

Houston Community College

Project Manual

for

Parking Lot Improvements

at

Central Campus



May 9, 2011
HCC Project No. 11-26
LDS Project No. 724

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**CONTRACT BETWEEN HOUSTON COMMUNITY COLLEGE
And**

HCC Project No. _____

This Contract ("Contract") is made by and between Houston Community College ("HCC," "Owner"), a public community college district organized under Chapter 130 of the Texas Education Code, and _____, hereinafter known as (the "Consultant"), whose address is _____ (individually, "Party" and collectively, "Parties"), effective as of _____ ("Effective Date").

WITNESSETH, that the Contractor and the Owner for the consideration hereinafter named agree as follows:

ARTICLE 1. SCOPE OF WORK: The Contractor shall furnish all of the materials and perform all of the work shown on the drawings and described in the specifications for the project entitled _____ (Project No. _____). These drawings and specifications prepared for Houston Community College by _____, acting as and in these Contract Documents entitled the Project Architect. The Contractor shall do everything required by this Agreement, the General and Supplemental Conditions of the Contract, the Special Conditions, the Addenda, the Specifications, the Drawings, the Historically Underutilized Business (HUB) Subcontracting Plan, and the Proposal attached as Exhibit 1 (including any unit prices stated therein).

The Specifications and Drawings are enumerated as follows:

UNIFORM GENERAL and SUPPLEMENTARY GENERAL CONDITIONS	Exhibit 1
SECTION 010000 MISCELLANEOUS REQUIREMENTS	Exhibit 2
CONTRACT FORMS AND GENERAL REQUIREMENTS	Exhibit 3
DRAWING LIST	Exhibit 4
ADDENDUM	Exhibit 5
ALLOWANCES	Exhibit 6
GENERAL CONDITIONS, REQUIREMENTS, INSURANCES, TAXES & BOND LINE ITEMS	Exhibit 7
INSURANCE REQUIREMENTS	Exhibit 8
PAYMENT AND PERFORMANCE BONDS, DOCUMENTS BF & BG	Exhibit 9
OWNER'S SPECIFICATIONS	Exhibit 10
ASSURANCE OF SBDP GOAL	Exhibit 11
POLICY ON UTILIZATION OF SMALL BUSINESS (SB) PROGRAM	Exhibit 12
CONTRACTOR/SUBCONTRACTOR PARTICIPATION FORM	Attachment A
SUBCONTRACTOR PAYMENT CERTIFICATION FORM	Attachment B
SUBCONTRACTOR PROGRESS ASSESSMENT FORM:	Attachment C
SMALL BUSINESS DEVELOPMENT PROGRAM	Attachment D
PAYROLL FOR CONTRACTOR'S OPTIONAL USE (U.S.) DEPT OF LABOR)	Exhibit 13

ARTICLE 2. TIME OF COMPLETION: The Owner shall provide a Notice to Proceed in which a date for commencement of the work shall be stated; such commencement date shall be 10 or more days after the date of the notice. The Contractor shall achieve substantial completion of the work within _____ (___) calendar days after such commencement date, as such completion date may be extended by approved Change Orders. The time set forth for completion of the work is an essential element of the Contract.

ARTICLE 3. THE CONTRACT SUM: The Owner shall pay the Contractor for performance of the Contract, subject to additions and deductions provided therein, the sum of _____ (\$ _____), and make payment on account as hereinafter provided.

ARTICLE 4. HUB SUBCONTRACTING PLAN: The Owner has adopted **Document DG, Assurance of SBDP Goal** ("Policy"), which is incorporated herein by reference. Contractor, as a provision of the Agreement must comply with the requirements of the Policy and adhere to the Small Business ("SB") Subcontracting Plan submitted with Contractor's Proposal and attached as **Exhibit 10, Exhibit 11, and Exhibit 12**. No changes to the SB Subcontracting Plan can be made by the Contractor without the prior written approval of the Owner in accordance with the Policy.

ARTICLE 5. LIQUIDATED DAMAGES: For each consecutive calendar day after the substantial completion period set forth in Article 2 above that any work, including the correction of deficiencies found during the final testing and inspection, is not completed, the amount of five hundred dollars (\$500.00) will be deducted from the money due or becomes due the Contractor, not as a penalty but as liquidated damages representing the parties' estimate at the time of contract execution of the damages which the Owner will sustain for late completion.

ARTICLE 6. CERTIFICATION OF NO ASBESTOS CONTAINING MATERIALS OR WORK: The Contractor shall provide a certification statement, included with each materials submittal, stating that no asbestos containing materials or work is included within the scope of the proposed submittal.

The Contractor shall insure that Texas Department of Health licensed individuals, consultants or companies are used for any required asbestos work including asbestos inspection, asbestos abatement plans/specifications, asbestos abatement, asbestos project management and third-party asbestos monitoring.

The Contractor shall provide at Substantial Completion, a notarized affidavit to the Owner and the Architect stating that no asbestos containing materials or work was provided, installed, furnished or added to the Project.

The Contractor shall take whatever measures he deems necessary to insure that all employees, suppliers, fabricators, materialmen, subcontractors, or their assigns, comply with this requirement.

All materials used on this Project shall be certified as non Asbestos Containing Building Materials (ACBM). The Contractor shall insure compliance with the following acts from all of his subcontractors and assigns:

Asbestos Hazard Emergency Response Act (AHERA—40 CFR 763-99 (7));

National Emission Standards for Hazardous Air Pollutants (NESHAP—EPA 40 CFR 61, National Emission Standard for Asbestos;

Texas Asbestos Health Protection Rules (TAHRP—Tex. Admin. Code Title 25, Part 1, Ch. 295C, Asbestos Health Protection

Every subcontractor shall provide a notarized statement that no ACBM has been used, provided, or left on this Project.

The Contractor shall provide, in hard copy and electronic form, all necessary material safety data sheets (MSDS) of all products used in the construction of the Project to the Texas Department of Health licensed inspector or Project Architect or Engineer who will compile the information from the MSDS and, finding no asbestos in any of the product, make a certification statement.

At Final Completion the Contractor shall provide a notarized certification statement per TAC Title 25 Part 1, Ch. 295.34, par. c.1 that no ACBM was used during construction of the Project.

ARTICLE 7. ACCEPTANCE OF BID OR AWARD OF CONTRACT: By signing this Agreement, the undersigned certifies as follows:

Assignment. This Agreement is a personal service contract for the services of Construction, and Contractor's interest in this Agreement, duties hereunder and/or fees due hereunder may not be assigned or delegated to a third party.

Records of expenses pertaining to Additional Services and services performed on the basis of a Worker Wage Rate or Monthly Salary Rate shall be kept on the basis of generally accepted accounting principles and in accordance with cost accounting standards promulgated by the Federal Office of Management and Budget Cost Accounting Standards Board and shall be available for audit by the Owner or the Owner's authorized representative on reasonable notice.

Family Code Child Support Certification. Pursuant to Section 231.006, Texas Family Code, Service Provider certifies that it is not ineligible to receive the award of or payments under this Agreement and acknowledges that this Agreement may be terminated and payment may be withheld if this certification is inaccurate.

Eligibility Certification. Pursuant to Section 2155.004, Texas Government Code, Service Provider certifies that the individual or business entity named in this Agreement is not ineligible to receive the award of or payments under this Agreement and acknowledges that this Agreement may be terminated and payment withheld if this certification is inaccurate.

Franchise Tax Certification. A corporate or limited liability company Contractor certifies that it is not currently delinquent in the payment of any Franchise Taxes due under Chapter 171 of the Texas Tax Code, or that the corporation or limited liability company is exempt from the payment of such taxes, or that the corporation or limited liability company is an out-of-state corporation or limited liability company that is not subject to the Texas Franchise Tax, whichever is applicable.

Payment of Debt or Delinquency to the State. Pursuant to Sections 2107.008 and 2252.903, Texas Government Code, Contractor agrees that any payments owing to Contractor under this Agreement may be applied directly toward any debt or delinquency that Contractor owes the State of Texas or any agency of the State of Texas regardless of when it arises, until such debt or delinquency is paid in full.

Entire Agreement; Modifications. This Agreement supersedes all prior agreements, written or oral, between Contractor and Owner and shall constitute the entire Agreement and understanding between the parties with respect to the Project. This Agreement and each of its provisions shall be binding upon the parties and may not be waived, modified, amended or altered except by a writing signed by Contractor and Owner.

Captions. The captions of paragraphs in this Agreement are for convenience only and shall not be considered or referred to in resolving questions of interpretation or construction.

Governing Law and Venue. This Agreement and all of the rights and obligations of the parties and all of the terms and conditions shall be construed, interpreted and applied in accordance with and governed by and enforced under the laws of the State of Texas without reference to its conflicts of law provisions. The county where the Project is located, Houston, Texas, Harris County, shall be the sole place of venue for any legal action arising from or related to this Agreement or the Project in which the Owner is a party.

Waivers. No delay or omission by either party in exercising any right or power arising from non compliance or failure of performance by the other party with any of the provisions of this Agreement shall impair or constitute a waiver of any such right or power. A waiver by either party of any covenant or

condition of this Agreement shall not be construed as a waiver of any subsequent breach of that or of any other covenant or condition of the Agreement.

Binding Effect. This Agreement shall be binding upon and inure to the benefit of the parties and their respective permitted assigns and successors.

Appointment. Owner hereby expressly reserves the right from time to time to designate by notice to Contractor a representative(s) to act partially or wholly for Owner in connection with the performance of Owner's obligations. Contractor shall act only upon instructions from the designated representative(s) unless otherwise specifically notified to the contrary.

Records. Records of Contractor's costs, reimbursable expenses pertaining to the Project and payments shall be available to Owner or its authorized representative during business hours and shall be retained for four (4) years after final Payment or abandonment of the Project, unless Owner otherwise instructs Contractor in writing.

Notices. All notices, consents, approvals, demands, requests or other communications relied on by the parties shall be in writing. Written notice shall be deemed to have been given when delivered in person to the designated representative of the Contractor or Owner for whom it is intended; or sent by U. S. Mail to the last known business address of the designated representative; or transmitted by fax machine to the last know business fax number of the designated representative. Mail notices are deemed effective upon receipt or on the third business day after the date of mailing, whichever is sooner. Fax notices are deemed effective the next business day after faxing.

Severability. Should any term or provision of this Agreement be held invalid or unenforceable in any respect, the remaining terms and provisions shall not be affected and this Agreement shall be construed as if the invalid or unenforceable term or provision had never been included.

Illegal Dumping. The Contractor shall ensure that it and all of its Subcontractors and assigns prevent illegal dumping of litter in accordance with Title 5, Texas Health and Safety Code, Chapter 365.

Ethics Matters/No Financial Interest. Contractor and its employees, agents, representatives and subcontractors have read and understand HCC's Ethics Policy, http://www.hccs.edu/hcc/System%20Home/Departments/Procurement_Operations/About_Procurement/Ethics%20Policy.pdf, available at and the HCC Vendor Conflict Interest Questionnaire, http://www.hccs.edu/hcc/System%20Home/Departments/Procurement_Operations/About_Procurement/Conflict%20of%20Interest%20Questionnaire.pdf and is in compliance with said policies and applicable state ethics laws and rules. Neither Contractor nor its employees, agents, representatives or subcontractors will assist or cause HCC employees to violate HCC's Ethic's Policy, provisions described by HCC Standards of Conduct Guide, , or applicable state ethics laws or rules. Contractor represents and warrants that no member of the Board has a direct or indirect financial interest in the transaction that is the subject of this Agreement.

By signature hereon, Contractor certifies that no member of the Board of Trustees of Houston Community College, or Executive Officers, has a financial interest, directly or indirectly, in the transaction that is the subject of this contract.

BY SIGNING BELOW, the Parties have executed and bound themselves to this Agreement as of the day and year first above written.

ATTEST:

Contractor

By: _____

By: _____
Insert Contractor's Name

Date: _____

CONTENT APPROVED:
Office of Facilities Planning and Construction
Houston Community College

HOUSTON COMMUNITY COLLEGE
(Owner)

By: _____
(Original Signature)

By: _____
(Original Signature)

Name: Winston Dahse
Title: Chief Administration Officer
Facilities Planning and Construction

Name: Dr. Mary Spangler
Title: Chancellor

Date: _____

CONTENT APPROVED:
Office of General Counsel
Houston Community College

By: _____
(Original Signature)

Name: Renee Byas
Title: General Counsel

**Uniform General and Supplementary General Conditions
for Houston Community College
Building Construction Contracts**

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Uniform General and Supplementary General Conditions for Houston Community College Building Construction Contracts

Article 1. Definitions

Unless the context clearly requires another meaning, the following terms have the meaning assigned herein.

1.1 *Architect/Engineer (A/E)* means a person registered as an architect pursuant to Tex. Occ. Code Ann., Chapter 1051, as a landscape architect pursuant to Tex. Occ. Code Ann., Chapter 1052, a person licensed as a professional engineer pursuant Tex. Occ. Code Ann., Chapter 1001 and/or a firm employed by Owner or Design-Build Contractor to provide professional architectural or engineering services and to exercise overall responsibility for the design of a Project or a significant portion thereof, and to perform the contract administration responsibilities set forth in the Contract.

1.2 *Change Order* means a written modification of the Contract between the Owner and Contractor, signed by the Owner, the Contractor and the Architect/Engineer.

1.3 *Change Order Proposal* means a Contractor -generated document in response to a Change Order Request (COR).

1.4 *Change Order Request (COR)* means a document which informs the Contractor of a proposed change in the Work, and appropriately describes or otherwise documents such change.

1.5 *Close-out documents* means the product brochures, product/equipment maintenance and operations instructions, manuals, and other documents/warranties, as-built record documents, affidavit of payment, release of lien and claim, and as may be further defined, identified, and required by the Contract Documents.

1.6 *Contract* means the entire agreement between the Owner and the Contractor, including all of the Contract Documents.

1.7 *Contract Date* is the date when the agreement between the owner and the Contractor becomes effective.

1.8 *Contract Documents* means those documents identified as a component of the agreement (contract) between the owner and the Contractor. These may include, but are not limited to, Drawings, Specifications, General, Supplementary and Special Conditions, and all pre-bid and/or pre-proposal addenda.

1.9 *Contractor* means the individual, corporation, company, partnership, firm or other entity contracted to perform the Work, regardless of the type of construction contract used, so that the term as used herein includes a Contractor or a Design-Build firm as well as a General or Prime Contractor. The contract documents refer to Contractor as if singular in number.

1.10 *Contract Sum* means the total compensation payable to the Contractor for completion of the Work in accordance with the terms of the contract.

1.11 *Contract Time* means the period between the Start Date identified in the Notice to Proceed with Construction and the Substantial Completion date identified in the Notice to Proceed or as subsequently amended by Change Order.

1.12 *Date of Commencement* means the date designated in the Notice to Proceed for the Contractor to commence the Work.

- 1.13 *Day* means a calendar day, unless otherwise specifically stipulated.
- 1.14 *Drawings* mean that product of the Architect/Engineer which graphically depicts the Work.
- 1.15 *Final Completion* means the date determined and certified by the Architect/Engineer and Owner on which the Work is fully and satisfactorily complete in accordance with the Contract.
- 1.16 *Owner* means Houston Community College, the State of Texas and any Agency of the State of Texas, acting through the responsible entity of Houston Community College identified in the Contract as the Owner.
- 1.17 *Owner's Designated Representative (ODR)* means the individual assigned by the Owner to act on its behalf, and to undertake certain activities as specifically outlined in the Contract. The ODR is the only party authorized to direct changes to the scope, cost, or time of the contract.
- 1.18 *Project* means all activities necessary for realization of the Work. This includes design, contract award(s), execution of the Work itself, and fulfillment of all contract and warranty obligations.
- 1.19 *Samples* means representative physical examples of materials, equipment or workmanship, used to confirm compliance with requirements and/or to establish standards for use in execution of the Work.
- 1.20 *Schedule of Values* means the detailed breakdown of the cost of the materials, labor and equipment necessary to accomplish the Work as described in the Contract Documents, submitted by Contractor for approval by Owner and Architect/Engineer.
- 1.21 *Shop Drawings* means the drawings, diagrams, illustrations, schedules, performance charts, brochures and other data prepared by the Contractor or its agents, which detail a portion of the Work.
- 1.22 *Site* means the geographical area of the location of the Work.
- 1.23 *Special Conditions* means the documents containing terms and conditions, which may be unique to the project. Special Conditions are a part of the Contract Documents and have precedence over the Uniform General Conditions.
- 1.24 *Specifications* means the written product of the Architect/Engineer that establishes the quality and/or performance of products utilized in the Work and processes to be used, including testing and verification for producing the Work.
- 1.25 *Subcontractor means* a business entity that enters into an agreement with the Contractor to perform part of the Work or to provide services, materials or equipment for use in the Work.
- 1.26 *Substantial Completion* means the date determined and certified by the Contractor, Architect/Engineer and Owner when the Work or a designated portion thereof is sufficiently complete, in accordance with the Contract, so as to be operational and fit for the use intended.
- 1.27 *Supplementary General Conditions* means procedures and requirements that modify the Uniform General Conditions. Supplementary General Conditions, when used, have precedence over the Uniform General Conditions.

1.28 *Unit Price Work* means Work or a portion of the Work paid for based on incremental units of measurement.

1.29 *Unilateral Change Order (ULCO)* means a Change Order issued by the Owner without the agreement of the Contractor.

1.30 *Work* means the administration, procurement, materials, equipment, construction and all services necessary for the Contractor, and/or its agents, to fulfill the Contractors obligations under the Contract.

Article 2. Laws Governing Construction

2.1. Environmental Regulations. The Contractor conducts activities in compliance with applicable laws and regulations and other requirements of the Contract relating to the environment, and its protection at all times. Unless otherwise specifically determined, the Owner is responsible for obtaining and maintaining permits related to stormwater run-off. The Contractor shall conduct operations consistent with stormwater run-off permit conditions. Contractor is responsible for all items it brings to site, including hazardous materials, and all such items brought to the site by its subcontractor and suppliers, or by other entities subject to direction of the Contractor. The Contractor shall not incorporate hazardous materials into the Work without prior approval of Owner, and shall provide an affidavit attesting to such in association with request for Substantial Completion inspection.

