer. Suitable covers shall be provided for the batch compartments of the trucks to protect the cement from the wind. All trucks, truck bodies, bulkheads, and compartments used in proportioning and transporting to the mixer of concrete materials shall be so designed and operated to insure the charging of the mixer, batch by batch, with the proper amounts of each material without overspillage, intermixing of batches or wastage. Any units which, in the opinion of the Engineer, do not operate satisfactorily, shall be removed from the work until properly rebuilt and corrected.

3.05 Mixing Concrete.

- A. Consistency. The quantity of water to be used shall be determined by the Engineer and shall not be varied without his consent. The Contractor shall furnish and use with the mixer an

approved adjustable, water measuring device which will prevent excess water flowing into the mixer, in order that the consistency may be under positive control and that all batches may be of the same consistency.

1. In general, the minimum amount of water shall be used which will produce the required workability. The mortar shall cling to the coarse aggregate and shall show no free water when removed from the mixer.
- B. Mixer. The mixing machine used shall be of an approved type known as a batch mixer, and of a design having a suitable device attached for automatically measuring the proper amount of water accurate to one percent (1%) and for automatically timing each batch of concrete so that all materials will be mixed together for the minimum time required. Such device shall be easily regulated and controlled to meet the variable conditions encountered. If the time device becomes broken or fails to operate, the Contractor will be permitted to continue the balance of the day without the timing device while the same is being repaired, provided that each batch of concrete is mixed two (2) minutes.
1. The normal mixing time for each batch shall be one (1) minute, and the measuring of this period shall begin after all the materials are in the drum. During this mixing period, the drum shall revolve at the speed for which the mixer is designed, but shall make not less than fourteen (14) nor more than twenty (20) revolutions per minute.
 2. No materials for a batch of concrete shall be placed in the drum of the mixer until all of the previous batch has been discharged therefrom. The discharge of water into the drum shall commence with the flow of the aggregates, but shall not be started before the entrance into the drum of part of the aggregates. The discharge of all of the mixing water for any batch shall be completed within ten (10) seconds after all of the aggregates are in the drum. The inside of the drum shall be kept free from hardened concrete.
 3. The use of mixers having a chute delivery will not be permitted except by permission of the Engineer. In all such cases the arrangement of chutes, baffle plates, etc., shall be such as will insure the placing of fresh concrete without segregation.
 4. Ready-mixed concrete from a central mixing plant delivered at the work ready for use, will be permitted, provided the mixture is transported to the job site in an agitating truck having the concrete contained in a revolving drum and provided there is no segregation of the mixture at the point of placing. Ready-mixed concrete from a central batching plant and mixed in transit will be permitted; however, the mixing and transporting equipment will be subject to the special approval of the Engineer. Any ready-mixed concrete shall comply with all of the requirements of these specifications.
 5. The time elapsing from the time the water is added to the mix until the concrete is deposited in place at the site of the Work shall not exceed 30 minutes when hauled in non-agitating

trucks, not 60 minutes when hauled in truck mixers or truck agitators. In addition, the total revolutions at mixing speed shall not be less than 70 nor more than 100. When truck mixers are used on hauls in excess of 1 hour, the cement shall be added at the site of the work. The concrete must be of workable consistency when placed. No mixer which has a capacity of less than a two-sack batch shall be used.

- i. Hand mixing will not be permitted except with the permission of the Engineer and then only in very small quantities or in case of an emergency.
6. Retempering concrete by adding water or by other means will not be permitted; however, a portion of the mixing water may be withheld from transit mixers and added at the work site provided the delivery ticket indicates the amount withheld. The batch shall be mixed for 30 revolutions at mixing speed after adding the water. Water cannot be added to a partial load of concrete mix. Concrete that is not within the specified slump limits at time of placement shall not be used.
7. In using air-entraining admixtures, the mixer shall be equipped with a suitable automatic dispensing device which will proportion the air entraining admixture accurately to each batch of concrete. The device shall be calibrated and adjusted to deliver to each batch of concrete the quantity of admixture required to produce the specified air content in the concrete.
8. The manufacturer of the concrete shall furnish to the purchaser with each batch of concrete before unloading at the site, a delivery ticket. The purchaser shall provide the Engineer with one (1) copy of each delivery ticket.

3.06 Forms.

- A. Forms shall be made of wood or metal. Forms shall be provided with adequate devices for secure setting so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. The top and face of forms shall be cleaned and oiled prior to the placing of concrete.

3.07 Placing Concrete.

- A. The concrete shall be unloaded into an approved spreading device, or deposited on the base, and spread in such a manner as to prevent segregation of the materials. As deposited, the mixture shall be placed where it will require as little rehandling as possible. No concrete shall be placed on frozen grade.
- B. Necessary hand spreading shall be done with shovels or other approved tools. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated in earthen or

other foreign substances.

- C. Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies, by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than 5 seconds in any one location.

3.08 Protection.

- A. It shall be the responsibility of the Contractor to protect from damage all freshly poured concrete regardless of the location or type of structure for a minimum period of seven (7) days or for such longer period as the Engineer may direct. Any concrete which is damaged shall be repaired to the satisfaction of the Engineer prior to acceptance of the completed work.

3.09 Quality Control Testing.

- A. The Owner or Consultant will employ a testing laboratory to perform test and submit test reports. Test reports will be reported in writing to Consultant, Owner, and Contractor as soon as possible upon completion of tests.

- 1. Compressive Strength Tests. Concrete test cylinders will be made by a qualified technician from a certified material testing laboratory.
- 2. The cylinders shall be made and tested in accordance with ASTM C39.
- 2. Tests may be required for each day's run or according to the following schedule:

<u>Total Cubic Yards of Concrete Placed (m³)</u>	<u>Minimum Number of Tests* (3 cylinders each)</u>
0 – 100(0-75)	One for 7 days, two at 28 days
100 – 1000 (75 -750)	One for each 50 cu. Yds. (38m ³)
1000 – 2000 (750 – 1500)	One for each 125 cu. Yds. (100m ³)
2000 and Over (1500)	One for each 175 cu. Yds. (125 m ³) One for each 250 cu. Yds. (200 m ³)

*One test per pour minimum.

- iii. Results of all tests shall be furnished to the Engineer as soon as they are available.
- 2. Slump. Slump test shall be conducted in accordance with ASTM C172. A test shall be performed for each day's pour of each type of concrete and for each set of compressive strength test.

2. Air Content. Air content shall be tested in accordance with ASTM C143 or ASTM C231. Air content test shall be performed for each set of compressive strength tests of each type of air-entrained concrete.