2.2. Wage Rates. The Contractor shall not pay less than the wage scale of the various classes of labor as shown on the "Prevailing Wage Schedule" provided by the Owner. The specified wage rates are minimum rates only. The Owner is not bound to pay any claims for additional compensation made by any Contractor because the Contractor pays wages in excess of the applicable minimum rate contained in the Contract. The "Prevailing Wage Schedule" is not a representation that qualified labor adequate to perform the Work is available locally at the prevailing wage rates.

2.2.1 Notification to Workers. The Contractor shall notify each worker, in writing, of the following as they commence work on the contract: the worker's job classification, the established minimum wage rate requirement for that classification, as well as the worker's actual wage. The notice must be delivered to and signed in acknowledgement of receipt by the employee and must list both the wages and fringe benefits to be paid or furnished for each classification in which the worker is assigned duties. When requested by the Owner, the Contractor shall furnish evidence of compliance with the Texas Prevailing Wage Law.

2.2.1.1 Submit a copy of each worker wage-rate notification to the ODR with the application for progress payment for the period during which the worker was engaged in activities on behalf of the project.

2.2.1.2 The "Prevailing Wage Schedule" is determined by the Owner in compliance with Tex. Gov't Code, Chapter 2258. Should the Contractor at any time become aware that a particular skill or trade not reflected on the Owner's Prevailing Wage Schedule will be or is being employed in the Work, whether by the Contractor or by a Subcontractor, the Contractor shall promptly inform the ODR of the proposed wage to be paid for the skill along with a justification for same. The Contractor is responsible for determining the most appropriate wage for a particular skill in relation to similar skills or trades identified on the Prevailing Wage

Schedule. In no case shall any worker be paid less than the wage indicated for Laborers.

2.2.1.3 Penalty for Violation. The Contractor and any Subcontractor will pay to the Owner a penalty of sixty dollars (\$60) for each worker employed for each calendar day, or portion thereof, that the worker is paid less than the wage rates stipulated in the Prevailing Wage Schedule.

2.2.1.4 Complaints of Violations

2.2.1.4.1 Owner's Determination of Good Cause. Upon receipt of information concerning a violation of Tex. Gov't Code, Chapter 2258, the Owner will, within 31 days, make an initial determination as to whether good cause exists that a violation occurred. The Owner will send documentation of the initial determination to the Contractor against whom the violation was alleged, and to the worker involved. Upon making a good-cause finding, the Owner will retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the Prevailing Wage Schedule and any supplements thereto, together with the applicable penalties, such amounts being subtracted from successive progress payments pending a final decision on the violation.

2.2.1.4.2 If the Contractor and claimant worker reach an agreement concerning the claim, the Contractor shall promptly notify the Owner in a written document countersigned by the worker.

2.2.1.4.3 Arbitration Required. If the violation is not resolved within 14 days following initial determination by the Owner, the Contractor and the claimant worker must participate in binding arbitration in accordance with the Texas General Arbitration Act, Tex. Civ. Prac. & Rev. Code, Chapter 171. For a period not to exceed 10 days, after which, if no agreement reached, a district court may be petitioned by any of the parties to the arbitration to appoint an arbitrator whose decision will be binding on all parties.

2.2.1.4.4 Arbitration Award. If an arbitrator assesses an award against the Contractor, the Contractor shall promptly furnish a copy of said award to the Owner. The Owner may use any amounts retained under Article 2.2.1.4.1 to pay the worker the amount as designated in the arbitration award. If the retained funds are insufficient to pay the worker in accordance with the arbitration award, the worker has a right of action against the Contractor, and/or the surety to receive the amount owed, plus attorneys' fees and court costs. The Owner has no duty to release any funds to either the claimant or the Contractor until it has received the notices of agreement or the arbitration award.

2.2.1.4.5 No Extension of Time. If the Owner's determination proves valid that good cause existed to believe a violation had occurred, the Contractor is not entitled to an extension of time for any delay arising directly or indirectly from of the arbitration procedures set forth herein.

2.3. Venue for Suits. The venue for any suit arising from this contract will be in a court of competent jurisdiction in Houston, Harris County, Texas, or as may otherwise designated in the Supplementary General Conditions.

2.4. Licensing of Trades. The Contractor shall comply with all applicable provisions of state law related to license requirements for skilled tradesmen, Contractors, suppliers

and or laborers, as necessary to accomplish the Work. In the event the Contractor, or one of its Subcontractors, loses its license during the term of performance of the Contract, the Contractor shall promptly hire or contract with a licensed provider of the service at no additional cost to the Owner.

2.5. Royalties, Patents & Copyrights. The Contractor shall pay all royalties and license fees, defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof.

2.6. State Sales and Use Taxes. The Owner qualifies for exemption from certain State and Local Sales and Use Taxes pursuant to the provisions of Tex. Tax Code, Chapter 151. The Contractor may claim exemption from payment of applicable State taxes by complying with such procedures as prescribed by the State Comptroller of Public Accounts. Owner is not required to reimburse Contractor for taxes paid on items that qualify for tax exemption.

Article 3. General Responsibilities of Owner & Contractor

3.1. Owner's General Responsibilities. The Owner is the entity identified as such in the Contract and referred to throughout the Contract Documents as if singular in number.

3.1.1 Preconstruction Conference. Prior to, or concurrent with, the issuance of Notice to Proceed with Construction, a conference will be convened for attendance by the Owner, Contractor, Architect/Engineer (AE) and appropriate Subcontractors. The purpose of the conference is to establish a working understanding among the parties as to the Work, the operational conditions at the project site, and general administration of the Project. Topics include communications, schedules, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, maintaining required records and all other matters of importance to the administration of the Project and effective communications between the project team members.

3.1.2 Owner's Designated Representative. Prior to the start of construction, Owner will identify the Owner's Designated Representative (ODR), who has the express authority to act and bind the Owner to the extent and for the purposes described in the various Articles of the Contract, including responsibilities for general administration of the Contract.

3.1.2.1 Unless otherwise specifically defined elsewhere in the contract documents, the ODR is the single point of contact between the Owner and Contractor. Notice to the ODR, unless otherwise noted, constitutes notice to the Owner under the Contract.

3.1.2.2 All directives on behalf of the Owner will be conveyed to the Contractor by the ODR in writing.

3.1.3 Owner Supplied Materials and Information.

3.1.3.1 The Owner will furnish to the Contractor those surveys describing the physical characteristics, legal description, limitations of the site, site utility locations, and other information used in the preparation of the Contract Documents.

3.1.3.2 The Owner will provide information, equipment, or services under the Owner's control to the Contractor with reasonable promptness.

3.1.4 Availability of Lands. The Owner will furnish, as indicated in the Contract, all required rights to use the lands upon which the Work occurs. This includes rights-of-way and easements for access and such other lands that are designated for use by the Contractor. The Contractor shall comply with all Owner identified encumbrances or restrictions specifically related to use of lands so furnished. The Owner will obtain and pay for easements for permanent structures or permanent changes in existing facilities, unless otherwise required in the Contract Documents.

3.1.5 Limitation on Owner's Duties

3.1.5.1 The Owner will not supervise, direct, control or have authority over or be responsible for Contractor's means, methods, technologies, sequences or procedures of construction or the safety precautions and programs incident thereto. The Owner is not responsible for any failure of Contractor to comply with laws and regulations applicable to the Work. The Owner is not responsible for the failure of Contractor to perform or furnish the Work in accordance with the Contract Documents. Owner is not responsible for the acts or omissions of Contractor, or any of its Subcontractor, suppliers or of any other person or organization performing or furnishing any of the Work on behalf of the Contractor.

3.1.5.2 The Owner will not take any action in contravention of a design decision made by the AE in preparation of the Contract Documents, when such actions are in conflict with statutes under which the AE is licensed for the protection of the public health and safety.

3.2 Role of Architect/Engineer. Unless specified otherwise in the Contract between the Owner and the Contractor, the AE shall provide general administration services for the Owner during the construction phase of the project. Written correspondence, requests for information, and shop drawings/submittals shall be directed to the AE for action. The AE has the authority to act on behalf of the Owner to the extent provided in the Contract Documents, unless otherwise modified by written instrument, which will be furnished to the Contractor by the ODR, upon request.

3.2.1 Site Visits

3.2.1.1 The AE will make visits to the site at intervals as provided in the AE's contract agreement with the Owner, to observe the progress and the quality of the various aspects of Contractor's executed Work and report findings to the Owner.

3.2.1.2 The AE has the authority to interpret Contract Documents and inspect the Work for compliance and conformance with the Contract. Except as referenced in Article 3.1.5.2, the Owner retains the sole authority to accept or reject Work and issue direction for correction, removal, or replacement of Work.

3.2.2 Clarifications and Interpretations. It may be determined that clarifications or interpretations of the Contract Documents are necessary. Upon direction by the ODR such clarifications or interpretations will be provided by the AE consistent with the intent of the Contract Documents. The AE will issue these clarifications with reasonable promptness to the Contractor as Architect's Supplemental Instruction (ASI) or similar instrument. If the Contractor believes that such clarification or interpretation justifies an adjustment in the Contract Sum or the Contract Time, the Contractor shall so notify the Owner in accordance with the provisions of Article 11.

3.2.3 Limitations on Architect/Engineer Authority. The AE is not responsible for:

3.2.3.1 The Contractor's means, methods, techniques, sequences, procedures, safety, or programs incident to the Project nor will the AE supervise, direct, control or have authority over the same.

3.2.3.2 The Failure of Contractor to comply with laws and regulations applicable to the furnishing or performing the Work.

3.2.3.3 The Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

3.2.3.4 Acts or omissions of the Contractor, or of any other person or organization performing or furnishing any of the Work.

3.3 Contractor's General Responsibilities. The Contractor is solely responsible for implementing the Work in full compliance with all applicable laws and the contract documents and shall supervise and direct the Work using the best skill and attention to assure that each element of the Work conforms to the Contract requirements. The Contractor is solely responsible for all construction means, methods, techniques, safety, sequences, coordination and procedures. ***The Contractor is responsible for visiting the site and being familiar with local conditions such as the location, accessibility, and general character of the site and/or building.***

3.3.1 Project Administration. The Contractor shall provide project administration for all Subcontractors, vendors, suppliers, and others involved in implementing the Work and shall coordinate administration efforts with those of the AE and ODR in accordance with these General Conditions and provisions of Division 1 Specifications, and as outlined in the Pre-construction Conference.

3.3.1.1 The Contractor shall furnish to the ODR one copy of the current edition of Means Facility Cost Data at no additional cost. This document shall be in either hard copy format or electronic CD, at option of the ODR.

3.3.1.2 The Contractor shall furnish to the ODR one copy of the current edition of the "Rental Rate Blue Book for Construction Mobilization Costs" at no additional cost. This document shall be in either hard copy format or electronic CD, at option of the ODR.

3.3.2 Contractor's Superintendent. Employ a competent resident superintendent who will be present at the Project Site during the progress of the Work. The superintendent is subject to the approval of the ODR. Do not change approved superintendents during the course of the project without the written approval of the ODR unless the superintendent leaves the employ of the Contractor.

3.3.3 Labor. Provide competent, suitably qualified personnel to survey, lay-out, and construct the Work as required by the Contract Documents. Maintain good discipline and order at the Site at all times.

3.3.4 Services, Materials, and Equipment. Unless otherwise specified, 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, incidentals, and services necessary for the construction, performance, testing, start-up, inspection and completion of the Work.

3.3.5 Non-Compliant Work. Should the AE and/or the ODR identify Work as non-compliant with the Contract Documents, the ODR will communicate the finding to the Contractor and the Contractor will correct such Work at its expense. The approval of Work by either the AE or ODR does not relieve the Contractor from the obligation to comply with all requirements of the Contract Documents.

3.3.6 Subcontractors. Do not employ any Subcontractor, supplier or other person or organization, whether initially or as a substitute, against whom the Owner may have reasonable objection. The Owner will communicate such objections in writing. The Contractor is not required to employ any Subcontractor, supplier or other person or organization to furnish any of the work to whom the Contractor has reasonable objection. The Contractor will not substitute Subcontractors without the acceptance of the Owner.

3.3.6.1 All Subcontracts and supply contracts shall be consistent with and bound to the terms and conditions of the Contract Documents including provisions of the Agreement between the Contractor and the Owner.

3.3.6.2 The Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the Contractor. Require all Subcontractors, suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with Owner only through the Contractor. Furnish to the Owner a copy of each first-tier subcontract promptly after its execution. The Contractor agrees that the Owner has no obligation to review or approve the content of such contracts and that providing the Owner such copies in no way relieves the Contractor of any of the terms and conditions of the Contract, including, without limitation, any provisions of the Contract which require the Subcontractor to be bound to the Contractor in the same manner in which the Contractor is bound to the Owner.

3.3.7 Continuing the Work. Carry on the Work and adhere to the progress schedule during all disputes, disagreements or alternative resolution processes with the Owner. Do not delay or postpone any Work because of the pending resolution of any disputes, disagreements or processes, except as the Owner and the Contractor may agree in writing.

3.3.8 Cleaning. At all times, keep the Site and the Work clean and free from accumulation of waste materials or rubbish caused by the construction activities under the Contract. The Contractor shall ensure that the entire Project is thoroughly cleaned prior to requesting Substantial Completion Inspection and, again, upon completion of the Project prior to the final inspection.

3.3.9 Acts and Omissions of Contractor, its Subcontractors and Employees. The Contractor is responsible for acts and omissions of his employees and all its Subcontractors, their agents and employees. The Owner may, in writing, require the Contractor to remove from the Project any of Contractor's or its Subcontractors employees that the ODR finds to be careless, incompetent, or otherwise objectionable.

3.3.10 Indemnification of Owner. The Contractor covenants and agrees to FULLY INDEMNIFY and HOLD HARMLESS, the Owner and the elected officials, employees, officers, directors, volunteers, and representatives of the Owner,

individually or collectively, from and against any and all costs, claims, liens, damages, losses, expenses, fees, fines, penalties, proceedings, actions, demands, causes of action, liability and suits of any kind and nature, including but not limited to, personal or bodily injury, death and property damage, made upon the Owner directly or indirectly arising out of, resulting from or related to Contractor's activities under this Contract, including any acts or omissions of Contractor, any agent, officer, director, representative, employee, consultant or the Subcontractor of Contractor, and their respective officers, agents, employees, directors and representatives while in the exercise of performance of the rights or duties under this Contract. The indemnity provided for in this paragraph does not apply to any liability resulting from the negligence of the Owner, officers or employees, separate Contractor s or assigned Contractors, in instances where such negligence causes personal injury, death or property damage. IN THE EVENT CONTRACTOR AND OWNER ARE FOUND JOINTLY LIABLE BY A COURT OF COMPETENT JURISDICTION, LIABILITY WILL BE APPORTIONED COMPARATIVELY IN ACCORDANCE WITH THE LAWS OF THE STATE OF TEXAS, WITHOUT WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO THE STATE UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW.

3.3.10.1 The provisions of this Indemnification are solely for the benefit of the parties hereto and not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

3.3.10.2 Promptly advise the Owner in writing of any claim or demand against the Owner or the Contractor known to the Contractor related to or arising out of the Contractor's activities under this Contract.

3.3.11 Ancillary Areas. Operate and maintain operations and associated storage areas at the site of the Work in accordance with the following:

3.3.11.1 Confine all Contractor operations, including storage of materials and employee parking upon the Site of Work, to areas designated by the Owner.

3.3.11.2 The Contractor may erect, at its own expense, temporary buildings that will remain its property. Remove such buildings and associated utility service lines upon completion of the Work, unless the Contractor requests and the Owner provides written consent that it may abandon such buildings and utilities in place.

3.3.11.3 Use only established roadways or construct and use such temporary roadways as may be authorized by the Owner. Do not allow load limits of vehicles to exceed the limits prescribed by appropriate regulations or law. Provide protection to road surfaces, curbs, sidewalks, trees, shrubbery, sprinkler s, drainage structures and other like existing improvements to prevent damage and repair any damage thereto at the expense of the Contractor.

3.3.11.4 The Owner may restrict the Contractor's entry to the site to specifically assigned entrances and routes.

3.3.12 Separate Contracts. Additional Contractor responsibilities when the Owner awards separate Contracts

3.3.12.1 The Owner reserves the right to award other contracts in connection with other portions of the Project under these or similar contract conditions.

3.3.12.2 The Owner reserves the right to perform operations related to the Project with the Owner's own forces.

3.3.12.3 Under a separate contract, the conditions described herein continue to apply except as may be amended by change order.

3.3.12.4 ***The Contractor shall cooperate with other Contractors employed on the project by the Owner, including providing access to site and project information as requested.***

Article 4. Small Business (SB) Subcontracting Plan

4.1. General Description. The purpose of the Small Business (SB) Program is to promote equal business opportunities for economically disadvantaged businesses to contract with the HCC in accordance with the goals specified in HCC Small Business Requirements.

4.1.1 State agencies are required by statute to make a good faith effort to assist SBs in participating in contract awards issued by the State. 1 TAC §111.11-111.28, outline the state's policy to encourage outreach to and potential utilization of SBs in state contracting opportunities through race, ethnic and gender neutral means.

4.1.2 A Contractor who contracts with the HCC in an amount of \$100,000 is required to make a good faith effort to award subcontracts to SBs in accordance with HCC Board policy by submitting a SB Subcontracting Plan at the time of bidding and complying with the SB Subcontracting Plan after it is accepted by the Owner and during the term of the contract.

4.2. Compliance with Approved SB Subcontracting Plan. Contractor, having been awarded this Contract in part by complying with the SB Program policies, hereby covenants to continue to comply with the SB Program as follows:

4.2.1 Prior to substituting a SB Subcontracting Plan the Contractor will promptly notify the Owner in the event a change is required for any reason; the Owner must approve and accept the substituted SB Subcontracting Plan.

4.2.2 Conduct the good faith effort activities required and provide the Owner with necessary documentation to justify approval of a change to the approved SB Subcontracting Plan.

4.2.3 Cooperate in the execution of a Change Order or such other approval of the change in the SB Subcontracting Plans as the Contractor and Owner may agree to.

4.2.4 Maintain and make available to Owner upon request business records documenting compliance with the accepted SB Subcontracting Plan.

4.2.5 Upon receipt of payment for performance of Work, submit to Owner a compliance report, in the format required by the Owner that demonstrates Contractor's performance of the SB Subcontracting Plan.

4.2.6 Promptly and accurately explain and provide supplemental information to Owner to assist in the Owner's investigation of the Contractor's good faith effort to fulfill the SB Subcontracting Plan and the requirements under 1 TAC §111.14.

4.3. Failure to Demonstrate Good Faith Effort. Upon a determination by Owner that Contractor has failed to demonstrate a good faith effort to fulfill the SB Subcontracting Plan or any contract covenant detailed above, the Owner may, in addition to all other remedies available to it, may bar the Contractor from future contracting opportunities with the Owner.

Article 5. Bonds & Insurance

5.1. Construction Bonds. The Contractor is required to tender to Owner, prior to commencing the Work, performance and payment bonds, as required by Tex. Gov't Code, Chapter 2253.

5.1.1. A Performance Bond is required if the Contract Price is in excess of \$100,000. The Performance Bond is solely for the protection of the Owner. The Performance Bond is to be for the Contract Sum to guarantee the faithful performance of the Work in accordance with the Contract Documents. The form of the bond shall be approved by the bond approved by Attorney General of Texas. The Performance Bond shall be effective through the Contractor's warranty period.

5.1.2. A Payment Bond is required if the Contract Price is in excess of \$25,000. The payment bond is to be for the Contract Sum and is payable to the Owner solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the Contractor or a Subcontractor. The form of the bond shall be the bond approved by the Attorney General of Texas.

5.1.3. Bond Requirements. Each bond shall be executed by a corporate surety or sureties authorized to do business in the State of Texas and acceptable to the Owner, on the Owner's form, and in compliance with the relevant provisions of the Texas Insurance Code. If any bond is for more than 10 percent of the surety's capital and surplus, the Owner may require certification that the company has reinsured the excess portion with one or more reinsurers authorized to do business in the State. A reinsurer may not reinsure for more than 10 percent of its capital and surplus. If a surety upon a bond loses its authority to do business in the State, the Contractor shall, within thirty (30) days after such loss, furnish a replacement bond at no added cost to the Owner.

5.1.4. Power of Attorney. Each bond shall be accompanied by a valid Power-of-Attorney (issued by the surety company and attached, signed and sealed with the corporate embossed seal, to the bond) authorizing the attorney in fact who signs the bond to commit the company to the terms of the bond, and stating any limit in the amount for which the attorney can issue a single bond.

5.1.5. Bond Indemnification. The process of requiring and accepting bonds and making claims thereunder shall be conducted in compliance with Tex. Gov't Code, Chapter 2253. IF FOR ANY REASON A STATUTORY PAYMENT OR PERFORMANCE BOND IS NOT HONORED BY THE SURETY, THE CONTRACTOR SHALL FULLY INDEMNIFY AND HOLD THE OWNER HARMLESS OF AND FROM ANY COSTS, LOSSES, OBLIGATIONS OR LIABILITIES IT INCURS AS A RESULT.

5.1.6. Furnishing Bond Information. Owner shall furnish certified copies of the payment bond and the related Contract to any qualified person seeking copies who complies with Tex. Gov't Code, §2253.026.

5.1.7. Claims on Payment Bonds. Claims on payment bonds must be sent directly to the Contractor and his surety in accordance with Tex. Gov't Code § 2253.041. All Payment Bond claimants are cautioned that no lien exists on the funds unpaid to the Contractor on such Contract, and that reliance on notices sent to the Owner may result in loss of their rights against the Contractor and/or his surety. The Owner is not responsible in any manner to a claimant for collection of unpaid bills, and accepts no such responsibility because of any representation by any agent or employee.

5.1.8. Payment Claims when Payment Bond not Required. The rights of Subcontractors regarding payment are governed by Tex. Prop. Code, §§ 53.231 – 53.239 when the value of the Contract between the Owner and the Contractor is less than \$25,000.00. These provisions set out the requirements for filing a valid lien on funds unpaid to the Contractor as of the time of filing the claim, actions necessary to release the lien and satisfaction of such claim.

5.1.9 Sureties shall be listed on the US Department of the Treasury's Listing Approved Sureties stating companies holding Certificates of Authority as A-acceptable sureties on Federal Bonds and acceptable reinsuring companies (Department Circular 570).

5.2. Insurance Requirements.

The Contractor shall carry insurance in the types and amounts indicated in this Article for the duration of the Contract. The required insurance shall include coverage for Owner's property in the care, custody and control of Contractor prior to construction, during construction and during the warranty period. The insurance shall be evidenced by delivery to the Owner of certificates of insurance executed by the insurer or its authorized agent stating coverages, limits, expiration dates and compliance with all applicable required provisions. Upon request, the Owner, and/or its agents, shall be entitled to receive without expense, copies of the policies and all endorsements. The Contractor shall update all expired policies prior to submission for monthly payment. Failure to update policies shall be reason for withholding of payment until renewal is provided to the Owner.

5.2.1. The Contractor shall provide and maintain the insurance coverage with the minimum amounts described below until the end of the warranty period unless otherwise stated in Supplementary General Conditions. Failure to maintain insurance coverage, as required, is grounds for Suspension of Work for Cause pursuant to Article 14. The Contractor will be notified of the date on which the Builder's Risk insurance policy may be terminated through Substantial Completion Notices, Acceptance Notices and/or other means as deemed appropriate by the Owner.

5.2.2. Coverage shall be written on an occurrence basis by companies authorized and admitted to do business in the State of Texas and rated A- or better by A.M. Best Company or otherwise acceptable to Owner.

5.2.2.1. Insurance coverage required includes:

5.2.2.1.1. Workers' Compensation. Insurance with limits as required by the Texas Workers' Compensation Act, with the policy endorsed to provide a waiver of subrogation as to the Owner, Employer's Liability insurance of not less than:

\$1,000,000 each accident

\$1,000,000 disease each employee

\$1,000,000 disease policy limit

5.2.2.1.2. Commercial General Liability Insurance. Including Independent Contractor's liability, Products and Completed Operations and Contractual Liability, covering, but not limited to, the liability assumed under the indemnification provisions of this contract, fully insuring Contractor's (or Subcontractors) liability for bodily injury and property damage with a combined bodily injury (including death) and property damage minimum limit of :

\$1,000,000 per occurrence

\$1,000,000 general aggregate

\$1,000,000 products and completed operations aggregate

Coverage shall be on an "occurrence" basis.

The policy shall include coverage extended to apply to completed operations and explosion, collapse, underground hazards. The policy shall include endorsement CG2503 Amendment-Aggregate Limits of Insurance (Per Project) or its equivalent.

5.2.2.1.3. Asbestos Abatement Liability Insurance, including coverage for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos containing materials. *This requirement applies if the Work or the Project includes asbestos containing materials.

The Combined single limit for bodily injury and property damage will be a minimum of \$1,000,000 per occurrence.

*Specific Requirement for Claims-Made Form: Required period of coverage will be determined by the following formula: Continuous coverage for life of the contract, plus one (1) year (to provide coverage for the warranty period), and an extended discovery period for a minimum of five (5) years which shall begin at the end of the warranty period.

If this contract is for asbestos abatement only, the All-Risk Builder's Risk or All-Risk Installation Floater (e) is not required.

5.2.2.1.4. Comprehensive Automobile Liability Insurance, covering owned, hired, and non-owned vehicles, with a combined bodily injury (including death) and property damage minimum limit of \$1,000,000 per occurrence. No aggregate shall be permitted for this type of coverage.

Such insurance is to include coverage for loading and unloading hazards.

5.2.2.1.5. All Risk Builder's Risk Insurance (or All Risk Installation Floater for instances in which the project involves solely the installation of equipment). Coverage shall be All-Risk, including, but not limited to, Fire, Extended Coverage, Vandalism and Malicious Mischief, Flood, Earthquake, Theft and damage resulting from faulty workmanship, design or materials. If Builder's Risk, limit shall be equal to 100 percent of the contract. If Installation Floater, limit shall be equal to 100 percent of the contract cost. The policy shall be written jointly in the names of the Owner, the Contractor, Subcontractors and, Subsubcontractors shall be named as additional insured. The policy shall have endorsements as follows:

5.2.2.1.5.1. This insurance shall be specific as to coverage and not contributing insurance with any permanent insurance maintained on the property.

5.2.2.1.5.2. This insurance shall not contain an occupancy clause suspending or reducing coverage should the Owner occupy, or begin beneficial occupancy before the Owner has accepted final completion.

5.2.2.1.5.3. Loss, if any, shall be adjusted with and made payable to the Owner as Trustee for the insureds as their interests may appear; the right of subrogation under the Builder's Risk policy shall be waived as to the Owner. The Owner shall be named as Loss Payee. For renovation projects or projects that involve portions of work contained within an existing structure, refer to Special Conditions for possible additional Builder's Risk insurance requirements.

5.2.2.1.6. "Umbrella" Liability Insurance. The Contractor shall obtain, pay for and maintain umbrella liability insurance during the contract term, insuring the Contractor (or Subcontractor) for an amount of not less than amount specified in the Supplementary General Conditions or Special Conditions that provides coverage at least as broad as and applies in excess and follows form of the primary liability coverages required hereinabove. The policy shall provide "drop down" coverage where underlying primary insurance coverage limits are insufficient or exhausted.

If this contract is for asbestos abatement only, the "Umbrella" Excess Liability is not required

5.2.3. Policies must include the following clauses, as applicable:

5.2.3.1. This insurance shall not be canceled, materially changed, or non-renewed until after thirty (30) days prior written notice has been given to the Owner.

5.2.3.2. It is agreed that the Contractor's insurance shall be deemed primary with respect to any insurance or self insurance carried by the Owner for liability arising out of operations under the Contract with the Owner.

5.2.3.3. The Owner, its officials, directors, employees, representatives, and volunteers are added as additional insureds as respects operations and activities of, or on behalf of the named insured performed under contract with the Owner. The additional insured status must cover completed operations as well. This is not applicable to the workers' compensation policy.

5.2.3.4. The workers' compensation and employers' liability policy will provide a waiver of subrogation in favor of the Owner.

5.2.4. Without limiting any of the other obligations or liabilities of the Contractor, the Contractor shall require each Subcontractor performing work under the Contract, at the Subcontractor's own expense, to maintain during the term of the Contract, the same stipulated minimum insurance including the required provisions and additional policy conditions as shown above. As an alternative, the Contractor may include its Subcontractors as additional insured on its own coverage as prescribed under these requirements. The Contractor's certificate of insurance shall note in such event that the Subcontractors are included as additional insured's and that Contractor agrees to provide Workers' Compensation for the Subcontractors and their employees. The Contractor shall obtain and monitor

the certificates of insurance from each Subcontractor in order to assure compliance with the insurance requirements. The Contractor must retain the certificates of insurance for the duration of the Contract plus 5 years and shall have the responsibility of enforcing these insurance requirements among its Subcontractors. The Owner shall be entitled, upon request and without expense, to receive copies of these certificates.

5.2.5. Workers' Compensation Insurance Coverage must meet the statutory requirements of the Tex. Lab. Code, §401.011(44) and specific to construction projects for public entities as required by Tex. Lab. Code, §406.096.

A. Definitions:

Certificate of coverage ("certificate")- A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

Duration of the project - includes the time from the beginning of the work on the project until the Contractor's/person's work on the project has been completed and accepted by the governmental entity.

Persons providing services on the project ("Subcontractor" in §406.096) - includes all persons or entities performing all or part of the services the Contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the Contractor and regardless of whether that person has employees. This includes, without limitation, independent Contractors, Subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

B. The Contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the Contractor providing services on the project, for the duration of the project.

C. The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

D. If the coverage period shown on the Contractor's current certificate of coverage ends during the duration of the project, the Contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

E. The Contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

(1) a certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

(2) no later than seven days after receipt by the Contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

F. The Contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

G. The Contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the Contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

H. The Contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

I. The Contractor shall contractually require each person with whom it contracts to provide services on a project, to:

(1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;

(2) provide to the Contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

(3) provide the Contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(4) obtain from each other person with whom it contracts, and provide to the Contractor:

(a) a certificate of coverage, prior to the other person beginning work on the project; and

(b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(5) retain all required certificates of coverage on file for the duration of the project and for one year thereafter;

(6) notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

(7) contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificates of coverage to be provided to the person for whom they are providing services.

J. By signing this contract or providing or causing to be provided a certificate of coverage, the Contractor is representing to the governmental entity that all employees of the Contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the Contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

K. The Contractor's failure to comply with any of these provisions is a breach of contract by the Contractor which entitles the governmental entity to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

Article 6. Contract Documents

6.1. Drawings and Specifications

6.1.1 Copies Furnished. The Contractor will be furnished, free of charge, the number of complete sets of the Drawings and Specifications as provided in the Supplementary General Conditions or Special Conditions. Additional complete sets of Drawings and Specifications, if requested, will be furnished at reproduction cost to the one requesting such additional sets.

6.1.2 Ownership of Drawings and Specifications. All Drawings, Specifications and copies thereof furnished by the AE are to remain A/E's property. These documents are not to be used on any other project, and with the exception of one Contract set for each party to the Contract, are to be returned to the Architect/Engineer, upon request, following completion of the Work.

6.1.3 Interrelation of Documents. The Contract Documents as referenced in the Agreement between the Owner and the Contractor are complimentary, and what is required by one shall be as binding as if required by all.

6.1.4 Resolution of Conflicts in Documents. Where conflicts may exist between and/or within the Contract Documents, the higher quality, greater quantity, more restrictive, and/or more expensive requirement shall be **required**. The Contractor shall notify the AE and the ODR **of any conflict before** executing the work in question.

6.1.5 Contractor's Duty to Review Contract Documents. In order to facilitate its responsibilities for completion of the Work in accordance with and as reasonably inferable from the Contract Documents, prior to pricing or commencing the Work, the Contractor shall examine and compare the Contract Documents, information furnished by the Owner, relevant field measurements made by the Contractor and any visible or reasonably anticipated conditions at the site affecting the Work. This duty extends throughout the construction phase prior to commencing each particular work activity and/or installation.

6.1.6 Discrepancies and Omissions in Drawings and Specifications

6.1.6.1 ***The Owner does not warrant or make any representations as to the accuracy or completeness of the information furnished to the Contractor by the Owner.*** The Contractor shall promptly report to the ODR and to the AE the discovery of any apparent error, omission or inconsistency in the Contract Documents prior to execution of the Work.

6.1.6.2 It is recognized that the Contractor is not acting in the capacity of a licensed design professional, unless it is performing as a Design-Build firm.

6.1.6.3 It is further recognized that the Contractor's examination of contract documents is to facilitate construction and does not create an affirmative responsibility to detect errors, omissions or inconsistencies or to ascertain compliance with applicable laws, building codes or regulations, unless it is performing as a Design-Build firm or a Contractor.

6.1.6.4 When performing as a Design-Build firm, the Contractor has sole responsibility for discrepancies, errors, and omissions in the drawings and specifications.

6.1.6.5 When performing as a Contractor, the Contractor has a shared responsibility for discovery and resolution of discrepancies, errors, and omissions in the Contract Documents. In such case, the Contractor's responsibility pertains to review, coordination, and recommendation of resolution strategies within budget constraints, but does not establish a liability for design.

6.1.6.6 The Contractor has no liability for errors, omissions, or inconsistencies unless the Contractor knowingly failed to report a recognized problem to the Owner or the Work is executed under a Design-Build or Contractor contract as outlined above. Should the Contractor fail to perform the examination and reporting obligations of these provisions, the Contractor is responsible for avoidable costs, direct, and/or consequential damages.

6.2 Requirements for Record Documents

Maintain at the Site one copy of all Drawings, Specifications, addenda, approved Submittals, Contract modifications, and all Project correspondence. Keep current and maintain Drawings and Specifications in good order with postings and markings to record actual conditions of Work and show and reference all changes made during construction. Provide Owner and AE access to these documents.

6.2.1 Maintain this record set of Drawings and Specifications which reflect the "As Constructed" conditions and representations of the Work performed, whether it be directed by addendum, Change Order or otherwise. Make available all records prescribed herein for reference and examination by the Owner and its representatives and agents.

6.2.2 Update the "As-Constructed" Drawings and Specifications monthly prior to submission of periodic partial pay estimates. Failure to maintain such records constitutes cause for denial of a progress payment otherwise due.

6.2.3 Prior to requesting Substantial Completion Inspection by the ODR and AE, furnish a complete set of the marked up "As-Constructed" set maintained at the site and one photocopy of same. Concurrently with furnishing these record drawings, furnish a preliminary copy of each operating and maintenance manual (O&M) required by the Contract Documents, for review by the AE and the ODR.

6.2.4 Once determined acceptable, provide mylar prints of professionally drafted "As-Constructed" drawings, along with electronic copy on CD, "As-Constructed" specifications in bound volume(s) along with electronic copy on CD, two sets of photocopies or prints of the mylar "As-Constructed" drawings, two sets of operating and maintenance manuals, two sets of approved submittals, and other record documents as required elsewhere in the Contract Documents. ***All electronic copies shall be provided in a format acceptable to the ODR.***

Article 7. Construction Safety

7.1. General. It is the duty and responsibility of the Contractor and all of its Subcontractors to be familiar with, enforce and comply with all requirements of Public Law 91-596, 29

U.S.C. §§651 et. seq., the Occupational Safety and Health Act of 1970, (OSHA) and all amendments thereto. The Contractor shall prepare a Safety Plan specific to the Project and submit it to the ODR and AE prior to commencing Work. In addition, the Contractor and all of its Subcontractors shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property to protect them from damage, injury or loss and erect and maintain all necessary

7.2. Notices. The Contractor shall provide notices as follows:

7.2.1 Notify owners of adjacent property including those that own or operate utility services and/or underground facilities, and utility owners, when prosecution of the Work may affect them or their facilities, and cooperate with them in the protection, removal, relocation and replacement, and access to their facilities and/or utilities.