CONCRETE CLASSIFICATION TABLE

Class of Concrete	Min. 28 day Compressive Strength (psi)	Slump in Inches	Min Cement–Sacks//CY (3)		Min Cement–#/CY (3)		Net Water Max. Gal/CY (3)		Net Water Max-#/CY (3)	
			Gravel Course Aggregate	Limestone Course Aggregate	Gravel Course Aggregate	Limestone Course Aggregate	Gravel Course Aggregate	Limestone Course Aggregate	Gravel Course Aggregate	Limestone Course Aggregate
A	3000	3-5	6.0	5.5	564	517	36	33	300	275
AS	4000	3-5	(2)	6.2	(2)	583	(2)	37.2	(2)	310
B	3500(1)	1-2.5	6.2	5.8	583	545	34.1	31.9	284	266
C	2500	2-4	5.0	4.5	470	423	34	30.6	283	255
P	5000	1-3	(2)	7.0	(2)	658	(2)	35	(2)	292

Notes:

- (1) Minimum compressive strength at 14 days. Minimum flexural strength at 14 days of 550 psi per AASHTO T 22
- (2) Gravel Coarse Aggregate not permitted.
- (3) Tabulated values are for Type I cement conforming to the requirement of AASHTO M 85 only.

END OF SECTION

PART 1. General

1.1 Related Documents

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

1.2 Summary of Work

- A. Extent of Landscape Work is indicated on Drawings and in schedules.
- B. Provide and furnish all labor, materials and equipment required or inferred from Drawings and Specifications to complete the Work of this Section.

1.3 Quality Assurance

- A. Industry Reference Standards: Refer to Division 1 References Section.
 - 1. National List of Scientific Plant Names, 1982.
 - 2. American National Standards Institute, Inc. (ANSI):
 - 3. ANSI Z60.1 – 96 American Standard for Nursery stock by the American Association of Nurseryman.
 - 4. American Wood Preservers Association (AWPA):
 - 5. C2-98 Lumber, Timbers, Bridge Ties and Mine Ties, Pressure Treatment.
 - 6. American Society for Testing and Materials (ASTM):
 - D 1140-97 Test Method for Amount of Material in Soils Finer Than the No. 200 Sieve.
 - D 1248-00 Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
 - D 2434-68 (94) Test Method for Permeability of Granular Soils (Constant Head).
 - D 2487-00 Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - D 2974-87(95) Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
 - D 4491-99a Test Methods for Water Permeability of Geotextiles by Permittivity.

- D 4549-98 Specification for Polystyrene Molding and Extrusion Materials (PS).
- D 4632-91(97) Test Method for Grab Breaking Load and Elongation of Geotextiles.
- D 4751-99a Test Method for Determining Apparent Opening Size of a Geotextile.
- D 4759-88 (96) Practice for Determining the Specification Conformance of Geosynthetics.
- D 4972-95a Test Method for pH of Soils.
- D 5268-92(96) Specification for Topsoil Used for Landscaping Purposes.
- F 405-97 Specifications for Corrugated Polyethylene (RE) Piping and Fittings.

B. Qualifications:

1. Installer Qualifications: Engage a firm specializing in landscape installation. Submit written documentation of successful completion of ten (10) projects of similar size, scope and complexity to work specified for this Project.
 - a. Firm Experience Period: Seven (7) years of experience.
 - b. Field Foreman Experience: Five (5) years of experience with installing firm.

C. Soil-Testing Laboratory Qualifications:

1. The Owner will engage a reputable independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct testing and analysis of existing surface soils representative of planting areas and lawn areas on site, new topsoil to be used in soil mixes and soil mixes with reference to specified plant materials. Soil report to include analysis of a minimum of three (3) soil samples from different locations for existing on site surface soils.

1.4 Submittals

- A. Section Cross Reference: Refer to Division 1 Submittals Section for general requirements.
- B. Topsoil Test Report: Submit results of soil analysis by a qualified soil-testing laboratory, for information only, of topsoil proposed for use in planting soil mixes. Report shall include percentages of deleterious materials; organic matter; gradation of sand, silt, and clay content, as determined by test methods included in Part 2 - Products; cation exchange

capacity; pH level; mineral, major nutrient and micro nutrient content of top soil.

- C. Planting Soil Mix Sample: Submit one cubic foot of each proposed planting soil mix.
- D. Planting Soil Mix Test Report: Submit results of soil analysis by a qualified soil-testing laboratory, for information only, of each planting soil mix as specified. Report shall include percentages of organic matter; pH level; mineral; major nutrient and micro nutrient content of each mix.
 - 1. State recommended quantities of nitrogen, phosphorus, potash and other nutrients and soil amendments to be added for suitable plant growth.
- E. Product Data: Submit, for information only, product data for proprietary materials and items, including soil amendments, soil conditioner, and other packaged products.
 - 1. Soil Permeability Test Report: Submit laboratory test results of planting soil mix to be used in all structured planters. Planting soil mix shall be tested in accordance with ASTM D 2434.
- F. Tree Pit Drainage Certification: Submit written documentation certifying that results of drainage test on tree pits and planting beds comply with requirements contained herein.
- G. Fertilizer Analysis: Submit, for information only, label or technical data for fertilizer bearing the trade name, manufacturer's name, weight and analysis for fertilizers used in planting soil mixes and on sodded lawn areas.
- H. Planting Schedule: Submit planting schedule showing scheduled dates for each type of planting in each area of site. The Owner may require special schedule requirements for specific areas of the project, prior to beginning the Work.
- I. Certification: Prior to acceptance of plant material submit certificates of inspection as required by governmental authorities, and manufacturer's or vendors certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.
- J. Maintenance Instructions: Upon completion of the installation, submit typewritten recommendations for maintenance of any portion of the landscape which, in the opinion of the Contractor, requires special attention.

- K. Installer Certification: Submit written documentation certifying that Installer complies with requirements of "Installer Qualifications" above.

1.5 Material Quantities

- A. It is the Contractor's responsibility to total and confirm all material quantities. Items quantified by an area (i.e., square feet - sf., square yard - sq. yd.) or volume (cubic feet - cu. ft., cubic yard - cu. yd.) shall be calculated and confirmed by the Contractor. The quantities listed on the plant list are estimated. In the event of a discrepancy between the totals listed on the plant list and the numerical callouts on the Drawings, the Drawings shall govern. The actual total quantities shall be determined by the Contractor.