7.2.2 Coordinate the 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 connection with laws and regulations. Maintain a complete file of MSDS for all materials in use on site throughout the construction phase and make such file available to the Owner and its agents as requested.

7.3. Emergencies. In any emergency affecting the safety of persons or property, the Contractor shall act to minimize, mitigate, and prevent threatened damage, injury or loss.

7.3.1 Have authorized agents of Contractor respond immediately upon call at any time of day or night when circumstances warrant the presence of Contractor to protect the Work or adjacent property from damage or to take such action pertaining to the Work as may be necessary to provide for the safety of the public.

7.3.2 Give the ODR and AE prompt notice of all such events.

7.3.3 If Contractor believes that any changes in the Work or variations from Contract Documents have been caused by its emergency response, promptly notify the Owner within 72 hours of the emergency response event.

7.3.4 Should Contractor fail to respond, Owner is authorized to direct other forces to take action as necessary and Owner may deduct any cost of remedial action from funds otherwise due the Contractor.

7.4. Injuries. In the event of an incident or accident involving outside medical care for an individual on or near the Work, Contractor shall notify the ODR and other parties as may be directed within twenty-four (24) hours of the event.

7.4.1 Record the location of the event and the circumstances surrounding it, by using photography or other means, and gather witness statements and other documentation which describes the event.

7.4.2 Supply the ODR and AE with an incident report no later than 36 hours after the occurrence of the event. In the event of a catastrophic incident (one fatality or three workers hospitalized), barricade and leave intact the scene of the incident until all investigations are complete. A full set of incident investigation

documents, including facts, finding of cause, and remedial plans shall be provided within one week after occurrence, unless otherwise directed by legal counsel. Contractor shall provide the ODR with written notification within one week of such catastrophic event if legal counsel delays submission of full report.

7.5. Environmental Safety. Upon encountering any previously unknown potentially hazardous material, or other materials potentially contaminated by hazardous material, Contractor shall immediately stop work activities impacted by the discovery, secure the affected area, and notify the ODR immediately.

7.5.1 Bind all Subcontractors to the same duty.

7.5.2 Upon receiving such notice, the ODR will promptly engage qualified experts to make such investigations and conduct such tests as may be reasonably necessary to determine the existence or extent of any environmental hazard. Upon completion of this investigation, the ODR will issue a written report to the Contractor identifying the material(s) found and indicate any necessary steps to be taken to treat, handle, transport or dispose of the material.

7.5.3 The Owner may hire third-party Contractors to perform any or all such steps.

7.5.4 Should compliance with the ODR's instructions result in an increase in the Contractor's cost of performance, or delay the Work, the Owner will make an equitable adjustment to the Contract price and/or the time of completion, and modify the Contract in writing accordingly.

7.6. Trenching Plan. When the project requires excavation which either exceeds a depth of four feet, or results in any worker's upper body being positioned below grade level, the Contractor is required to submit a trenching plan to the ODR prior to commencing trenching operations. The plan is required to be prepared and sealed by a professional engineer registered in the State of Texas, and employed by the Contractor. Said engineer cannot be anyone who is otherwise either directly or indirectly engaged on this project.

Article 8. Quality Control

8.1. Materials & Workmanship. The Contractor shall execute Work in a good and workmanlike manner in accordance with the Contract Documents. The Contractor shall develop and provide a Quality Control Plan specific to this project and acceptable to the Owner. Where Contract Documents do not specify quality standards, complete and construct all Work in compliance with generally accepted construction industry standards. Unless otherwise specified, incorporate all new materials and equipment into the Work under the Contract.

8.2. Testing

8.2.1 Contractor Testing. The Contractor is responsible for coordinating and paying for all routine and special tests required to confirm compliance with quality and performance requirements of the Contract Documents. This "quality control" testing shall include any particular testing required by the Specifications and the following general tests.

8.2.1.1. Any test of basic material or fabricated equipment included as part of a submittal for a required item in order to establish compliance with the Contract Documents.

8.2.1.2 Any test of basic material or fabricated equipment offered as a substitute for a specified item on which a test may be required in order to establish compliance with the Contract Documents.

8.2.1.3 Routine, preliminary, start-up, pre-functional and operational testing of building equipment and s as necessary to confirm operational compliance with requirements of the Contract Documents.

8.2.1.4 All subsequent tests on original or replaced materials conducted as a result of prior testing failure.

8.2.2 Owner Testing. The Owner reserves the right to subject materials and s incorporated into the Project to routine tests as may be specified or as deemed necessary by the ODR or the AE to ensure compliance with the quality and/or performance requirements of the Contract Documents and/or with laws, ordinances, rules, regulations and/or orders of any public authority having jurisdiction. The results of such “quality assurance” testing will be provided to the Contractor and, to the extent provided, the Contractor may rely on findings.

8.2.3 All testing shall be performed in accordance with standard test procedures by an accredited laboratory, or special consultant as appropriate, acceptable to the Owner. Results of all tests shall be provided promptly to the ODR, Architect/Engineer and the Contractor.

8.2.4 Non-Compliance (Test Results). Should any of the tests indicate that a material and/or does not comply with the contract requirements, the burden of proof remains with the Contractor, subject to:

8.2.4.1 Contractor selection and submission of the laboratory for Owner acceptance.

8.2.4.2 Acceptance by the Owner of the quality and nature of tests.

8.2.4.3 All tests taken in the presence of the Architect/Engineer and/or ODR, or their representatives.

8.2.4.4 If tests confirm that the material/s comply with Contract Documents, the Owner will pay the cost of the test.

8.2.4.5 If tests reveal noncompliance, the Contractor will pay those laboratory fees and costs of that particular test and all future tests, of that failing Work, necessary to eventually confirm compliance with Contract Documents.

8.2.4.6 Proof of noncompliance with the Contract Documents will make the Contractor liable for any corrective action which the ODR determines appropriate, including complete removal and replacement of noncompliant work or material.

8.2.5 Notice of Testing. The Contractor shall give the ODR and the AE timely notice of its readiness and the date arranged so the ODR and AE may observe such inspection, testing or approval.

8.2.6 Test Samples. The Contractor is responsible for providing samples of sufficient size for test purposes and for coordinating such tests with their Work Progress Schedule to avoid delay.

8.2.7 Covering Up Work - If the Contractor covers up any Work without providing the Owner an opportunity to inspect, the Contractor shall, if requested by ODR, uncover and recover the work at Contractor’s expense.

8.3 Submittals

8.3.1 Contractor's Submittals. Submit with reasonable promptness consistent with the Project Schedule and in orderly sequence all Shop Drawings, Samples, or other information required by the Contract Documents, or subsequently required by Change Order. Prior to submitting, the Contractor shall review each submittal for compliance with Contract Documents and certify by approval stamp affixed to each copy. Submittal data presented without the Contractor's certification will be returned without review or comment, and any delay resulting from such certification is the Contractor's responsibility.

8.3.1.1 Within twenty-one (21) calendar days of the effective date of the Notice To Proceed with construction, submit to the ODR, and the AE, a submittal schedule/register, organized by specification section, listing all items to be furnished for review and approval by the Architect/Engineer and Owner. The list shall include shop drawings, manufacturer's literature, certificates of compliance, materials samples, materials colors, guarantees, and all other items identified throughout the specifications.

8.3.1.2 Indicate the type of item, contract requirements reference, and Contractor's scheduled dates for submitting the item along with the requested dates for approval answers from the Architect/Engineer and Owner. The submittal register shall indicate the projected dates for procurement of all included items and shall be updated at least monthly with actual approval and procurement dates. Show and allow a minimum of thirty (30) calendar days duration after receipt by the Architect/Engineer and ODR for review and approval. If re-submittal is required, allow a minimum of an additional fifteen (15) calendar days for review. Submit the updated submittal register with each request for progress payment. The Owner may establish routine review procedures and schedules for submittals at the preconstruction conference and/or elsewhere in the Contract Documents. ***Failure to update and provide the submittal schedule/register as required shall constitute cause for Owner to withhold payment otherwise due.***

8.3.1.3 Coordinate the submittal register with the Work Progress Schedule. Do not schedule Work requiring a submittal to begin prior to scheduling review and approval of the related submittal. Revise and/or update both schedules monthly to ensure consistency and current project data. Provide to the ODR the updated submittal register and schedule with each application for progress payment. Refer to requirements for the Work Progress Schedule for inclusion of procurement activities therein. Regardless, the submittal register shall identify dates submitted and returned and shall be used to confirm status and disposition of particular items submitted, including approval or other action taken and other information not conveniently tracked through the Work Progress Schedule.

8.3.1.4 By submitting Shop Drawings, Samples or other required information, the Contractor represents and certifies that they have determined and verified all applicable field measurements, field construction criteria, materials, catalog numbers and similar data; and has checked and coordinated each Shop Drawing and Sample with the requirements of the Work and the Contract Documents.

8.3.2 Review of Submittals. AE and ODR review is only for conformance with the design concept and the information provided in the Contract Documents. Responses to submittals will be in writing. The approval of a separate item does

not indicate approval of an assembly in which the item functions. The approval of a submittal does not relieve the Contractor of responsibility for any deviation from the requirements of the Contract unless the Contractor informs the AE and ODR of such deviation in a clear, conspicuous, and written manner on the submittal transmittal and at the time of submission, and obtains the Owner's written specific approval of the particular deviation.

8.3.3 Correction and Resubmission. Make any corrections required to a submittal and resubmit the required number of corrected copies promptly so as to avoid delay, until submittal approval. Direct attention in writing to the AE and the ODR, when applicable, to any new revisions other than the corrections requested on previous submissions.

8.3.4 Limits on Shop Drawing Approvals. The Contractor shall not commence any Work requiring a submittal until approval of the submittal. Construct all such work in accordance with approved submittals. Approval of Shop Drawings and Samples is not authorization to Contractor to perform extra work or changed work unless authorized through a Change Order. The AE's and ODR's approval, if any, does not relieve Contractor from responsibility for defects in the Work resulting from errors or omissions of any kind on the submittal, regardless of any approval action.

8.3.5 No Substitutions Without Approval. The ODR and the AE may receive and consider the Contractor's request for substitution when the Contractor agrees to reimburse the Owner for review costs and satisfies 8.3.5.1, 8.3.5.2, and 8.3.5.3 in combination with one or more of the items in 8.3.5.4 through 8.3.5.11 of the following conditions, as determined by the Owner. If the Contractor does not satisfy these conditions, the ODR and AE will return the request without action except to record noncompliance with these requirements. The Owner will not consider the request if the Contractor cannot provide the product or method because of failure to pursue the Work promptly or coordinate activities properly.

8.3.5.1 The Contract Documents do not require extensive revisions.

8.3.5.2 Proposed changes are in keeping with the general intent of the Contract Documents and the design intent of the AE and do not result in an increase in cost to the Owner.

8.3.5.3 The request is timely, fully documented, and properly submitted.

8.3.5.4 The Contractor cannot provide the specified product, assembly or method of construction within the Contract Time.

8.3.5.5 The request directly relates to an "or-equal" clause or similar language in the Contract Documents.

8.3.5.6 The request directly relates to a "product design standard" or "performance standard" clause in the Contract Documents.

8.3.5.7 The requested substitution offers the Owner a substantial advantage in cost, time, energy conservation or other considerations, after deducting additional responsibilities the Owner must assume.

8.3.5.8 The specified product or method of construction cannot receive necessary approval by an authority having jurisdiction, and the ODR can approve the requested substitution.

8.3.5.9 The Contractor cannot provide the specified product, assembly or method of construction in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.

8.3.6 Unauthorized Substitutions at Contractor's Risk. The Contractor is financially responsible for any additional costs or delays resulting from using materials, equipment or fixtures other than those specified. The Contractor shall reimburse the Owner for any increased design or contract administration costs resulting from such unauthorized substitutions.

8.4 Field Mock-up

8.4.1 Mockups shall be constructed prior to commencement of a specified scope of work to confirm acceptable workmanship.

8.4.1.1 As a minimum, field mock-ups shall be constructed for roofing s, exterior veneer / finishes, glazing, and any other Work requiring a mock-up as identified throughout the Contract Documents. Mockups for s not part of the project scope shall not be required.

8.4.1.2 Mock-ups may be incorporated into the Work if allowed by the Contract Documents and if acceptable to the ODR. If mock-ups are freestanding, they shall remain in place until otherwise directed by the Owner.

8.4.1.3 The Contractor shall include field mock-ups in their Work Progress Schedule and shall notify the ODR and Architect/Engineer of readiness for review sufficiently in advance to coordinate review without delay.

8.5 Inspection During Construction

8.5.1 The Contractor shall provide sufficient, safe, and proper facilities, including equipment as necessary for safe access, at all reasonable times for observation and/or inspection of the Work by the Owner and its agents.

8.5.2 The Contractor shall not cover up any work with finishing materials or other building components prior to providing the Owner and its agents an opportunity to perform an inspection of the Work.

8.5.2.1 Should corrections of the Work be required for approval, do not cover up corrected Work until the Owner indicates approval.

8.5.2.2 Provide notification of at least five (5) working days or otherwise as mutually agreed, to the ODR of the anticipated need for a cover up inspection. Should the ODR fail to make the necessary inspection within the agreed period, the Contractor may proceed with cover up Work, but is not relieved of responsibility for Work to comply with requirements of the Contract Documents.

Article 9. Project Scheduling Requirements

9.1. Contract Time. TIME IS AN ESSENTIAL ELEMENT OF THE CONTRACT. The Contract Time is the time between the dates indicated in the Notice to Proceed for commencement of the Work and for achieving Substantial Completion and Final Completion. The Contract Time can be modified only by Change Order.

Failure to achieve Substantial Completion within the Contract Time, Final Completion within thirty (30) days following Substantial Completion or as otherwise agreed to in writing will cause damage to the Owner and may subject the Contractor to Liquidated Damages as provided in the Contract Documents.

9.2. Notice to Proceed. The Owner will issue a Notice to Proceed which shall state the dates for beginning Work and for achieving Substantial Completion and Final Completion of the Work.

9.3. Work Progress Schedule. Refer to Special Conditions and Division 1 General Administration Specifications for additional schedule requirements. ***This Article pertains to construction phase schedules. Additional requirements for design phase scheduling for Contractor and Design Build contracts are outlined in Division 1 Project Planning and Scheduling Specification.*** Unless indicated otherwise in those documents, Contractor shall submit their initial Work Progress Schedule for the Work in relation to the entire Project not later than twenty-one (21) days after the effective date of the Notice to Proceed to the ODR and the AE. Unless otherwise indicated in the Contract Documents, the Work Progress Schedule shall be computerized Critical Path Method (CPM) with full reporting capability. This initial schedule shall indicate the dates for starting and completing the various aspects required to complete the Work, including mobilization, procurement, installation, testing, inspection, and acceptance of all the Work of the Contract. When acceptable to the Owner, the initially accepted schedule shall be the Baseline Schedule for comparison to actual conditions throughout the contract duration.

9.3.1 Schedule Requirements. Submit electronic and paper copy of the initial Work Progress Schedule reflecting accurate and reliable representations of the planned progress of the Work, the Work to date if any, and of the Contractor's actual plans for its completion. Organize and provide adequate detail so the Schedule is capable of measuring and forecasting the effect of delaying events on completed and uncompleted activities.

9.3.1.1 Re-submit initial Schedule as required to address review comments from AE and ODR until such Schedule is accepted as the Baseline Schedule.

9.3.1.2 Submittal of a schedule, schedule revision or schedule update constitutes the Contractor's representation to the Owner of the accurate depiction of all progress to date and that the Contractor will follow the schedule as submitted in performing the Work.

9.3.2 Schedule Updates. Update the Work Progress Schedule and the Submittal Schedule monthly, as a minimum, to reflect progress to date and current plans for completing the Work, and submit paper and electronic copy of the update to the AE and ODR as directed. The Owner has no duty to make progress payments unless accompanied by the updated Work Progress Schedule. Show the anticipated date of completion reflecting all extensions of time granted through Change Order as of the date of the update. The Contractor may revise the Progress Schedule logic only with the Owner's concurrence when in the Contractor's judgment it becomes necessary for the management of the Work. Identify all proposed changes to schedule logic to Owner and to the AE via an Executive Summary accompanying the updated schedule for review prior to implementation of revisions.

9.3.3 The Work Progress Schedule is for the Contractor's use in managing the Work and submittal of the Schedule, and successive updates or revisions, is for the information of the Owner and to demonstrate that the Contractor has complied with requirements for planning the Work. The Owner's acceptance of a schedule, schedule update or revision constitutes the Owner's agreement to

coordinate its own activities with the Contractor's activities as shown on the schedule.

9.3.3.1 Acceptance of the Work Progress Schedule, or update and/or revision thereto does not indicate any approval of the Contractor's proposed sequences and duration.

9.3.3.2 Acceptance of a Work Progress Schedule update or revision indicating early or late completion does not constitute the Owner's consent, alter the terms of the Contract, or waive either the Contractor's responsibility for timely completion or the Owner's right to damages for the Contractor's failure to do so.

9.3.3.3 The Contractor's scheduled dates for completion of any activity or the entire Work do not constitute a change in terms of the contract. Change Orders are the only method of modifying the completion Date(s) and Contract time.

9.4. Ownership of Float. Unless indicated otherwise in the Contract Documents, the Contractor shall develop the schedule and their execution plan to provide a minimum of 10 percent total float at the project level at acceptance of the Baseline Schedule. Float time contained in the Work Progress Schedule is not for the exclusive benefit of the Contractor or the Owner, but belongs to the Project and may be consumed by either party as needed on a first-used basis.

9.5. Completion of Work. The Contractor is accountable for completing the Work in the time stated in the Contract, or as otherwise amended by Change Order.

9.5.1 If, in the judgment of the Owner, the work is behind schedule and the rate of placement of work is inadequate to regain scheduled progress to insure timely completion of the entire work or a separable portion thereof, the Contractor, when so informed by the Owner, shall immediately take action to increase the rate of work placement by:

9.5.1.1 An increase in working forces.

9.5.1.2 An increase in equipment or tools.

9.5.1.3 An increase in hours of work or number of shifts.

9.5.1.4 Expedite delivery of materials.

9.5.1.5 Other action proposed if acceptable to Owner.

9.5.2 Within ten (10) calendar days after such notice from the ODR, the Contractor shall notify the ODR in writing of the specific measures taken and/or planned to increase the rate of progress. Include an estimate as to the date of scheduled progress recovery and an updated Work Progress Schedule illustrating the Contractor's plan for achieving timely completion of the project. Should the ODR deem the plan of action inadequate, take additional steps or make adjustments as necessary to its plan of action until it meets with the ODR's approval.

9.6 Modification of the Contract Time

9.6.1 Delays and extension of time as hereinafter described are valid only if executed in accordance with provisions set forth in Article 11.

9.6.2 When a delay defined herein as excusable prevents the Contractor from completing the Work within the Contract Time, the Contractor is entitled to an extension of time. The Owner will make an equitable adjustment and extend the number of calendar days lost because of excusable delay, as measured by the Contractor's progress schedule. All extensions of time will be granted in

calendar days. In no event, however, will an extension of time be granted for delays that merely extend the duration of non-critical activities, or which only consume float without delaying the project completion date.

9.6.2.1 "A Weather Day" is a day on which the Contractor's current schedule indicates Work is to be done, and on which inclement weather and related site conditions prevent the Contractor from performing seven continuous hours of Work between the hours of 7:00 a.m. and 6:00 p.m. Weather days are excusable delays. When weather conditions at the site prevent work from proceeding, immediately notify the ODR for confirmation of the conditions. At the end of each calendar month, submit to the ODR and AE a list of Weather Days occurring in that month along with documentation of the impact on critical activities. Based on confirmation by the ODR, any time extension granted will be issued by Change Order. If the Contractor and Owner cannot agree on the time extension, the Owner may issue a ULCO for fair and reasonable time extension.

9.6.2.2 Excusable Delay. The Contractor is entitled to an equitable adjustment of time, issued via change order, for delays caused by the following:

9.6.2.2.1 Errors, omissions and imperfections in design which the AE corrects by means of changes in the drawings and specifications.

9.6.2.2.2 Unanticipated physical conditions at the Site which the AE corrects by means of changes to the drawings and specifications or for which the ODR directs changes in the Work identified in the Contract Documents.

9.6.2.2.3 Changes in the Work that effect activities identified in the Contractor's schedule as "critical" to completion of the entire Work, if such changes are ordered by the ODR or the AE.

9.6.2.2.4 Suspension of Work for unexpected natural events (sometimes called "acts of God"), civil unrest, strikes or other events which are not within the reasonable control of the Contractor.

9.6.2.2.5 Suspension of Work for convenience of the ODR, which prevents Contractor from completing the Work within the Contract Time.

9.6.3 The Contractor's relief in the event of such delays is the time impact to the critical path as determined by analysis of the Contractor's schedule. In the event that the Contractor incurs additional direct costs because of the delay, they are to be determined pursuant to the provisions of Article 11.

9.7 **No Damages for Delay. The Contractor has no claim for monetary damages for delay or hindrances to the work from any cause except when the delay is solely caused by the Owner.**

9.8 Concurrent Delay. When the completion of the Work is simultaneously delayed by an excusable delay and a delay arising from a cause not designated as excusable, the Contractor may not be entitled to a time extension for the period of concurrent delay

9.9 Other Time Extension Requests. Time extensions requested in association with changes to the Work directed or requested by the Owner shall be included with the Contractor's proposed costs for such change. Time extensions requested for inclement weather are covered by paragraph 9.6.2.1 above. If the Contractor believes that the completion of the Work is delayed by a circumstance other than for changes directed to the Work or weather, they shall give the ODR written notice, stating the nature of the delay and the activities potentially affected, within five (5) calendar days after the onset of the event or circumstance giving rise to the excusable delay. Provide sufficient

written evidence to document the delay. In the case of a continuing cause of delay, only one **notice of delay** is necessary. State claims for extensions of time in numbers of whole or half calendar days.

9.9.1 Within ten (10) calendar days after the cessation of the delay, the Contractor shall formalize its request for extension of time in writing to include a full analysis of the schedule impact of the delay and substantiation of the excusable nature of the delay. All Changes to the Contract Time or made as a result of such claims is by Change Order, as set forth in Article 11.

9.9.2 No extension of time releases the Contractor or the Surety furnishing a performance or payment bond from any obligations under the contract or such a bond. Those obligations remain in full force until the discharge of the Contract.

9.9.3 Contents of Time Extension Requests. Provide with each Time Extension Request a quantitative demonstration of the impact of the delay on project completion time, based on the Work Progress Schedule. Include with Time Extension Requests a reasonably detailed narrative setting forth:

9.9.3.1 The nature of the delay and its cause; the basis of the Contractor's claim of entitlement to a time extension.

9.9.3.2 Documentation of the actual impacts of the claimed delay on the critical path indicated in the Contractor's Work Progress Schedule, and any concurrent delays.

9.9.3.3 Description and documentation of steps taken by the Contractor to mitigate the effect of the claimed delay, including, when appropriate, the modification of the Work Progress Schedule.

9.9.4 Owner's Response. The Owner will respond to the Time Extension Request by providing to the Contractor written notice of the number of days granted, if any, and giving its reason if this number differs from the number of days requested by the Contractor.

9.9.4.1 The Owner will not grant time extensions for delays that do not affect the Contract Completion Date.

9.9.4.2 The Owner will respond to each properly submitted Time Extension Request within fifteen (15) calendar days following receipt. If the Owner cannot reasonably make a determination about the Contractor's entitlement to a time extension within that time, the Owner will notify the Contractor in writing. Unless otherwise agreed by the Contractor, the Owner has no more than fifteen (15) additional calendar days to prepare a final response. If the Owner fails to respond within forty-five (45) calendar days from the date the Time Extension Request is received, the Contractor is entitled to a time extension in the amount requested.

9.10 Failure to Complete Work Within the Contract Time. **TIME IS OF THE ESSENCE OF THIS CONTRACT**. The Contractor's failure to substantially complete the Work within the Contract Time or to achieve final completion as required will cause damage to the Owner. These damages may be liquidated by agreement of the Contractor and the Owner, as set forth in the Contract Documents.

9.11 Liquidated Damages. The Owner may collect Liquidated Damages due from the Contractor directly or indirectly by reducing the contract sum in the amount of Liquidated Damages stated in the Contract Documents.

Article 10. Payments

10.1. Schedule of Values. The Contractor shall submit to the ODR and the AE for acceptance a Schedule of Values, or Work Breakdown, accurately itemizing material and labor for the various classifications of the Work based on the organization of the specification sections and using the same activity names and terms as the Work Progress Schedule. The accepted Schedule of Values will be the basis for the progress payments under the Contract.

10.1.1 No progress payments will be made prior to receipt and acceptance of the Schedule of Values, provided in such detail as required by the ODR, and submitted not less than twenty-one calendar (21) days prior to the first request for payment. The Schedule of Values shall follow the order of trade divisions of the specifications and include costs for general conditions, fees, contingencies, and Owner cash allowances, if applicable, so that the sum of the items will equal the contract price. As appropriate, assign each item labor and/or material values, the subtotal thereof equaling the value of the work in place when complete.

10.1.2 The Contractor shall retain a copy of all worksheets used in preparation of its bid or proposal, supported by a notarized statement that the worksheets are true and complete copies of the documents used to prepare the bid or proposal. Make the worksheets available to the ODR at the time of Contract execution. Thereafter grant the Owner during normal business hours access to said notarized copy of worksheets at any time during the period commencing upon execution of the Contract and ending one year after final payment.

10.2. Progress Payments. The Contractor will receive periodic progress payments for Work performed, materials in place, suitably stored on site, or as otherwise agreed to by the Owner and the Contractor. Payment is not due until receipt by the ODR or his designee of a correct and complete Pay Application in electronic and/or hard copy format as set forth in Supplementary General Conditions, Special Conditions or Division 1 Specifications, and certified by the AE. Progress payments are made provisionally and do not constitute acceptance of work not in accordance with the Contract Documents. The Owner will not process progress payment applications for Change Order work until all parties execute the Change Order.

10.2.1 Preliminary Pay Worksheet once each month that a progress payment is to be requested, the Contractor shall submit to the Architect/Engineer and the ODR a complete, clean copy of a preliminary pay worksheet or Preliminary Pay Application, to include the following:

10.2.1.1 The Contractor estimate of the amount of Work performed, labor furnished and materials incorporated into the Work, using the established Schedule of Values.

10.2.1.2 An updated Work Progress Schedule including the Executive Summary and all required schedule reports.

10.2.1.3 SB Subcontracting Plan reports.

10.2.1.4 Such additional documentation as Owner may require as set forth in the Supplementary General Conditions or elsewhere in the Contract Documents.

10.2.2 Contractor's Application for Progress Payment. As soon as practicable, but in no event later than seven days after receipt of the Preliminary Pay Worksheet, the AE and ODR will meet with the Contractor to review the Preliminary Pay Worksheet and to observe the condition of the Work. Based on this review, the ODR and the AE may require modifications to the Preliminary Pay Worksheet prior to the submittal of an application for progress payment, and will promptly notify the Contractor of revisions necessary for approval. As soon as practicable, the

Contractor shall submit its Invoice on the appropriate and completed form, reflecting the required modifications to the Schedule of Values required by the AE and/or ODR. Attach all additional documentation required by the ODR and/or AE, as well as an affidavit affirming that all payrolls, bills for labor, materials, equipment, subcontracted work and other indebtedness connected with the Contractor's invoice are paid or will be paid within the time specified in Tex. Gov't Code, Chapter 2251. No invoice is complete unless it fully reflects all required modifications, and attaches all required documentation including the Contractor's affidavit.

10.2.3 Certification by Architect/Engineer. Within five days or earlier following the AE's receipt of the Contractor's formal invoice, the AE will review the application for progress payment for completeness, and forward to the ODR. The AE will certify that the application is complete and payable, or that it is incomplete, stating in particular what is missing. If the Invoice is incomplete, the Contractor shall make the required corrections and resubmit the Invoice for processing.

10.3 Owner's Duty to Pay. The Owner has no duty to pay the Contractor except on receipt by the ODR of; 1) a complete Invoice certified by the AE and 2) the Contractor's updated Work Progress Schedule, and 3) confirmation that the Contractor's as-built documentation at the site is kept current.

10.3.1 Payment for stored materials and/or equipment confirmed by the Owner and AE to be on-site or otherwise properly stored may be limited to 85 percent of the invoice price or 85 percent of the scheduled value for the materials or equipment, whichever is less.

10.3.2 Retainage. The Owner will withhold from each progress payment, as retainage, 5 percent of the total earned amount, the amount authorized by law, or as otherwise set forth in the Supplementary General Conditions. Retainage is managed in conformance with Tex. Gov't Code, Chapter 2252, Government Code, subchapter B.

10.3.2.1 The Contractor shall provide written consent of its Surety for any request for reduction or release of retainage.

10.3.2.2 At least sixty-five (65) percent of the total Contract must be completed before the Owner can consider a retainage reduction or release.

10.3.3 Price Reduction to Cover Loss. The Owner may reduce any Periodic Invoice, or application for Progress Payment, prior to payment to the extent necessary to protect the Owner from loss on account of actions of the Contractor including, but not limited to:

10.3.3.1 Defective or incomplete Work not remedied.

10.3.3.2 Damage to Work of a separate Contractor.

10.3.3.3 Failure to maintain scheduled progress or reasonable evidence that the Work will not be completed within the Contract Time.

10.3.3.4 Persistent failure to carry out the Work in accordance with the Contract Documents.

10.3.3.5 Reasonable evidence that the Work cannot be completed for the unpaid portion of the contract sum.

10.3.3.6 Assessment of fines for violations of Prevailing Wage Rate law; or

10.3.3.7 Failure to include the appropriate amount of retainage for that periodic progress payment.

10.3.4 Title to all material and Work covered by progress payments transfers to the Owner upon payment.

10.3.4.1 Transfer of title to Owner does not relieve the Contractor of the sole responsibility for the care and protection of materials and Work upon which payments have been made until final acceptance of the entire Work, or the restoration of any damaged Work, or waive the right of the Owner to require the fulfillment of all the terms of the Contract.

10.4 Progress payments to the Contractor do not release the Contractor or its surety from any obligations under this Contract.

10.4.1 Upon the Owner's request, the Contractor shall furnish proof of the status of Subcontractor's accounts in a form acceptable to the Owner.

10.4.2 Pay estimate certificates must be signed by a corporate officer or a representative duly authorized by the Contractor.

10.4.3 Provide copies of bills of lading, invoices, delivery receipts or other evidence of the location and value of such materials in requesting payment for materials.

10.4.4 For purposes of Tex. Gov't Code § 2251.021 (a) (2), the date the performance of service is complete is the date when the Owner's representative approves the application for payment.

10.5 Off-Site Storage. With prior approval by the Owner and in the event Contractor elects to store materials at an off-site location, abide by the following conditions, unless otherwise agreed to in writing by the Owner.

10.5.1 Store materials in a Bonded Commercial Warehouse.

10.5.2 Provide separate Insurance Coverage adequate not only to cover materials while in storage, but also in transit from the off-site storage areas to the project site. Copies of duly authenticated Certificates of Insurance, made out to insure the State Agency which is signatory to the contract, must be filed with the Owner's representative.

10.5.3 Inspection by Owner's representative is allowed at any time. The Owner's Inspectors must be satisfied with the security, control, maintenance, and preservation measures.

10.5.4 Materials for this project are physically separated and marked for the project in a sectioned-off area. Only materials which have been approved through the submittal process are to be considered for payment.

10.5.5 Owner reserves the right to reject materials at any time prior to final acceptance of the complete Contract if they do not meet Contract requirements regardless of any previous progress payment made.

10.5.6 With each monthly payment estimate, submit a report to the ODR, AE, and Inspector listing the quantities of materials already paid for and still stored in the off-site location.

10.5.7 Make warehouse records, receipts and invoices available to Owner's representatives, upon request, to verify the quantities and their disposition.

10.5.8 In the event of Contract termination or default by Contractor, the items in storage off-site, upon which payment has been made, will be promptly turned over to Owner or Owner's agents at a location near the jobsite as directed by the ODR. The full provisions of Performance and Payment Bonds on this project cover the materials off-site in every respect as though they were stored on the Project Site.

Article 11. Changes

11.1. Change Orders. A Change Order issued after execution of the Contract is a written order to the Contractor, signed by the ODR, the Contractor, and the Architect/Engineer, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time can only be changed by Change Order. A Change Order signed by the Contractor indicates his agreement with it, including the adjustment in the Contract Sum and/or the Contract Time. The ODR may issue written authorization for the Contractor to proceed with work of a change order in advance of final execution by all parties. ***In the absence of an agreement with the Contractor on a Change Order, the Owner may issue a Unilateral Change Order that will have the full force and effect of a contract modification. The issuance of a Unilateral Change Order does not prejudice the Contractor's rights to make claims or to appeal disputed matters under terms of the Contract.***

11.1.1 The Owner, without invalidating the Contract, ***and without approval of the Contractor's Surety***, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, and the Contract Sum and the Contract Time will be adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents. If such changes cause an increase or decrease in the Contractor's cost of, or time required for, performance of the Contract, an equitable adjustment shall be made and confirmed in writing in a Change Order.

11.1.2 The parties acknowledge that the specifications and drawings may not be complete or free from errors, omissions or imperfections and that they may require changes or additions in order for the work to be completed to the satisfaction of Owner. Therefore, and notwithstanding any other provisions in this Contract, the parties agree that any errors, omissions or imperfections in the specifications and drawings, or any changes in or additions to them or to the work ordered by Owner and any resulting delays in the work or increases in Contractor's costs and expenses, shall not constitute or give rise to any claim, demand or cause of action of any nature whatsoever in favor of Contractor, whether for breach of contract, *quantum meruit*, or otherwise; provided, however, that Owner shall be liable to Contractor for the sum stated to be due Contractor in any Change Order approved and signed by both parties. The parties agree that the Change Order sum, together with any extension of time contained in the Change Order, shall constitute full compensation to Contractor for all costs, expenses and damages to Contractor, whether direct, consequential or otherwise that are incident to, arise out of, or result directly or indirectly from or indirectly from the work performed by Contractor under such Change Order.

11.1.3 Procedures for administration of Change Orders shall be established by the Owner and stated in Supplementary General Conditions, Special Conditions, or elsewhere in the Contract Documents.

11.1.4 Except as provided above, no order, oral statement, or direction of the Owner or his duly appointed representative shall be treated as a change under this article or entitle the Contractor to an adjustment.

11.1.5 The Contractor agrees that the Owner or any of its duly authorized representatives shall have access and the right to examine any directly pertinent books, documents, papers, and records of the Contractor. Further, the Contractor agrees to include in all its subcontracts a provision giving the Owner or any of its duly authorized representative's access to and the right to

examine any directly pertinent books, documents, papers and records of any Subcontractor relating to any claim arising from this Contract, whether or not the Subcontractor is a party to the claim. The right of access and examination described herein shall continue for the duration of any claims brought under the Disputes article of the Contract, litigation, or the settlement of claims arising out of the performance of this Contract until final disposition of such claims, appeals or litigation.