1.6 Delivery, Storage and Handling

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored on site.
- B. Sod: Time delivery so that sod will be placed within twenty-four (24) hours after stripping. Protect sod against drying and breaking of rolled strips.
- C. Trees: Provide freshly dug trees. Do not prune prior to delivery. Do not bend or bind-tie trees in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during shipment.
- D. Deliver trees after preparations for planting have been completed and plant immediately. If planting is delayed more than six (6) hours after delivery, set trees in shade, protect from current and forecasted weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground or in partially excavated hole and cover root-ball with soil, peat moss, sawdust or other acceptable material.
 - 2. Do not remove container-grown stock from containers until planting time.
 - 3. Water root systems of plant material stored on-site. Water as often as necessary to maintain root systems in a moist condition.
- E. Label at least one (1) tree of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.
- F. Do not remove labels attached to plant material by the Landscape Architect until directed to do so.

1.7 Project Conditions

- A. Insurance on plant material and other materials stored or installed is the responsibility of the Contractor. Such insurance shall cover fire, theft, vandalism and other unusual phenomenon. Should the Contractor elect not to provide such insurance, he will in no way hold the Owner responsible for any losses incurred by the aforementioned acts. The Contractor is responsible for all costs incurred in replacing damaged or stolen materials prior to Date of Substantial Completion of the Work.
- B. Proceed with and complete landscape work as rapidly as portions of Site become available, working within seasonal limitations for each kind of landscape work required.
- C. Existing Grades: Existing grades will be within 0.05 feet of grades shown on the Civil Engineering Drawings when landscape work is to begin. Determine condition of existing grades prior to beginning the Work. When irregular or incomplete grading conditions are encountered, notify the Owner in writing before beginning the Work. Determine location of existing drainage patterns and maintain patterns in completed Work. Perform Work in a manner which will avoid damage to finished grading and drainage patterns. All damage to finished grading and drainage resulting from Work covered in these Contract Documents shall be repaired at the Contractor's expense.
- D. Existing Utilities: Determine location of underground utilities. Perform Work in a manner which will avoid possible damage. Excavate as required. Maintain grade stakes set by others unless removal is mutually agreed upon by parties concerned. All damage to utilities resulting from Work covered in these Contract Documents shall be repaired at the Contractor's expense.
- E. Existing Conditions: Perform landscape Work in the Tree Protection Zones and in existing or previously completed landscape areas to avoid damage and disturbance to these areas. Limit work in these areas to only that necessary to perform work specified herein and shown on the Drawings. Return and repair any areas damaged or disturbed while performing the Work to the existing conditions encountered prior to the Work.
- F. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect in writing before planting.
- G. Weather Limitations: Proceed with planting when existing and forecasted weather conditions are suitable.
- H. Planting Schedule: Prepare a proposed planting schedule. Schedule dates for each type of landscape work during contract period. Coordinate

schedule with General Contractor and Irrigation Contractor.

- I. Coordination with Lawns: Plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Landscape Architect. If planting of trees and shrubs occurs after lawn Work, protect lawn areas and promptly repair damage to lawns resulting from plant operations.

1.8 Warranty

- A. Warranty for a period of one (1) year, following the Date of Substantial Completion, all trees and grass against any defects including death and unsatisfactory growth, as determined by the Landscape Architect. Warranty shall include the complete cost to supply and install all replacement plant materials according to the requirements herein. Defects resulting from lack of adequate maintenance, neglect or abuse by the Owner, abuse or damage by others, or unusual phenomenon or incidents beyond the Contractor's control are excepted. Should questions arise concerning the responsibility of replacement, the Landscape Architect will be available for arbitration provided the Owner and Contractor mutually desire.
- B. Remove and replace all trees and lawn found to be more than 25 percent dead or in unhealthy condition during warranty period as determined by Landscape Architect or Owner. Make replacements immediately unless required to plant in the succeeding planting season.
- C. Replacements: Match adjacent specimens of same species. Replacements are subject to all requirements stated in the Contract Documents and are subject to observation by the Landscape Architect prior to digging.
- D. Repair grades, lawn areas, paving and any other damage resulting from replacement planting operations, at no additional cost to the Owner.
- E. Inspect Project site monthly during warranty period to determine what changes, if any, should be made in the maintenance program. Submit all recommended changes in writing to the Landscape Architect and the Owner.
- F. Replacements made during the Warranty Period or following the site visit for Final Acceptance will carry an additional one (1) year warranty beginning at the time of replacement.

PART 2. Products

2.1 Source Quality Control

- A. General: Only plant material grown in a recognized nursery in accordance with good horticultural practice will be accepted. Provide healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sunscald, injuries, abrasions or disfigurement.
- B. Observation of Plant Material Prior to Digging:
1. Contractor must locate all plant material to be supplied for the Project and inform the Landscape Architect in writing of location within thirty (30) days of the date of the Contract or notice to proceed, whichever is first.
 2. The Landscape Architect may select and tag the trees required for the Project, at the Contractor's sources. In any event the Landscape Architect shall approve 100 percent of the trees required for the Project.
 3. In the event plant material is found to be unacceptable, the Contractor will pursue other sources until acceptable plant material is found, at no additional cost to the Owner. If, due to unacceptable plant material at the Contractor's source, additional tagging trips are required by the Landscape Architect, the Contractor will reimburse the Landscape Architect for his time and travel expenses.
 4. Approval at the plant source does not impair the right of the Landscape Architect to observe and reject material at the time of shipping or during progress of the Work.
- C. Shipping:
1. Ship landscape materials with certificates of inspection required by governing authorities. Inspection by Federal and/or State Governments at Grower does not preclude rejection of plants at the site by the Landscape Architects. Comply with regulations applicable to landscape materials. Prepare plants for shipment to prevent damage to the plants.
 2. From March 15th to September 15th, ship plant material to be transported over one hundred (100) miles at night only. Make arrangements to have plant material watered during shipment as necessary to avoid excessive stress. Plant material may be rejected if not properly shipped.
 3. Do not ship plant material in temperatures below 20 degrees Fahrenheit.

- D. Do Not Make Substitutions: If specified landscape material is not obtainable, submit to Landscape Architect proof of non-availability and for use of equivalent material. For proof of non-availability submit a written statement from a minimum of twelve (12) reliable nursery sources (American Nurserymen's Association Members) that the plant in question is not obtainable in the Eastern United States.
- E. Analysis and Standards: Package standard products with manufacturer's certified analysis. Including but not limited to:
 - 1. Soil Amendments
 - 2. Grass Materials
 - 3. Mulch
- F. Approval and Selection of Materials and Work: The selection of all materials and the execution of all operations required under the Drawings and Specifications is subject to the approval of the Landscape Architect. The Landscape Architect has the right to reject any and all materials and any and all Work which, in his opinion, does not meet the requirements of the Contract Documents at any stage of the operations. The Contractor shall remove rejected work and/or materials from Project site and replace promptly.

2.2 Topsoil

- A. Topsoil **has not** been stockpiled for re-use in planting soil and other Landscape Work.
- B. Provide new topsoil which is fertile, friable, pervious, sandy loam, surface soil; free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than one and one-half (1½) inches in any dimension, and other extraneous or toxic matter harmful to plant growth.
- C. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at Project Site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than four (4) inches; do not obtain from bogs or marshes, unless specified.
- D. Topsoil: ASTM D 5268 complying with the following composition as determined by the indicated test methods:
 - 1. Deleterious Materials: 2 percent max. by mass; ASTM D 2487. (Rock, gravel, slag, cinder, stone).
 - 2. Organic Material: 5-10 percent min. by mass; ASTM D 2974.

3. Sand Content: 20 to 40 percent by mass; ASTM D 1140.
4. Silt and Clay Content: 40 to 50 percent by mass; ASTM D 1140.
5. pH Range: 5 to 7; ASTM D 4972.

2.3 Inorganic Soil Amendment

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.
- B. Aggregate Soil Conditioner: Rotary kiln expanded slate specially graded for use as a horticultural soil conditioner with the following composition as determined by the indicated test methods:
 1. Dry Loose Unit Weight: 48-55 lbs/cu.ft.; ASTM C 29.
 2. Specific Gravity: To meet 1.45 to 1.60 dry bulk; ASTM C 127.
 3. Gradation: 3/8-inch to No. 8; ASTM C 330 with 100 percent passing the 3/4-inch sieve.
 4. Absorption: Five percent or more; ASTM C 127.
 5. LA Abrasion: Weight loss between 20 percent and 30 percent; AASHTO T 96.
 6. Chemical Characteristic:
 - a. pH: 6.5 to 10 range.
 - b. Soluble salts: To meet horticultural rural range of 0.75 to 3.5 mmhos/cm.
 7. Process the slate using only non-hazardous fuels such as coal or natural gas.
 8. The expanded slate shall be free of clay lumps and organic impurities.
 9. Obtain aggregate soil conditioner from a single supplier.
 10. Available Products: Subject to compliance with the requirements, aggregate soil conditioners that may be incorporated in the Work includes, but is not limited to the following:
 - a. Acceptable Supplier and Products:

- 1) Supplier: Caroline Stalite Company
 - a) Product: 5/16-inch Perma Till

- C. Coarse Sand: Clean, washed, natural or manufactured sand, free of extraneous or toxic matter with the following grain size distribution or coarser; ASTM C136.

Sieve Size	% Passing
.5 in.	100.0
.375 in.	98.0
#4	98.0
#10	93.0
#20	21.0
#60	1.0
#140	0.5
#200	0.5

2.4 Organic Soil Amendments

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve; soluble salt content of 4 to 6 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 percent minimum of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; bio-solids; yard trimmings; or source-separated or compostable mixed solid waste that meet all State Environmental Protection Agency requirements.
 3. Available Products: Subject to compliance with the requirements, compost products that may be incorporated in the Work includes, but is not limited to the following:
 - a. Acceptable Supplier and Products:
 - 1) Supplier: EARTH Products, LLC
 - a) Product: EARTH Food
 - 2) Supplier: It Saul Natural, LLC
 - a) Product: Hen Manure Compost
- B. Humus: Air dried, finely shredded, and pH range suitable for intended horticultural use. Humus shall be completely decomposed forest type including composted leaves, bark and organic wastes.
- C. Peat: Air dried, finely shredded or granular texture, completely decomposed and free of fibers with pH range suitable for intended

horticultural use. Peat shall be a naturally occurring, highly organic and derived primarily from plant materials.

- D. Organic Pre-Mixed Soil Amendment: Composted and screened 100 percent organic manufactured soil amendment.
 - 1. Acceptable Supplier and Products:
 - a. Supplier: It Saul Natural, Inc.
 - 1) Product: Mr. Natural CLM
 - 2) Product: Mr. Natural WSM
- E. Shredded Pine Bark: Shredded bark pieces between one-half (1/2) inch and two (2) inches in length with partially decomposed bark matter.

2.5 Fertilizer

- A. Bone Meal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial phosphate mixture, soluble, minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-released nitrogen, 50 percent derived from natural organic sources, phosphorous, and potassium in the following composition:
 - 1. General: For trees, provide a homogeneous fertilizer complete with micro nutrients having an analysis of 12-4-8 (12 pounds of nitrogen, 4 pounds of available phosphoric acid, and 8 pounds of water soluble potash respectively for each 100 pounds of mixture).
 - 2. For trees, provide fertilizer with adjusted analysis in accordance with results and recommendations of planting soil mix test reports.
 - 3. For lawns, provide fertilizer in accordance with results and recommendations of existing on site surface soil report relative to lawn installation. Provide nitrogen in a form that will be available to lawn during initial period of growth.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in existing on site surface soil reports from a qualified

soil-testing laboratory.

2.6 Planting Soil

- A. Planting Soil Mix For On-Grade Plantings: Provide soil mix amended as per laboratory recommendations. Basic planting soil mix consists of:
1. 60 percent topsoil (as specified)
 2. 40 percent prepared additives (by volume as follows)
 - a. 2 parts humus, peat, and/or compost
 - b. 1 part shredded pine bark (bark pieces between 1/2 inch and 2 inches in length)
 - c. 1 part sterilized composted cow manure
 3. Commercial fertilizer as recommended in soil report
 4. Lime as recommended in soil report
- B. Humus shall be omitted from planting soil mixes if topsoil used has an organic content of 40 percent or greater as determined by the topsoil test report.

2.7 Plant Materials

- A. General:
1. Provide plants true to species and variety, complying with recommendations of ANSI Z60.1 "American Standard for Nursery Stock". Nomenclature to comply with "National List of Scientific Plant Names."
 2. Specific requirements concerning plant material and the manner in which it is to be supplied are shown on the Drawings and plant list.
 3. Acclimatization: Plants must have grown under climatic conditions similar to those of the locality of the project site for a minimum of two (2) years immediately prior to being planted on the Project.
- B. Quality and Size:
1. Furnish nursery grown plants, freshly dug, normally shaped and well branched, fully foliated when in leaf and with healthy well developed root systems. Plants to be free of disease, insect infestations or their

eggs and larvae, and defects such as knots, sun scald, injuries, abrasions and disfigurement.