11.2. Unit Prices: The Contract Documents may require the Contractor to provide certain work or materials on the basis of unit prices. If the quantity originally contemplated in determining any unit price is **materially** changed such that application of the agreed unit price to the actual quantity of work required will cause substantial inequity to the Owner or the Contractor, the applicable unit price shall be equitably adjusted as provided in the Special Conditions or as agreed to by the parties and incorporated into Change Order.

11.3. Claims for Additional Costs

11.3.1 The Contractor shall provide written notice to the Owner and the Architect/Engineer within twenty-one (21) days of the occurrence of any event or the discovery of any condition that the Contractor claims will cause an increase in the Contract Sum or Contract Time that is not related to a requested change. The Contractor shall not proceed with any work for which it will assert a claim for additional cost or time before providing the written notices, except for emergency situations governed by Article 7.3. Failure to provide the required notices is sufficient grounds for rejecting any claim for an increase in the Contract Sum or the Contract Time arising from the event or the condition. Any adjustment in the Contract Sum or Contract Time for any additional Work shall be authorized by Change Order.

11.3.2 The notice provisions of Article 11.3.1 apply to, but are not limited to, any claims for additional cost or time brought by the Contractor as a result of: 1) any written interpretation of the Contract Documents, 2) any order by the Owner to stop the Work pursuant to Article 14 where the Contractor was not at fault, or 3) any written order for a minor change in the Work issued pursuant to Article 11.4.

11.3.3 Should the Contractor or his Subcontractors fail to call attention of the AE to obvious discrepancies or omissions in the Bid/Proposal Documents during the pre-bid/pre-proposal period, but claim additional costs for corrective work after contract award, the Owner may assume intent to circumvent competitive bidding for necessary corrective work. In such case, the Owner may choose to let a separate contract for the corrective work, or issue a Unilateral Change Order to require performance by the Contractor. Claims for time extensions or for extra cost resulting from delayed notice of contract document discrepancies or omissions will not be considered by the Owner.

11.4. Minor Changes. The AE, with concurrence of the ODR, will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time. Such changes shall be effected by written order which the Contractor shall carry out promptly and record on as-built record documents.

11.5. Concealed Site Conditions. If, in the performance of the Contract, subsurface, latent or concealed conditions at the site are found to be materially different from the information included in the bid/proposal documents, or if unknown conditions of an unusual nature are disclosed differing materially from the conditions usually inherent in work of the character shown and specified, the ODR and the Architect/Engineer shall be notified in writing of such conditions before they are disturbed. Upon such notice, or upon its own observation of such conditions, the Architect/Engineer, with the approval of the ODR, will promptly make such changes in the Drawings and Specifications as they

deem necessary to conform to the different conditions, and any increase or decrease in the cost of the Work, or in the time within which the Work is to be completed, resulting from such changes will be adjusted by Change Order, subject to the prior approval of the ODR.

11.6. Extension of Time. All Changes to the Contract Time shall be made as a consequence of requests as required under Article 9.6, and as documented by Change Order as provided under Article 11.1.

11.7. Administration of Change Order Requests

All changes in the Contract shall be administered in accordance with procedures approved by the Owner, and when required make use of such electronic information management (s) as the owner may employ.

11.7.1 Routine changes in the Construction Contract shall be formally initiated by the Architect/Engineer by means of a Change Request form detailing requirements of the proposed change for pricing by the Contractor. This action may be preceded by communications between the Contractor, AE and ODR concerning the need and nature of the change, but such communications shall not constitute a basis for beginning the proposed Work by the Contractor. Except for emergency conditions described below, approval of the Contractor's cost proposal by the Architect/Engineer and ODR will be required for authorization to proceed with the Work being changed. The Owner will not be responsible for the cost of work changed without prior approval and the Contractor may be required to remove work so installed.

11.7.2 Any unexpected circumstance which necessitates an immediate change in order to avoid a delay in progress of the Work may be expedited by verbal communication and authorization between the Contractor and Owner, with written confirmation following within twenty-four (24) hours. A limited scope not-to-exceed estimate of cost and time will be requested prior to authorizing Work to proceed. Should the estimate be impractical for any reason, the ODR may authorize the use of detailed cost records of such work to establish and confirm the actual costs and time for documentation in a formal Change Order.

11.7.3 Emergency changes to save life or property may be initiated by the Contractor alone (see Article 7.3) with the claimed cost and/or time of such work to be fully documented as to necessity and detail of the reported costs and/or time.

11.7.4 The method of incorporating approved changes into the parameters of the accepted Schedule of Values must be coordinated and administered in a manner acceptable to the ODR.

11.8. Pricing Change Order Work

11.8.1 All proposed costs for change order work must be supported by itemized accounting of material, equipment and associated itemized installation costs in sufficient detail, following the outline and organization of the established Schedule of Values, to permit analysis by the AE and ODR using current estimating guides and/or practices.

11.8.1.1 Photocopies of Subcontractor and vendor proposals shall be furnished unless specifically waived by the ODR.

11.8.1.2 Contractor shall provide written response to change request within twenty-one (21) calendar days of receipt.

11.8.1.3 *If the parties cannot agree on an equitable adjustment for labor hours attributable to a change, they shall use the Means Facility Cost Data as a guide for labor hours as a basis of negotiation.*

11.8.1.4 *If the parties cannot agree on an equitable adjustment for equipment rental charges attributable to a change, they shall use the Rental Rate Blue Book for Construction Mobilization as a basis of negotiation.*

11.8.2 The amounts that the Contractor and/or its Subcontractors add to a Change Order for profit and overhead will also be considered by the Owner before approval is given. The amounts established hereinafter are the maximums that are acceptable to the Owner.

11.8.2.1 For work performed by its forces, the Contractor will be allowed their actual costs for materials, the total amount of wages paid for labor, the total cost of Federal Old Age Benefit (Social Security Tax) and of Worker's Compensation and Comprehensive General Liability Insurance, plus Bond cost if the change results in an increase in the Bond premium paid by the Contractor. To the total of the above costs, the Contractor will be allowed to add a percentage as noted below to cover overhead and profit combined. Overhead shall be considered to include insurance other than mentioned above, field and office supervisors and assistants, including safety and scheduling personnel, use of small tools, incidental job burdens and general Home Office expenses, and no separate allowance will be made therefore. Allowable percentages for overhead and profit on changes will not exceed 15 percent if the total of self-performed work is less than or equal to \$10,000, 10 percent if the total of self-performed work is between \$10,000 and \$20,000 and 7.5 percent if the total of self-performed work is over \$20,000, for any specific change priced.

11.8.2.1.1 *On contracts based on a Guaranteed Maximum Price (GMP), the Contractor or Design Build Firm shall NOT be entitled to a percentage mark-up on any change order work unless the Change Order increases the Guaranteed Maximum Price.*

11.8.2.2 For subcontracted Work each affected Subcontractor shall figure its costs, overhead and profit as described above for Contractor's work, all Subcontractor costs shall be combined, and to that total Subcontractor cost the Contractor will be allowed to add a maximum mark-up of 10 percent if the total of all subcontracted work is less than or equal to \$10,000, 7.5 percent if the total of all subcontracted work is between \$10,000 and \$20,000 and 5 percent if the total of all Subcontractor work is over \$20,000.

11.8.2.3 On changes involving both additions and deletions, percentages for overhead and profit will be allowed only on the net addition. The Owner does not accept and will not pay for additional contract cost identified as indirect, consequential, or as damages caused by delay.

Article 12. Project Completion and Acceptance

12.1. Closing Inspections

12.1.1 Substantial Completion Inspection. When the Contractor considers the entire Work or part thereof Substantially Complete, it shall notify the ODR in writing that the Work will be ready for Substantial Completion Inspection on a specific

date. The Contractor shall include with this notice the Contractors Punchlist to indicate that it has previously inspected all the Work associated with the request for inspection, has corrected items where possible, and includes all items scheduled for completion or correction prior to final inspection. The failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. If any of the items on this list prevents the building from the use to which it is intended, the Contractor shall not request a Substantial Completion Inspection. The Owner and its representatives will review the list of items and schedule the requested inspection, or inform the Contractor in writing that such an inspection is premature because the Work is not sufficiently advanced or conditions are not as represented on the Contractor's list.

12.1.1.1 Prior to the Substantial Completion Inspection, the Contractor shall furnish a copy of its marked-up As-Built Drawings and a preliminary copy of each instructional manual, maintenance and operating manual, parts catalog, wiring diagrams, spare parts, specified written warranties and like publications or parts for all installed equipment, s and like items. Delivery of these items is a prerequisite for requesting the Substantial Completion Inspection.

12.1.1.2 On the date requested by Contractor, or as mutually agreed upon, the AE, ODR, the Contractor and other Owner representatives as determined by the Owner, will jointly attend the Substantial Completion Inspection, which shall be conducted by the ODR or their delegate. If the ODR **concurs with the AE and Contractor in a determination** that the Work is Substantially Complete, the ODR will issue a Certificate of Substantial Completion to be signed by the AE, Owner and Contractor, establishing the date of Substantial Completion **and identifying responsibilities for security, maintenance, and insurance**. AE will provide with this certificate a list of punchlist items (the Pre-Final Punchlist) for completion prior to final inspection. This list may include items in addition to those on the Contractor's punchlist, which the inspection team deems necessary to correct or complete prior to Final Inspection. If the Owner occupies the facility upon determination of Substantial Completion, the Contractor shall complete all corrective Work at the convenience of the Owner, without disruption to Owner's use of the facility for its intended purposes.

12.1.2 Final Inspection. The Contractor shall complete the list of items identified on the Pre-Final Punchlist prior to requesting a Final Inspection. Unless otherwise specified, or otherwise agreed in writing by the parties as documented on the Certificate of Substantial Completion, the Contractor shall complete and/or correct all Work within thirty (30) days of the Substantial Completion date. Upon completion of the Pre-Final Punchlist work, the Contractor shall give written notice to the ODR and AE that the Work will be ready for Final Inspection on a specific date. The Contractor shall accompany this notice with a copy of the updated Pre-Final Punchlist indicating resolution of all items. On the date specified or as soon thereafter as is practicable, the ODR, AE and the Contractor will inspect the Work. The AE will submit to the Contractor a Final Punchlist of open items that the inspection team requires corrected or completed before final acceptance of the Work.

12.1.2.1 Correct or complete all items on the Final Punchlist before requesting Final Payment. Unless otherwise agreed to in writing by the parties, complete this work within seven (7) days of receiving the Final

Punchlist. Upon completion of the Final Punchlist, notify the AE and ODR in writing stating the disposition of each Final Punchlist item. The AE, Owner and Contractor shall promptly inspect the completed items. When the Final Punchlist is complete, and the Contract is fully satisfied according to the Contract Documents the ODR will issue a certificate establishing the date of Final Completion. Completion of all Work is a condition precedent to the Contractor's right to receive Final Payment.

12.1.3 Annotation. Any Certificate issued under this Article may be annotated to indicate that it is not applicable to specified portions of the Work, or that it is subject to any limitation as determined by the Owner.

12.1.4 Purpose of Inspection. Inspection is for determining the completion of the Work, and does not relieve the Contractor of its overall responsibility for completing the Work in a good and competent fashion, in compliance with the Contract. Work accepted with incomplete punchlist items or failure of the Owner or other parties to identify Work that does not comply with the Contract Documents or is defective in operation or workmanship does not constitute a waiver of the Owner's rights under the Contract or relieve the Contractor of its responsibility for performance or warranties.

12.1.5 Additional Inspections

12.1.5.1 If the Owner's inspection team determines that the Work is not Substantially Complete at the Substantial Completion Inspection, the ODR or AE will give the Contractor written notice listing cause(s) of the rejection. The **Contractor** will set a time for completion of incomplete or defective work **as acceptable to the ODR**. Complete or correct all work so designated prior to requesting a second Substantial Completion Inspection.

12.1.5.2 If the Owner's inspection team determines that the Work is not complete at the Final Inspection, the ODR or the AE will give the Contractor written notice listing the cause(s) of the rejection. The **Contractor** will set a time for completion of incomplete or defective work **as acceptable to the ODR**. The Contractor shall complete or correct all Work so designated prior to again requesting a Final Inspection.

12.1.5.3 The Contract Agreement contemplates three (3) comprehensive inspections: the Substantial Completion Inspection, the Final Completion Inspection, and the Inspection of Completed Final Punchlist Items. The cost to the Owner of additional inspections resulting from the Work not being ready for one or more of these inspections is the responsibility of the Contractor. The Owner may issue a Unilateral Change Order deducting these costs from Final Payment. Upon the Contractor's written request, the Owner will furnish documentation of any costs so deducted. Work added to the Contract by Change Order after Substantial Completion Inspection is not corrective work for purposes of determining timely completion, or assessing the cost of additional inspections.

12.1.6 Phased Completion. The contract may provide, or project conditions may warrant, as determined by the ODR, that designated elements or parts of the Work be completed in phases. Where phased completion is required or specifically agreed to by the parties, the provisions of the contract related to Closing Inspections, Occupancy and Acceptance apply independently to each designated element or part of the Work. For all other purposes, unless

otherwise agreed by the parties in writing, Substantial Completion of the Work as a whole is the date on which the last element or part of the Work completed receives a Substantially Completion certificate. Final Completion of the Work as a whole is the date on which the last element or part of the Work completed receives a Final Completion certificate **or notice**.

12.2 Owner's Right of Occupancy. The Owner may occupy or use all or any portion of the Work following Substantial Completion, or at any earlier stage of completion. Should the Owner wish to use or occupy the Work, or part thereof, prior to Substantial Completion, the ODR will notify the Contractor in writing **and identify responsibilities for security, maintenance, and insurance**. Work performed on the premises by third parties on the Owner's behalf does not constitute occupation or use of the Work by the Owner for purposes of this Article. All Work performed by the Contractor after occupancy, whether in part or in whole, shall be at the convenience of the Owner so as to not disrupt Owner's use of, or access to occupied areas of the project.

12.3 Acceptance & Payment

12.3.1 Request for Final Payment. Following the certified completion of all work, including all punch list items, cleanup, and the delivery of record documents, the Contractor shall submit a certified Application for Final Payment that includes all sums held as retainage and forward to the AE and the ODR for review and approval.

12.3.2 Final Payment Documentation. Prior to or with the Application for Final Payment, Contractor shall submit final copies of all close out documents, maintenance and operating instructions, guarantees and warranties, certificates, record documents and all other items required by the Contract. Submit Consent of Surety to Final Payment and an affidavit that all payrolls, bills for materials and equipment, subcontracted work and other indebtedness connected with the Work, except as specifically noted, are paid, will be paid, or otherwise satisfied within the period of time required by Tex. Gov't Code, Chapter 2251. Furnish documentation establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims and liens arising out of the Contract. The Contractor may not subsequently submit a claim on behalf of a Subcontractor or vendor unless the Contractor's affidavit notes that claim as an exception.

12.3.3 Architect/Engineer Approval. The AE will review a submitted Application for Final Payment promptly but in no event later than ten (10) days after its receipt. Prior to the expiration of this deadline, the AE will either 1) return the Application for Final Payment to Contractor with corrections for action and resubmission or 2) accept it, note their approval and send to Owner.

12.3.4 Offsets and Deductions. The Owner may deduct from the Final Payment all sums due from the Contractor. If the Certificate of Final Completion notes any Work remaining, incomplete, or defects not remedied, the Owner may deduct the cost of remedying such deficiencies from the Final Payment. On such deductions, the Owner will identify each deduction, the amount, and the explanation of the deduction on or by the 21st day after Owner's receipt of an approved Application for Final Payment. Such offsets and deductions shall be incorporated via a final Change Order, including Unilateral Change Order as may be applicable.

12.3.5 Final Payment Due. Final Payment is due and payable by the Owner, subject to all allowable offsets and deductions, on the 31st day following the Owner's approval of the Application for Payment. If the Contractor disputes any amount deducted by the Owner, the Contractor shall give notice of the dispute on or

before the thirtieth (30th) day following receipt of Final Payment. Failure to do so will bar any subsequent claim for payment of amounts deducted.

12.3.6 Effect of Final Payment. Final Payment constitutes a waiver of all claims by the Owner, relating to the condition of the Work except those arising from:

12.3.6.1 Faulty or defective Work appearing after Substantial Completion (latent defects); and/or

12.3.6.2 Failure of the Work to comply with the requirements of the Contract Documents; and/or

12.3.6.3 Terms of any warranties required by the Contract, or implied by law; and/or

12.3.6.4 Claims arising from personal injury or property damage to third parties.

12.3.7 Waiver of Claims. **Submission of an Application for Final Payment by the Contractor** constitutes a waiver of all claims and liens by the Contractor except those specifically identified in writing and submitted to the ODR prior to the application for Final Payment.

12.3.8 Effect on Warranty. Regardless of approval and issuance of Final Payment, the Contract is not deemed fully performed by the Contractor and closed until the expiration of all warranty periods.

Article 13. Warranty & Guarantee

13.1. Contractor's General Warranty and Guarantee. Contractor warrants to the Owner that all Work is executed in accordance with the Contract, complete in all parts and in accordance with approved practices and customs, and of the best finish and workmanship. The Contractor further warrants that unless otherwise specified, all materials and equipment incorporated in the Work under the Contract are new. The Owner may, at its option, agree in writing to waive any failure of the Work to conform to the Contract, and to accept a reduction in the Contract Price for the cost of repair or diminution in value of the Work by reason of such defect. Absent such a written agreement, the Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute and is not waived by any inspection or observation by the Owner, Architect/Engineer or others, by making any progress payment or final payment, by the use or occupancy of the Work or any portion thereof by the Owner, at any time, or by any repair or correction of such defect made by the Owner.