2. Furnish plants to match as closely as possible whenever symmetry is called for.
3. Provide trees of sizes shown or specified. Trees of larger size may be used if acceptable to the Landscape Architect, and if sizes of roots or root balls are increased proportionately. The increased size will not result in additional cost to the Owner.
4. Stock Specified in a Size Range: Within each size range not less than 50 percent the plants must be of the maximum size specified.
5. Balled and Burlapped Plants: Plants designated "B&B" are to have firm, natural balls of soil corresponding to sizes specified in ANSI Z60.1 "American Standard for Nursery Stock". Balls to be firmly wrapped in biodegradable burlap and securely tied with biodegradable heavy twine, rope and/or wire baskets. Plants with loose, broken or manufactured root balls will be rejected. Root balls shall be lifted from the bottom only, not by stems or trunks.
6. Container grown plants in cans, plastic containers or timber boxes will be acceptable in lieu of balled and burlapped plants provided that they are of specified quality. The container must be removed prior to planting, with care being exercised as to not injure the plant.

C. Trees:

1. Provide trees of height and caliper listed or shown and with branching configuration recommended by ANSI Z60.1 for type and species required. Provide single stem trees except where special forms are specified in the Contract Documents.
2. Provide self-supporting trees with straight trunks and leaders intact. Where required in the Contract Documents, provide trees with character as described.
3. Determining dimensions for trees are caliper, height and spread. Caliper shall be measured six (6) inches above ground for trees up to and including four (4) inch caliper. Trees over four (4) inch caliper shall be measured twelve (12) inches above ground. Specified height and spread dimensions refer to the main body of the plant and not branch tip to tip. Take measurements with branches in natural position.

D. Tree Forms: Do not limb up tree forms more than two (2) feet before planting. Prune to desired shape as directed by Landscape Architect.

E. Grass Materials:

1. Grass Seed: Provide fresh, clean, new crop-seed complying with tolerance for purity and germination established by Association of Official Seed Analysts. Provide seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified on Drawings.
2. Sod: Provide viable sod of uniform density, color, and texture, strongly rooted, not less than two (2) years old and free of weeds and undesirable native grasses. Only provide sod capable of growth and development when planted (viable, not dormant). Provide machine cut sod of a uniform minimum soil thickness of five-eighths (5/8) inch, plus thickness of top growth and thatch. Sod pieces to be consistent in size and shape. All sod must be a true certified turf grass.

2.8 Miscellaneous Landscape Materials

- A. Burlap for wrapping earth-ball shall be biodegradable jute mesh not less than 7.2 oz. per square yard. Wrapping materials made from man-made fibers are unacceptable.
- B. Guy Stakes, Upright Stakes, and Deadmen: Grade No. 2 or better, uniform grade pressure preservative treated pine AWPA C-2, or sound new hardwood or redwood free of knots, holes and other defects, two (2) by two (2) inches by thirty (30) inches long, pointed at one end.
- C. Guy Anchors: Buried anchors only. Anchors are to be buried a minimum of 1'-6" with a quantity of three (3) per tree to be placed.
 1. Manufacturer: Duckbill
 2. Manufacturer: Better Bilt
 3. Manufacturer: Arborbrace
- D. Guys Ties: Woven synthetic strap manufactured specifically for this purpose.
 1. 1. Manufacturer: Arbor-Tie
- E. Hose: One half (1/2) inch diameter black reinforced rubber or plastic garden hose. Cut to required lengths to protect tree trunks from damage by wires. Used hose is acceptable.
- F. Drainage/Separation Fabric: Manufacturer's standard nonwoven pervious

geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.

1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method:
 - a. Grab Tensile Strength (ASTM D 4632): 100 lb.
 - b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard Sieve.
 - c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft.
- G. Drainage Gravel: Washed crushed stone.
- H. Water and water transportation is the sole responsibility of the Contractor.
- I. Mulch:
 1. Pine straw: Pine needle mulch predominately composed of Longleaf Pine needles and other long needled Southern Yellow Pine species. Clean, fresh, dark brown, and free of branches, cones, foreign matter, insects and disease.
 2. Shredded Pine Bark Mulch: Premium grade shredded and ground, one (1) inch maximum particle size in any dimension.
 - a. Submit sample for approval.
- J. Lawn Anti-Erosion Mulch: Clean, threshed straw of wheat, rye, oats or barley.
- K. Anti-Desiccant: Water-insoluble emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully labeled containers and mix in accordance with manufacturer's instructions.

PART 3. Execution

3.1 Preparation

- A. General:
 1. Contractor shall examine conditions under which planting is to be installed, review applicable architectural and engineering Drawings, and be familiar with alignment of underground utilities before digging.

2. Planting Time: Planting operations are to be performed at such times of the year as the job may require, with the stipulation that the Contractor guarantees the plant material as specified. Plant only during periods when weather conditions are suitable.
3. Verify layout information shown on the Drawings, in relation to property survey and existing bench marks before proceeding to layout the work. Locate and protect existing benchmarks and control points. Preserve reference points (coordinates) shown on the Drawings during construction.
4. Work from lines established by the property survey, established bench marks and markers to set coordinate points for the tree locations on the Project. Calculate and measure required dimensions. Do not scale Drawings to determine dimensions.
5. Tree Locations: Locate and layout tree (coordinate) locations by instrumentation and similar appropriate means.
6. Layout individual tree locations and areas for multiple plantings. Stake locations and outline areas and secure Landscape Architect's acceptance before start of excavation for planting work. Make adjustments as requested.
7. Notify Landscape Architect of adverse sub-surface drainage or soil conditions. State conditions and submit a recommendation for correction including costs. Obtain approval for method of correction prior to continuing Work in the affected area. In the event that alternate locations are selected, the Contractor shall prepare such areas at no additional expense to the Owner.

B. Excavation for Trees:

1. Excavate pits, beds and trenches with vertical sides, as specified and as shown on the Drawings.
2. Loosen hardpan and moisture barrier until hardpan has been broken and moisture is allowed to drain freely.
3. For balled and burlapped (B&B trees), make excavations at least four (4) feet wider than the ball diameter for the top twelve (12) inches of the pit. For the remaining depth of the pit, excavate at least two (2) feet wider than the full diameter and equal to the ball depth, plus an allowance for setting of ball on a layer of compacted backfill. Allow for six (6) inch minimum setting layer of excavated soil.
4. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.

C. Test Drainage:

1. Tree Pits: Fill each pit with water. If percolation is less than 100 percent within a period of twelve (12) hours, drill a ten (10) inch diameter auger hole to a depth up to five (5) feet below the bottom of the pit. Fill auger hole with drainage gravel and cover with filter fabric. Retest pit. In case drainage is still unsatisfactory, notify Landscape Architect, in writing, of the condition before planting trees in the questionable areas. Contractor is fully responsible for warranty of the plant material.

D. Subsoil Removal:

1. Dispose of subsoil removed from landscape excavations at an off-site location. Do not mix with planting soil. Do not use as backfill.

3.2 Field Quality Control

- A. Testing: Contractor shall employ testing agency to perform soil permeability test in accordance with ASTM 2434 on planting soil mix to be used in structured planters prior to procuring and installing drainage matting. Test results shall be used to determine weight of integral non-woven filter fabric.

3.3 Preparation of Planting Soil

- A. Before mixing, clean topsoil, or existing surface soil if using a soil conditioner, of roots, plants, clods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.
- B. Mix specified soil amendments and fertilizers with topsoil, or soil conditioner with existing surface soil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
- C. For pit and trench type backfill, mix planting soil prior to backfilling and keep covered until used.
- D. For planting soil prepared with a manufactured soil conditioner, mix planting soil in large batches before backfilling, stock pile for use at site and keep covered until used. Do not mix soil conditioner at individual planting sites.

3.4 Preparation for Planting Lawns

- A. Loosen the grade of lawn areas to a minimum depth of six (6) inches. Remove stones over one and one-half (1½) inches in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to

areas which will be planted promptly after preparation.

- B. Place approximately one-half (1/2) of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of topsoil mixture to minimum depth required to meet lines, grades and elevations shown, after light rolling and natural settlement. (Insert Paragraph if included in scope and coordinate with Alternate No. 2 & 3).
- C. Allow for sod thickness in areas to be sodded.
- D. Grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
- E. Fertilize and lime prior to start of grassing operation. Apply ground limestone at the rate recommended by soil test analysis and work into top six (6) inches of soil. Apply fertilizer at the recommended rate; work into top two (2) inches of soil. The fertilizer application shall not precede the placement of sod by more than three (3) days.
- F. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.
- G. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.
- H. Preparation of Unchanged Grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than six (6) inches; apply soil amendments and initial fertilizers as specified; remove high areas and fill in depressions; till soil to a homogenous mixture of fine texture, free of lumps, clots, stones, roots and other extraneous matter. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for lawns.

3.5 Planting Trees

- A. Set balled and burlapped (B&B) stock on layer of compacted excavated existing soil, plumb and in center of pit or trench with top of ball two to three (2-3) inches above the finish grade and also two to three (2-3) inches above the grade they bore to natural grade before transplanting. Remove all straps and ropes made of man-made fibers completely from root ball.

Loosen and remove burlap and biodegradable ropes from top half of root ball. Cut and remove the top half of all wire baskets before backfilling. Use planting soil mixture to backfill plant pits. When plants are set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately two thirds (2/3) full, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing final layer of backfill.

- B. Remove all man made or impervious materials from the root ball and trunk before final installation of trees and specimen shrubs.
- C. Set container grown stock as specified for balled and burlapped stock, except remove containers, without damaging root balls, prior to backfilling.
- D. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage. If deciduous trees or shrubs are moved in full leaf, spray with anti-desiccant at nursery before moving and again after planting as per manufacturer's recommendations.
- E. Mulching: Immediately after planting work has been completed, mulch pits, trenches and planting beds. Provide a minimum depth of three (3) inches of bark. Finish edges according to the Drawings.
- F. Water: Soak all plants immediately after planting, continue watering thereafter as necessary until Date of Substantial Completion.
- G. Smooth planting areas to conform to specified grades after full settlement has occurred and mulch has been applied.

3.6 Staking, Guying and Pruning

- A. Stake and guy trees immediately after planting. Plants shall be plumb after staking or guying. Maintain stakes, wires and guys until Final Acceptance of the Work.
- B. Staking trees of one (1) inch caliper and under or four (4) feet height: Use single stake with rubber hose and wire loop around trunk. Use only wooden stakes as specified.
- C. Staking trees of one (1) to two and three quarters (2-3/4) inch caliper: Drive stakes securely into ground and fasten to tree with wire and tie. Use hose around wire so wire is not in contact with plant, or use Cinch-tie of appropriate size. Adhere to staking details unless alternate detail has been approved by Landscape Architect prior to beginning of planting operation.
- D. Guying trees of three (3) inch caliper and larger: Guy trees according to

detail. Position guys around trunk at approximately two-fifths (2/5) the height of the tree. Anchor guys in ground either to notched stakes or steel rods driven securely into ground with top end three (3) inches below finish grade.

- E. Pruning: Unless otherwise directed by the Landscape Architect do not cut tree leaders. Remove only injured or dead branches from trees, if any. Prune shrubs at the direction of the Landscape Architect.
- F. Remove and replace promptly any plants pruned or mis-formed resulting from improper pruning.
- G. Inspect tree trunks for injury, improper pruning and insect infestation and take corrective measures.

3.7 Maintenance

- A. Begin maintenance immediately after planting.
- B. Maintain trees, shrubs lawns, and other plants until Date of Substantial Completion of the Work.
- C. Maintain trees and lawns by watering, pruning, cultivating, weeding, and re-mulching as required for healthy growth. Restore trench edges around mulch rings and along bed limes. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical position as required. Restore or replace damaged wrappings. Spray as required to keep trees and shrubs free of insects and disease.
- D. Maintain lawns by watering, weeding, mowing, repair of eroded areas and re-seeding or re-sodding as necessary to establish a uniform stand of the specified grasses.
- E. Remove all trees, lawn or other plants which die, turn brown and/or defoliate prior to Date of Substantial Completion from the site. Replace immediately with plant material of the same species, quantity, size and meeting all requirements.

3.8 Clean-Up and Protection

- A. During Landscape Work, keep pavements clean and work area in an orderly condition.
- B. Upon completion of Work, clear grounds of debris, superfluous materials and all equipment. Remove from site to satisfaction of Landscape Architect and Owner.

- C. Protect landscape Work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape Work as directed, at no additional cost to the Owner.
- D. Theft: Contractor is responsible for theft of plant material at the Project site before, during and after planting, until the Date of Substantial Completion of the Work.