13.2. Warranty Period. Except as may be otherwise specified or agreed, the Contractor shall repair all defects in materials, equipment, or workmanship appearing within one year from the date of Substantial Completion of the Work. ***If less than all of the Work is accepted as substantially complete (Partial Substantial Completion), the warranty period for the Work accepted begins on the date of Partial Substantial Completion, or as otherwise stipulated on the Certificate of Partial Substantial Completion for the Work.***

13.3 Limits on Warranty. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

13.3.1 Modification or improper maintenance or operation by persons other than Contractor, Subcontractors, or any other individual or entity for whom Contractor is not responsible, unless Owner is compelled to undertake maintenance or operation due to the neglect of the Contractor.

13.3.2 Normal wear and tear under normal usage after acceptance of the Work by the Owner.

13.4 Events Not Affecting Warranty. Contractor's obligation to perform and complete the Work in a good and workmanlike manner in accordance with the Contract Documents is 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:

13.4.1 Observations by Owner and/or AE.

13.4.2 Recommendation to pay any progress or final payment by AE.

13.4.3 The issuance of a certificate of Substantial Completion or any payment by Owner to Contractor under the Contract Documents.

13.4.4 Use or occupancy of the Work or any part thereof by Owner.

13.4.5 Any acceptance by Owner or any failure to do so.

13.4.6 Any review of a Shop Drawing or sample submittal; or

13.4.7 Any inspection, test or approval by others.

13.5 Separate Warranties. If a particular piece of equipment or component of the Work for which the contract requires a separate warranty is placed in continuous service before Substantial Completion, the Warranty Period for that equipment or component will not begin until Substantial Completion, regardless of any warranty agreements in place between suppliers and/or Subcontractors and the Contractor. The ODR will certify the date of service commencement in the Substantial Completion Certificate.

13.5.1 In addition to the Contractor's warranty and duty to repair, the Contractor expressly assumes all warranty obligations required under the Contract for specific building components, s and equipment.

13.5.2 The Contractor may satisfy any such obligation by obtaining and assigning to the Owner a complying warranty from a manufacturer, supplier, or Subcontractor. Where an assigned warranty is tendered and accepted by the Owner which does not fully comply with the requirements of the Contract, the Contractor remains liable to the Owner on all elements of the required warranty not provided by the assigned warranty.

13.6 Correction of Defects. Upon receipt of written notice from the Owner, or any agent of the Owner designated as responsible for management of the Warranty Period, of the discovery of a defect, the Contractor shall promptly remedy the defect(s), and provide written notice to the Owner and designated agent indicating action taken. In case of emergency where delay would cause serious risk of loss or damage to the Owner, or if the Contractor fails to remedy within 30 days, or within another period agreed to in writing, the Owner may correct the defect and be reimbursed the cost of remedying the defect from the Contractor or its Surety.

13.7 Certification of No Asbestos Containing Materials or Work. The Contractor shall ensure compliance with the Asbestos Hazard Emergency Response Act (AHERA- 40 CFR 763-99 (7)) from all Subcontractors and materials suppliers, and shall provide a notarized certification to the Owner that all equipment and materials used in fulfillment of their contract responsibilities are non Asbestos Containing building Materials (ACBM). This certification must be provided no later than the Contractor's application for Final Payment.

Article 14. Suspension and Termination

14.1. Suspension of Work for Cause. The Owner may, at any time without prior notice, suspend all or any part of the Work if the Owner determines it is necessary to do so to prevent or correct any condition of the Work which constitutes an immediate safety hazard or which may reasonably be expected to impair the integrity, usefulness or longevity of the Work when completed.

14.1.1 The Owner will give the Contractor a written notice of suspension for cause, setting forth the reason for the suspension and identifying the Work suspended. Upon receipt of the notice, the Contractor shall immediately cease all activities related to the identified Work. As soon as practicable following the issuance of a suspension notice, the Owner will conduct an investigation into the circumstances giving rise to the suspension, and issue a written determination of the findings.

14.1.2 If the cause of the suspension is due to actions or omissions within the control of the Contractor, the Contractor will not be entitled to an extension of time for delay resulting from the suspension. If the cause of the suspension is something not within the control of the Contractor and the suspension will prevent the Contractor from completing the Work within the Contract Time, the suspension is an Excusable Delay and a Time Extension will be granted through a Change Order.

14.1.3 Suspension of work under this provision will be no longer than is reasonably necessary to remedy the conditions giving rise to the suspension.

14.2. Suspension of Work for Owner's Convenience. Upon seven (7) calendar days written notice to the Contractor, the Owner may at any time without breach of the Contract suspend all or any portion of the Work for its own convenience. Upon resumption of the Work, if the suspension prevents the Contractor from completing the Work within the Contract Time, it is an Excusable Delay. A notice of suspension for convenience may be modified by the Owner at any time on seven

(7) calendar days written notice to the Contractor. If the Owner suspends the Work for its convenience for more than 60 consecutive calendar days, the Contractor may elect to terminate the contract pursuant to the provisions of the contract.

14.3. Termination by Owner for Cause

14.3.1 ***Upon thirty (30) days written notice to the Contractor and its Surety,*** the Owner may, without prejudice to any right or remedy, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, under any of the following circumstances:

14.3.1.1 Persistent or repeated failure or refusal, except during complete or partial suspensions of work authorized under the Contract, to supply enough properly skilled workmen or proper materials; and/or

14.3.1.2 Persistent disregard of laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, including the ODR; and/or

14.3.1.3 Persistent failure to prosecute the work in accordance with the Contract, and to insure its completion within the time, or any approved extension thereof, specified in this Contract; and/or

14.3.1.4 Failure to remedy defective work condemned by the ODR; and/or

- 14.3.1.5 Failure to pay Subcontractors, laborers, and material suppliers pursuant to Tex. Gov't Code Chapter 2251; and/or
- 14.3.1.6 Persistent endangerment to the safety of labor or of the Work; and/or
- 14.3.1.7 Failure to supply or maintain statutory bonds or to maintain required insurance, pursuant to the contract; and/or
- 14.3.1.8 Any material breach of the Contract; and/or
- 14.3.1.9 The Contractor's insolvency, bankruptcy, or demonstrated financial inability to perform the work.

14.3.2 Failure by the Owner to exercise the right to terminate in any instance is not a waiver of the right to do so in any other instance.

14.3.3 Upon receipt of a termination notice, the Contractor or its Surety has thirty days to cure the reasons for the termination or demonstrate to the satisfaction of the Owner that it is prepared to remedy to the condition(s) upon which the notice of termination was based. If the Owner is satisfied that the Contractor or its Surety can remedy the reasons for the termination and complete the Work as required, the notice of termination shall be rescinded in writing by the Owner and the Work shall continue without an extension of time.

14.3.4 If at the conclusion of the thirty day cure period the Contractor or its Surety is unable to demonstrate to the satisfaction of the Owner its ability to remedy the reasons for termination, the Owner may **immediately terminate the employment of the Contractor**, make alternative arrangements for completion of the Work and deduct the cost of completion from the unpaid Contract Sum.

- 14.3.4.1 Recoverable costs include additional Owner expenses for items such as AE services, other consultants, and contract administration.

14.3.5 The Owner will make no further payment to the Contractor or its Surety until all costs of completing the Work are paid. If the unpaid balance of the Contract Sum exceeds the costs of administering and finishing the Work, the Contractor will receive the excess funds. If costs of completing the Work exceed the unpaid balance, the Contractor or its Surety will pay the difference to the Owner.

- 14.3.5.1 This obligation for payment survives the termination of the Contract.

14.3.6 The owner reserves the right in termination for cause to take assignment of all contracts between the Contractor and its Subcontractors, vendors and suppliers. The ODR will promptly notify the Contractor of the contracts the Owner elects to assume. Upon receipt of such notice, the Contractor shall promptly take all steps necessary to effect such assignment.

14.4 Termination for Convenience of Owner. Upon written notice to the Contractor and the AE, the Owner may, without breach, terminate the Contract for any reason.

14.4.1 The notice will specify the reason for and the effective date of contract termination. The notice may also contain instructions necessary for the protection, storage or decommissioning of incomplete work or s, and for safety.

14.4.2 Upon receipt of the notice of termination, the Contractor shall immediately proceed with the following obligations:

- 14.4.2.1 Stop all work.
- 14.4.2.2 Place no further subcontracts or orders for materials or services.

- 14.4.2.3 Terminate all subcontracts.
- 14.4.2.4 Cancel all materials and equipment orders as applicable.
- 14.4.2.5 Take appropriate action to protect and preserve all property related to this Contract which is in the possession of the Contractor.

14.4.3 When the Contract is terminated for the Owner's convenience, the Contractor may recover from the Owner payment for all Work executed ***before the notice of termination along with the actual and reasonable cost of any additional work required to secure the project and property related to the Contract following the notice of termination. The Contractor will not be entitled to recover any other costs or damages arising from the termination for convenience of the Owner including, but not limited to, claims for lost profits or lost business opportunities.***

14.5 Termination By Contractor. If the Work is stopped for a period of ninety (90) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon thirty

(30) additional days' written notice to the ODR, terminate the Contract and recover from the Owner payment for all Work executed ***before the work stoppage and the actual and reasonable cost of securing the project and property related to the Contract during the work stoppage. The Contractor will not be entitled to recover any other costs or damages arising from the work stoppage including, but not limited to, claims for lost profits or lost business opportunities.*** If the cause of the work stoppage is removed prior to the end of the thirty (30) day notice period, the Contractor may not terminate the Contract.

14.6 Settlement on Termination. Within 180 days of the effective date of Contract termination for any reason, the Contractor shall submit a final termination settlement proposal to the Owner based upon recoverable costs as provided under the contract. If the Contractor fails to submit a settlement proposal within the time allowed, the Owner may ***unilaterally*** determine the amount due to the Contractor because of the termination.

Article 15. Dispute Resolution

15.1 Unresolved Contractor Disputes. The dispute resolution process provided for in Tex. Gov't Code, Chapter 2260, shall be used by the Owner and the Contractor to attempt to resolve any claim for breach of contract made by the Contractor, that is not resolved under procedures described throughout the Uniform General Conditions, Supplemental Conditions, or Special Conditions of the Contract.

15.2 Alternative Dispute Resolution Process. The Owner may establish a dispute resolution process to be utilized in advance of that outlined in Tex. Gov't Code, Chapter 2260.

15.3 Before submitting any matter not resolved in the ordinary course of business to the dispute resolution process provided for in Tex. Gov't Code, Chapter 2260, the Contractor shall make a written request to the Owner's designated official in charge of construction contract administration for a determination of the matter in dispute. The written request shall clearly state the disputed issue and include or incorporate by specific reference all information or documents that the Contractor wants the official to consider in reaching his/her determination. The official shall issue a written notice of decision on the request. Within 30 days of the notice of decision, the Contractor may submit a request for reconsideration to the official that particularly states the factual and legal basis for the

Contractor's objections to the official's decision. The official will review his/her decision and consider the basis for reconsideration asserted in the request. The official will issue a written notice of decision following reconsideration which shall be final and conclusive on all matters except for claims of breach of contract which are then subject to the dispute resolution process provide by Chapter 2260.

15.4 ***Nothing herein shall hinder, prevent or be construed as a waiver of Owner's right to seek redress on any disputed matter in a court of competent jurisdiction.***

15.5 ***Nothing herein shall waive or be construed as a waiver of the state's sovereign immunity.***

Article 16. Miscellaneous

16.1. Supplemental and Special Conditions. When the Work contemplated by the Owner is of such a character that the foregoing Uniform General Conditions of the Contract cannot adequately cover necessary and additional contractual relationships, the Contract may include Supplemental and Special Conditions as described below:

16.1.1 Supplemental Conditions may describe the standard procedures and requirements of contract administration followed by a contracting agency of the State. Supplemental Conditions may expand upon matters covered by the Uniform General Conditions, where necessary, provided the expansion does not weaken the character or intent of the Uniform General Conditions. Supplemental Conditions are of such a character that it is to be anticipated that a contracting agency of the State will normally use the same, or similar, conditions to supplement each of its several projects.

16.1.2 Special Conditions shall relate to a particular project and be peculiar to that project but shall not weaken the character or intent of the Uniform General Conditions.

16.2. Federally Funded Projects. On Federally funded projects, the Owner may waive, suspend or modify any Article in these Uniform General Conditions which conflicts with any Federal statute, rule, regulation or procedure, where such waiver, suspension or modification is essential to receipt by the Owner of such Federal funds for the project. In the case of any project wholly financed by Federal funds, any standards required by the enabling Federal statute, or any Federal rules, regulations or procedures adopted pursuant thereto, shall be controlling.

16.3. Internet-based Project Management s. At its option, the Owner may administer its design and construction management through an Internet-based management. In such cases, the Contractor shall conduct communication through this media and perform all project related functions utilizing this database. This includes correspondence, submittals, requests for information, vouchers or payment requests and processing, amendment, change orders and other administrative activities.

16.3.1 Accessibility And Administration.

16.3.1.1 When used, the Owner will make the software accessible via the Internet to all project team members.

16.3.1.2 The Owner shall administer the software.

16.3.2 Training. When used, the Owner shall provide training to the project team members.

End of Uniform General Conditions

SECTION 01 00 00 – MISCELLANEOUS REQUIREMENTS

1 Summary

- 1.1 These Miscellaneous Requirements are issued as supplements to the Uniform General Conditions for Construction Contracts (UGC's) and any Special Conditions that form a part of the Contract for Construction between the Owner and the General Contractor (or Construction Manager, or Design-Build Contractor). The term "Contractor", as used herein, is meant to refer to a General Contractor, or a Design-Build Contractor, or a Construction Manager. Should any provision of these Division 1 Specifications conflict with the Contract, the UGC's or the Special Conditions, the latter shall govern.

2 Removal of Debris (see Section 01 52 40)

- 2.1 The Contractor shall remove and legally dispose of all demolition debris and all unused construction materials off-site. Unless specifically noted otherwise, all excess earth and rock excavation materials shall be removed and disposed of offsite. Such demolition debris, unused construction materials and excess excavated earth and rock shall be handled, transported and legally disposed of at the Contractor's expense.

3 Drawings and Specifications (also see UGC Article 6)

- 3.1 The Drawings and Specifications are intended to describe and provide for a finished and complete piece of Work that meets the requirements of all the applicable governing laws, ordinances, rules, and regulations of the locality. It is mandatory that all work must meet these requirements.
- 3.1.1 No extra compensation will be allowed for the Contractor's rework due to its failure to conform to any such requirements unless the original installation was directed by written order issued by the A/E or the Owner.
- 3.1.2 Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be like effect as if shown or mentioned in both. If the Contractor believes that some information is missing then that information should be requested of the Owner or A/E in writing. Should the Drawings disagree among themselves, or with the Specifications, the better quality and/or greater quantity of work and/or materials shall be

included with the Contractor's project proposed pricing. In the case where the Specifications do not fully agree with the material schedules, the material schedules shall govern.

- 3.1.3 The general character of the detail work is shown on Drawings, but minor modifications may be made by A/E in full size Drawings, shop drawings, or models. Contractor shall not attempt to execute any part of the Work requiring such drawings until he has received approved copies of same.
- 3.1.4 Where the word "similar or typical" occurs on Drawings, they shall be understood in their general sense and not as meaning identical. All details shall be worked out in relation to their location and their connection to other parts of the Work. If the Contractor finds this to be beyond its capability, interpretations and directions should be requested of the A/E.
- 3.1.5 Small scale and large scale drawings are intended to be mutually compatible and explanatory. In case of variances, the following order of preferences is established to define the intent of the work.
 - 3.1.5.1 Explanatory notes on Drawings;
 - 3.1.5.2 Recorded dimensions;
 - 3.1.5.3 Large scale details;
 - 3.1.5.4 Small scale details;
 - 3.1.5.5 Scaled measurements.
- 3.2 The "Scope of Work" description placed in the front portion of each section of the Specifications is intended to designate the scope and locations of all items of Work included in that section, either generally or specifically. It is not, however, intended to limit the scope of the work where plans, schedules, or notes indicate a larger scope.

4 Interpretations of Documents (see UGC 3.2.2)

- 4.1 Whether bidding or building the Project, if there is any doubt as to the meaning of any part of the Construction Documents, the Contractor shall submit a written request to the Owner seeking an interpretation. If the question has to do with technical requirements, the Contractor should provide the A/E with a copy of the request as the Owner will typically ask the A/E for the technical interpretation. If such a request is made during bidding, it should be made at least ten days before bid opening. Interpretations shall then be issued by written

response only and during bidding only by issuing an “Addendum” to the bid documents. When in doubt during construction, the Contractor should proceed only with a written interpretation by the Owner, or in its absence, proceed only after notifying the Owner in writing about the interpretation that is being used. Failure of the Contractor to request an interpretation shall not relieve the Contractor from responsibility to complete the Work to the Owner’s satisfaction. If the Contractor does not agree that an interpretation received is satisfactory and without cost or time implications, the Owner should be notified immediately in writing of that fact.

5 Materials and Work (see UGC 8.1)

- 5.1 Unless otherwise specified, all materials shall be new and free of asbestos, noxious or toxic fumes, urea–formaldehyde and lead (lead in potable water system) and both workmanship and materials shall be of the best quality. If requested by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of his materials and workmanship. Any work installed that does not meet the requirements of the Construction Documents shall be removed and replaced with conforming Work. **(UGC 3.3.5)**
- 5.2 The Contractor and subcontractors shall be responsible for the proper care and protection of all materials and equipment furnished both during and after installation. Such materials and equipment may be staged inside the construction fence, or areas designated by the Owner, but only consistent with a Staging Plan acceptable to the Owner. All materials affected by the weather shall be covered and protected to keep them free from damage while being transported to the site. When stored on site, they shall be placed in watertight storage shed/compartments or otherwise protected from the weather. Any material damaged by water or other causes shall be removed from the site and replaced with new material.
- 5.3 When necessary to avoid delay or to protect work or equipment, provide suitable watertight coverings over windows, doors, skylights, hatchways, and such other openings admitting rain, including the Owner’s materials within the building area when working on a combined effort.
- 5.4 The Contractor and subcontractors shall protect and be responsible for their Work and any damage to their Work from the date of delivery or installation until Substantial Completion when the Owner will take possession and assume responsibility. They shall make good, without cost to the Owner, any damage or

loss that may occur to their Work during this period.