3.9 Observation and Acceptance

- A. Periodic site visits will be made by the Landscape Architect to review the quality and progress of the Work. Work found to be unacceptable must be corrected within five (5) calendar days. Remove rejected plants and materials promptly from the Project.
- B. Upon completion of Work, the Contractor shall notify the Landscape Architect and the Owner at least ten (10) days prior to requested date of site visit for Substantial Completion of all or portions of the Work. Landscape Architect will issue a punch list for work to be corrected. All work on the punch list must be completed within five (5) working days from date of site visit. Where Work does not comply with requirements, replace rejected Work and continue specified maintenance until by Landscape Architect finds work to be acceptable.
- C. If a site visit to verify Substantial Completion has been scheduled and the Landscape Architect arrives at the site and determines that the Landscape Development is not substantially complete, the Contractor shall be responsible for all costs incurred by the Landscape Architect to re-visit the site. Reimbursable expenses include but are not limited to the following: mileage, airfare, consultant's time, parking fee, meals, rental car, etc. All incurred expenses will be deducted from the final contract amount.
- D. Certificate of Substantial Completion will be issued for acceptable Work. If punch list items are issued with the Certificate, they must be corrected within five (5) working days.
- E. One (1) Year Warranty commences on the date of issuance of the Certificate of Substantial Completion. Refer to Section 32 90 00, 1.8 Warranty.
- F. Final Acceptance: One (1) year after Date of Substantial Completion of the Work in total the Landscape Architect and/or the Owner will visit the site to determine Final Acceptance. Upon satisfactory completion of repairs and/or replacements the Landscape Architect and/or the Owner will certify,

in writing, the Final Acceptance of the Work. The Final Acceptance letter will serve as evidence that the Contractor's one (1) year warranty obligations have been met.

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PART 1. General

- 1.1 The work called for by this section shall include, but not necessarily be limited to preparation of subgrade, finish grading and the spreading and shaping of topsoil to the finished contour elevations indicated by the drawings for the natural turf sports fields.
- 1.2 Refer to other sections for work related to that specified under this heading. Coordinate this work with that specified by other sections for timely execution.

PART 2. Products

2.1 Topsoil

- A. Top soil is to be stock piled on site and/or imported to meet these requirements: Topsoil furnished shall be natural, fertile, containing sufficient organic material and other elements as required to promote healthy plant growth, and be friable soil possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well drained areas. It shall be a sandy loam soil. It shall not be excessively acid or alkaline nor contain toxic substances that may be harmful to plant growth. Topsoil shall be without admixture of subsoil and shall be cleaned and reasonably free from clay lumps, stones, stumps, roots, or similar substances 1/2 inches or more in diameter (screen topsoil if necessary to meet this requirement), debris, or other objects that are a hindrance to planting operations and/or presents a safety or playability issue with the fields. Samples of topsoil shall be submitted to Landscape Architect for approval. Topsoil is to be tested to indicate pH value, fertilization requirements along with relevant micronutrient information for the specified turf grass.

2.2 Sub-Surface Soil

- A. The soil directly below the topsoil shall be either existing compacted soil or imported material or both. It shall be properly compacted to provide a uniform base for the topsoil and of sufficient character as to provide an adequate root zone medium.

2.3 Sand

- A. United States Golf Association (USGA) greens sand or approved equal.

PART 3. Execution

- 3.1 Do not begin work until the earth is dry enough to be tillable. Install fields a minimum of thirty (30) days prior to sprigging and/or sodding to allow settling and germination of any weed seeds.
- 3.2 Inspect subgrades to see that they generally conform to the standards called for elsewhere in these specifications, particularly with regard to the approximate depths required for the work. After work is completed, inspect it to ensure that all finish grading complies with design requirements. Do not over compact sub-surface soil. This soil shall be evenly compacted.
- 3.3 Place finished grade stakes wherever necessary to bring the work accurately to the elevations required by the drawings.
- 3.4 Till the field(s) with a disc harrow 6" - 8" into the subsurface a minimum of 3 times.
- 3.5 Remove small loose rocks, stones, and debris, using a RockHound or equivalent as required, thereby causing the subsurface soil to be reasonably free of such miscellaneous matter.
- 3.6 Laser grade the subsurface to within +/- one-half inch (1/2") of the designated slopes and elevations. Automatic laser-controlled systems and equipment shall be used for laser grading.
- 3.7 Adjust locations of irrigation heads as needed and cap existing irrigation that is to be abandoned. For sports fields where underground drainage is to be installed, repair irrigation main and lateral lines. Re-compact trenches and other excavations to prevent future settling. The depth and height of installation is subject to the final grade.
- 3.8 Spread minimum of 6 inches of topsoil or as noted in drawings and grade based on designated thickness and locations (initial placement/spreading of the topsoil can be by the grading contractor).

- 3.9 Add sand, as a leveling course, as needed to aid in the laser grading of the fields.
- 3.10 Add, subject to soil conditions and soil test, a minimum of one ton (1T) of 5-10-15 fertilizer and two tons (2T) of lime per acre and evenly distribute.
- 3.11 Lightly blend the topsoil, sand, lime and fertilizer into the previous tiled and laser graded subsurface, thereby creating the root zone with a loose consistency. Laser grade to within +/- one-fourth inch (1/4") of designated slopes and elevations.
- 3.12 Install the sprinkler heads even with the surface and carefully re-compact around the heads to prevent future settling. Provide a 2' square sod strip around each sprinkler head; recess sod so as not to create a mound. The irrigation system shall be tested and its proper operation thoroughly confirmed and demonstrated prior to installing the sprigs and/or sod.
- 3.13 Prior to the installation of sod, treat all emerged weeds with Roundup Pro @ 3 qts/acre or approved equal.
- 3.14 Coordinate sodding with installation of lighting, fencing and other structures as required and all per the designated specifications in the appropriate sequence, fencing typically being last.
- 3.15 Dispose of excess excavated materials and debris away from the site.
- 3.16 Sodding shall be per Specification Section 32 92 33.

END OF SECTION 32 90 01

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Part 1 General

1.1 Work Included

- A. Furnishing and installing sod.
- B. Preparation of Ground.
- C. Placement of Sod and Fertilization.
- D. Maintenance of Sod.

1.2 Related Sections

- A. Section 02315 Excavation Embankment Fill
- B. Section 02835 Seeding and Lawn Restoration
- C. Coordinate this work with that specified by other sections for timely execution. The Contractor shall be wholly responsible for the scheduling, ordering, receiving, storing, and installing of all sodding materials.

1.3 Definitions

- A. Stand of Turf: 100 percent ground cover of the established species.

1.4 Submittals

- A. The following shall be submitted in accordance with Section 01340 Submittal Procedures:
 - 1. Product Data Fertilizer: Include physical characteristics, and recommendations.
 - 2. Test Reports: Topsoil composition tests (reports and recommendations).
 - 3. Certificates: Sod farm certification for sods. Indicate type of sod in accordance with TPI GSS.

1.5 Delivery, Storage, and Handling

- A. Delivery
 - 1. Sod Protection: Protect from drying out and from contamination during delivery, on-site storage, and handling.

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2. Fertilizer, Sulfur, Iron and Lime Delivery: Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer and associated elements may be furnished in bulk with certificate indicating the above information.

B. Storage

1. Sod Storage: Lightly sprinkle with water, cover with moist burlap, straw, or other approved covering; and protect from exposure to wind and direct sunlight until planted. Provide covering that will allow air to circulate so that internal heat will not develop. Do not store sod longer than 24 hours. Do not store directly on concrete or bituminous surfaces.
2. Topsoil: Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.
3. Handling: Do not drop or dump materials from vehicles.

1.6 Time Restrictions and Planting Conditions

- A. Restrictions: Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit.

1.7 Time Limitations

- A. Sod: Place sod a maximum of thirty six hours after initial harvesting, in accordance with TPI GSS as modified herein.

Part 2 Products**2.1 Sods**

- A. Classification: Nursery grown, certified as classified in the TPI GSS. Machine cut sod at a uniform soil thickness of not less than one inch, excluding top growth and thatch. Each individual sod piece shall be strong enough to support its own weight when lifted by the ends. Broken pads, irregularly shaped pieces, and torn or uneven ends will be rejected.
- B. Purity: Sod species shall be genetically pure, free of weeds, pests, and disease.
- C. Set sod between March 1 and October 15 and when the soil is in a workable condition.
- D. "Tifway 419" Hybrid Bermuda Grass; new sod consisting of live, dense, well rooted growth; well suited for the intended purpose and soil conditions; completely free of noxious weeds and grasses; and containing less than 5 plants of objectionable weeds per 100 square feet.

2.2 Topsoil

- A. On-Site Topsoil: Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available, topsoil shall be existing surface soil stripped and stockpiled on-site.
- B. Off-Site Topsoil: Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.
- C. Composition:
 - 1. Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42.
 - 2. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen.
 - 3. The pH shall be tested in accordance with ASTM D4972.
 - 4. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials.
 - 5. Other components shall conform to the following limits:
 - a. Silt: 25-50 percent
 - b. Clay: 10-30 percent
 - c. Sand: 20-35 percent
 - d. pH: 5.5 to 7.0
 - e. Soluble Salts: 600 ppm maximum

2.3 Soil Conditioners

- A. Add conditioners to topsoil as required to bring into compliance with "composition" standard for topsoil as specified herein.
- B. Lime: Commercial grade hydrate limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C602 of not less than 85 percent
- C. Aluminum Sulfate Commercial grade
- D. Sulfur: 100 percent elemental
- E. Iron: 100 percent elemental
- F. Peat: Natural product of peat moss derived from a freshwater site and conforming to

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ASTM D4427. Shred and granulate peat to pass a 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation.

- G. Sand: USGA grade sand, clean and free of materials harmful to plants or approved equal.
- H. Perlite Horticultural grade
- I. Composted Derivatives: Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:
 - 1. Particle Size: Minimum percent by weight passing:
 - a. No. 4 mesh screen: 95
 - b. No. 8 mesh screen: 80
 - 2. Nitrogen Content: Minimum percent based on dry weight:
 - a. Fir Sawdust: 0.7
 - b. Fir or Pine Bark: 1.0

2.4 Fertilizer

- A. Granular Fertilizer: Organic, granular controlled release fertilizer containing the following minimum percentages, by weight, of plant food nutrients:
 - 1. 20 percent available nitrogen
 - 2. 10 percent available phosphorus
 - 3. 15 percent available potassium

2.5 Water

- A. Source of water shall be approved by Owner and of suitable quality for irrigation containing no element toxic to plant life.

Part 3 Execution

3.1 Preparation

- A. Provide 5 inches of topsoil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer, pH adjusters, soil conditioners into soil a minimum depth of 5 inches by disking, harrowing, tilling or other method approved by the Engineer. Remove debris and stones larger than 3/4 inch in any dimension remaining on the surface after finish grading.

- B. Apply fertilizer and agricultural limestone uniformly over the sod bed at the rates shown below.
 - 1. Fertilizer: 15 pounds per 1,000 square feet of 10-10-10
 - 2. Agricultural Limestone: 40 pounds per 1,000 square feet
- C. Correct irregularities in finish surfaces to eliminate depressions. Apply 1 inch of USGA sand on top of the leveled topsoil. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

3.2 Sodding

- A. Finished Grade and Topsoil
 - 1. Prior to the commencement of the sodding operation, the Contractor shall verify that finished grades are as indicated on drawings; the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02315 Excavation Embankment Fill.
 - 2. The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be completed with a light raking to remove from the surface debris and stones over a minimum 5/8 inch in any dimension.
- B. Placing: Place sod a maximum of 36 hours after initial harvesting, in accordance with TPI GSS as modified herein.
 - 1. Place sod by hand so that the edges are in close contact and in a position to break joints with the long dimension perpendicular to the slope. Fit and pound the sod into place with a 10 inches x 10 inches wood tamp or other similar implements.
- C. Finishing: After completing sodding, blend edges of sodded area smoothly into surrounding area. Air pockets shall be eliminated and a true and even surface shall be provided. Frayed edges shall be trimmed and holes and missing corners shall be patched with sod.
- D. Rolling: Immediately after sodding, firm entire area except for slopes in excess of 3 to 1 with a roller not exceeding 90 pounds for each foot of roller width.
- E. Watering: Start watering areas sodded as required by daily temperature and wind conditions. Apply water at a rate sufficient to ensure thorough wetting of soil to minimum depth of 6 inches. Run-off, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or plant material shall be prevented.
- F. Two weeks after the sod is installed, top dress and thoroughly water it. Top dressing shall consist of the following:
 - 1. 1/2 to 1 pound of 38 percent urea formaldehyde per 1,000 square feet

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- 2. 5 pounds of 6 12 12 fertilizer per 1,000 square feet
- G. Dispose of all surplus material as directed by the Owner.
- H. The Owner will review the sod for acceptance 30 days after installation, at which time the maintenance period will begin as stated in these specifications. This acceptance by the Owner is for the purposes of payment only.

3.3 Protection of Turf Areas

- A. Immediately after turfing, protect area against traffic and other use.

3.4 Inspections

- A. The Owner's Representative shall inspect the sod within 30 days after installation and determine if it is acceptable.
- B. Establish an acceptable stand of turf, as defined herein, on all areas indicated on the Drawings.

END OF SECTION 32 92 23