- 5.5 When any room in one of Owner's buildings has been provided for use as a shop, storeroom, etc., the Contractor shall restore the room to equal, or better, condition by providing repairs, patching, cleaning, and painting at its sole expense.
- 5.6 During the execution of the Work the open ends of all piping, conduit and mechanical ducts and openings in equipment shall be sealed in such a way as to prevent the entrance of foreign matter. All heating, ventilating, plumbing and electrical equipment shall be covered and protected. All plumbing fixtures shall be protected and boarded over to prevent their usage by any person. All drains shall be covered until they are placed into service.
- 5.7 The Contractor shall provide all scaffolding and ladders necessary for performing the Work. All scaffolding shall be so constructed, anchored and braced to comply in all respects with OSHA guidelines to afford safety and protection to both workers and their Work, the inspectors and the Work of other contractors.
- 5.8 Except as otherwise specified, the Contractor shall furnish at its own cost and risk all tools, apparatus, hoists or cranes, derricks, etc. needed for the Work.
- 5.9 Temporary equipment shall be installed in such a manner that finished Work will not be damaged by smoke, falling mortar, concrete or other causes. The location and arrangement of temporary equipment shall be subject to the approval of the Owner.
- 5.10 All temporary shoring required for the installation of Work shall be provided by the Contractor who will take all responsibility.
- 5.11 The Contractor and its subcontractors shall provide on the premises, at locations approved by the Owner, suitable watertight storage sheds for the storage of tools and equipment. Such sheds shall be at least 6 inches off the ground on heavy joists. The Contractor shall maintain such sheds in good condition and remove them when directed by the Owner.
- 5.12 Also see Sections 01 31 00, 01 35 23 and 01 50 00 for related requirements.

6 Intent of the Documents (see UGC 11.1.2)

- 6.1 It is the intention of the Construction Documents to describe and require the complete installation of the various systems and the Contractor is to furnish all

items necessary to make the various systems complete, although each and every item required may not be specifically mentioned in the Construction Documents.

- 6.2 It is not the intent of the Construction Documents to limit materials, equipment or fixtures to the product of any particular manufacturer. Where definite materials, equipment or fixtures have been specified by name, manufacturer or catalog number, it has been done to set a quality standard, applicability, physical conformity and other characteristics. It is not the Owner's intent to discriminate against or prevent any dealer, jobber or manufacturer from furnishing materials, equipment or fixtures that meet or exceed the characteristics of the specified items. However, substitutions of materials shall not be made without a specific written request by the Contractor having been approved by the Owner in writing. **(See paragraph 18 of this Section.)**
- 6.3 Any discrepancies in the Specifications must be reported to the Owner for clarification, correction and interpretation from the A/E before the work is executed.

7 Existing Underground Utilities

- 7.1 If existing underground lines occur in the site where the work is to be accomplished, such lines will be located and staked by the Contractor for the benefit of the Owner and the Contractor prior to start of the work. Contractor shall maintain these markings throughout the duration of the construction project. Prior to any excavation, the Contractor shall review with the Owner the locations of all underground utilities and receive the Owner's written permission to proceed.

8 Pumping, Shoring, Etc.

- 8.1 Pumping: When necessary to avoid delay or to protect the Work or the premises, provide suitable pumping equipment and keep excavations, pits and other areas involved free of water that may leak, seep, or rain in. Do not allow water to flow into excavations. Do not allow water to flow off site in quantities or at rates that exceed the quantities or rates that existed prior to the start of construction
- 8.2 Shoring: The Contractor shall provide and be responsible for all temporary shoring required for execution and protection of the work. After all construction is secure and stable, and when authorized by the Structural Engineer or Civil Engineer, the Contractor shall remove all shoring.

9 Hazardous Materials

- 9.1 If during the course of his work, the Contractor observes the existence of asbestos, or asbestos bearing materials, the Contractor shall immediately terminate further operations and notify Owner of the condition. The Owner will, after consultations, determine a further course of action. **(UGC 7.5)**
- 9.2 Contractor shall furnish Manufacturer's Safety Data Sheets (MSDS) on all materials and products installed by the Contractor and subcontractors on this project to indicate no asbestos-containing materials have been installed.

10 Substantial Completion (see UGC 1.26 and 12.1.1)

- 10.1 "Substantial Completion" constitutes a stage of project completion that will allow Owner beneficial occupancy for the purpose of safely installing furnishings, maintaining normal security over them, and use of the facility for its intended purpose. Substantial Completion shall not be considered as Final Completion as there may be minor correction items outstanding and there are additional completion items required to achieve Final Completion. Upon acceptance that an entire Project, or a portion of a Project, as Substantially Complete the Owner will take possession from the Contractor and assume operations, maintenance and insurance liability responsibilities for that portion of the Project.

11 Coordination (see UGC 3.3.6.2)

- 11.1 The Contractor and subcontractors on the project shall coordinate their work with each other, advising on work schedules, equipment locations, etc. It shall be the responsibility of Contractor to assure this coordination and to schedule and supervise the work of all subcontractors performing work under this contract. Contractor shall be responsible for the proper fit of the various parts of the Work and for the coordination of operations of all trades, the subcontractors and the material suppliers engaged upon or in connection with the Work as well as those of his own employees. Contractor shall accommodate and coordinate with other independent contractors and Owner personnel on site during construction to allow them necessary access to perform their work.

12 Observation of Work (see UGC 8.5.1)

- 12.1 The Owner's representatives, as well as the A/E, shall have access to the work at all times wherever it is in preparation or progress. The Contractor shall provide

proper and safe facilities for such access and for observation.

13 Cooperation with Building Officials

- 13.1 Contractor, Subcontractor and all related suppliers, vendors and employees will cooperate with applicable utility and government officials and inspectors at all times. If such official or inspector deems special inspections necessary, provide assistance and facilities that will expedite such inspection or observation.

14 Notification

- 14.1 The Contractor shall notify the Owner at least 48 hours in advance (Monday thru Friday) of concrete pours, roofing installation, start of each new section of classification of work, concealment of plumbing, heating, air conditioning, or electrical work.

15 Ongoing Operations/Construction Personnel

- 15.1 The facilities of the campus will only be available during the scheduled construction time-period as specified by the Owner, and if not specified, then from 8:00 a.m. until 6:00 p.m., Monday through Friday. Work during other times, including weekends, shall only be allowed with prior request and written authorization from the Owner. In addition, the Contractor shall accommodate and coordinate its construction work force and activities to allow the Owner's forces and Owner's separate contractors (i.e. telephone, data, IT, computer, and furniture installation) to enter the jobsite to perform their work.
- 15.2 This project is surrounded by continuously functioning campus facilities, including student housing, academic and research efforts. The Contractor shall make every effort to avoid disruptions to ongoing campus activities and to maintain a safe environment for students, faculty, and staff in the areas adjacent to the Project.
- 15.3 Adjacent facilities will continue to be used for their intended purpose while this Project is underway and the following requirements shall apply:
- 15.3.1 Contractor, Subcontractors, Owner and A/E shall meet regularly to coordinate and schedule any construction activities affecting ongoing operations including, but not limited to: testing days, student/staff holidays, special events, etc.
- 15.3.2 The Owner may have other contractors, or its own employees, performing work on the campus and in the vicinity of the Contractor's

Work. The Contractor shall not commit any act, or allow any act, that will interfere with the performance of work by these other work forces. The Contractor shall cooperate with all performing parties so that the Owner can realize the best possible outcome of all projects involved and requiring coordination.

- 15.3.3 Student, faculty and general public safety is of utmost importance. Fire and life safety exiting from buildings must be maintained at all times and closely monitored. Review and receive approval for changes in existing conditions with the local fire marshal for each phase of construction. Provide temporary signage as required by the fire marshal and/or the Owner.
 - 15.3.4 Fire arms, drugs, intoxicating beverages, X-rated materials, etc. are banned from the Owner's property.
 - 15.3.5 Smoking is not allowed inside any campus building or anywhere on the campus except in designated areas. Smoking will not be allowed in any enclosed area of the building(s) of this project. Enclosed, as used here, refers to erection of exterior walls and overhead structure for any portion of the project; it does not mean to limit the term to only "dried in" situations. Use of or possession of illegal drugs or alcohol on the project site or anywhere on campus is prohibited.
 - 15.3.6 Construction personnel are not to communicate or interact with students and faculty on site. Only the Project Superintendent, Project Manager and/or their appointed representatives may communicate with the faculty and administrative staff on an as needed basis.
- 15.4 Campus utilities must not be interrupted except when scheduled and approved in advance through Owner-designated campus channels. The Contractor or his personnel shall NOT open or close any valves of the central campus utility systems. Valve operation is to be done by University utilities personnel only. The Contractor shall not activate or de-activate any campus utility system or component of any system, without express written direction from the Owner.
- 15.5 Chemical cleaning of new utility additions shall be done by circulating a good non-phosphate cleaner through as much of the new system as possible. Prior to dumping the cleaning agent, the Contractor shall notify the local City/County industrial water treatment department to sample the effluent. If the City/County officials approve of dumping to drain, then the Contractor will dump into the

sanitary sewer. The Contractor shall refill the new system with water and again have the City/County water treatment officials sample the effluent prior to dumping. If at any stage the City/County water treatment officials refuse to accept the effluent, then the Contractor must make special arrangements for legal disposal at its expense and provide the Owner with copies of the resulting shipping and disposal manifests.

16 Field Measurements (see 01 45 18 – Field Engineering)

- 16.1 The Contractor will employ an experienced, competent staff to establish or survey the building lines, elevations, and field dimensions. Each subcontractor shall verify all existing grades, lines, levels and dimensions affected by their work.
- 16.2 Before ordering any materials or doing any work, each subcontractor shall verify all measurements and shall be responsible for their correctness. Any difference between the actual dimensions and conditions on the site and those indicated on the drawings shall be submitted to the Owner for instructions and consideration before proceeding with the work.

17 Substitutions (see UGC 8.3.5 and 8.3.6)

- 17.1 The Contractor may submit and Owner and A/E will consider substitutions that have not been submitted and approved prior to receipt of proposals. Contractor shall submit a written substitution request on an Owner approved form and the substitution shall be fully identified for product or method being replaced by substitution, including related specification section and drawing number(s) and fully documented to show compliance with the requirements of the Construction Documents. Include product data/drawings, description of methods, samples where applicable and Contractor's detailed comparison of significant qualities between the specified item and the proposed substitution. The Contractor shall include a statement of effect on construction time, coordination and other affected work, cost information or proposal and a written guarantee indicating the proposed substitution will result in overall work equal to or better than work originally indicated. Contractor shall allow sufficient time for review and approval of such proposed substitutions.

END OF SECTION

SECTION 01 20 00 – PROJECT MEETINGS

1 Pre-Construction Conferences (see UGC 3.1.1)

- 1.1 Prior to commencing construction, the Contractor shall schedule a meeting to review all aspects of the Construction Project. The time of the Pre-Construction Conference and the attendees shall be determined through discussions between the Owner and Contractor prior to scheduling.
- 1.2 The following is a tentative agenda for the Pre-Construction Conference:
 - Critical work sequencing;
 - Designation of responsible personnel;
 - Procedures for processing submittals, substitutions, applications for payment, proposal requests, change letters and Contract Close-out procedures;
 - Parking and access to the site;
 - Office, storage areas and temporary facilities;
 - Utility information;
 - Testing procedures;
 - Procedures for maintaining record documents.
- 1.3 Minutes of the Pre-Construction Conference will be kept and distributed to all attendees and to all team members not present at the meeting. All final decisions recorded in the minutes shall become binding on the parties.

2 Pre-Installation Conferences

- 2.1 Conduct a Pre-installation Conference at the site before each construction activity that requires extensive coordination and for those activities where a preinstallation meeting is specifically required by the specification section.

3 Progress Meetings (see UGC 8.5 and 8.6)

- 3.1 The Contractor shall schedule progress meetings at regular intervals to discuss and monitor the construction project. The Contractor shall determine the meeting times and required attendees.
- 3.2 Minutes of the Progress Meeting shall be kept and distributed to all attendees and to all team members not present at the meeting.

4 Close-out Meetings

- 4.1 When the Contractor determines that a Project, including all punch list items, has been substantially completed and an acceptance date established, a formal project close-out meeting will be scheduled and attended by the parties designated by the Owner and A/E.
- 4.2 At the close-out meeting, upon documentation of exceptions and assignment of completion responsibilities, the close-out documents required by the Construction Documents will be released to the Owner.
- 4.3 Minutes of the Project Close-out meeting will be kept by the A/E and any exceptions identified will be recorded. Specific completion dates for the exceptions will be established and tracked by the Owner to ensure expeditious completion. Copies of the minutes will be distributed to all attendees.

END OF SECTION

SECTION 01 31 00 – PROJECT ADMINISTRATION

1 Subcontracts (see UGC 3.3.6)

- 1.1 Contractor agrees to bind every subcontractor, and every subcontractor agrees to be bound by the terms and conditions of the Owner's contract.
- 1.2 The Contractor is required to submit a list of all first tier subcontractors to the Owner as subcontracts are executed.

2 Flow of Communications (see UGC 3.2, 3.3.1 and 3.3.6)

- 2.1 The Owner's Designated Representative (ODR) is the Owner's primary representative for the Project who will be designated to the Contractor in writing. The ODR is the only party authorized to issue written/or oral instructions directly to the Contractor that involve changes to the contract scope, cost or time of the Work. If any other party directs the Contractor to make changes to the Work that will involve scope, cost or time the Contractor should notify the ODR immediately in writing. (see UGC 1.17)
- 2.2 Normally, the Owner will also designate in writing an Owner's Designated Site Representative (ODSR). The ODSR will have the authority, delegated by the ODR, to make decisions on behalf of the Owner concerning coordination with the University of Work on the site including: traffic controls, site safety, scheduling of utility outages, and all matters within the contract that do not involve changes to the scope, cost and/or time for completion. The ODSR, or a designee, will coordinate and conduct quality inspections of the construction work as it is installed or performed, authorize payments (except first and final) and conduct final acceptance inspections. The ODSR will be the Contractor's primary point of contact on the site.
- 2.3 The Architect/Engineer (A/E) is responsible to the Owner for the technical aspects of the Design, including the review of Contractor Submittals and for interpretation of the technical requirements of the Construction Documents. The Owner's written instructions to the Contractor on these matters will generally be issued through the A/E.
 - 2.3.1 The A/E may issue clarifications and other information not affecting the contract scope, cost or time by means of an A/E's Supplemental Instructions (ASI), or similar clarification form, that will be sequentially numbered. Both the A/E and Contractor will maintain separate ASI

registers. (See UGC 3.2.2).

- 2.3.2 If Contractor believes such a clarification will create a change in the contract scope, cost or time for performance, a written notification of such must be provided to the ODR before performing the Work involved. The Contractor should proceed with such Work only after being directed to do so in writing by the ODR.
- 2.4 Any oral direction to the Contractor by the ODR, ODSR or the A/E should be confirmed in writing prior to the Contractor proceeding with the direction.
- 2.5 All Project correspondence shall include the Project Number and Name in the title or reference.
- 2.6 All correspondence originated by the Contractor should include simultaneous copies to the ODSR and the A/E. Such correspondence that involves changes, or proposed changes, to the scope, cost or time for the Work, or any dispute or potential dispute, should also include copies to the ODR.
- 2.7 All subcontractor correspondence to either the Owner or the A/E shall be routed through the Contractor.
- 2.8 All subcontractor Requests for Information (RFIs) shall be submitted by and under cover of the Contractor, who is to carefully review and ensure the completeness and appropriateness of the question prior to submission. The Contractor should sequentially number each RFI and submit them directly to the A/E, with copies to the ODSR. The Contractor and A/E will maintain separate RFI logs.
- 2.9 The preparation and handling of Pay Applications, Request for Information, Change Proposals, Submittals, etc. are to be processed as discussed in the Pre-Construction Conference meeting.

3 Project Changes (see UGC 9.1, 9.3.3.3, 9.6.2.2 and Article 11)

- 3.1 All changes to the Contract involving scope, cost, or time will be issued on the standard Houston Community College (HCC) Change Order form. Such Change Orders are valid only if signed by either the Chancellor of HCC or by the Executive Director for Construction Administration. A single Change Order may include several different change issues and they will not be required to be related to each other.
- 3.2 Prior to issuing a Change Order, the Owner must have received from the

Contractor a Change Order Proposal that is complete in its description of the changes in scope and its detailed presentation of cost and time implications of the proposed change. If the Owner and Contractor do not agree on the implications of a proposed change, they will meet and discuss and resolve their differences prior to proceeding with the changes to the Work.

- 3.2.1 The Contractor shall summarize all costs for each change at each level of subcontractor and supplier by preparing a "Cost Analysis", and shall provide each subcontractor's cost summary as backup. Additional support documentation from both the Contractor and its subcontractors is encouraged.
- 3.2.2 Where the Contractor believes it is entitled to a time extension, it shall so state as part of its response to the Change Proposal, including a justification for such request. Time extensions will be granted only if a Change Order Proposal affects the activities on the Critical Path of the Owner approved Project Schedule (i.e., when the work impacts the "Contract Substantial Completion Date").
- 3.2.3 If the Owner and Contractor cannot mutually agreed upon a fair and reasonable cost and time settlement, the Owner may: 1) Reject the quotation and void the Change Order Proposal, 2) Issue instruction to the Contractor to proceed on a time and material basis for a price to be determined later not to exceed a fixed maximum dollar and time, or 3) Issue a Unilateral Change Order.
- 3.2.4 The Owner may issue Field Orders directly to the Contractor for minor changes to the contract, which can be negotiated in the field. Pricing backup shall be the same as a Change Order Proposal and is to be outlined as noted above. Once the Owner and the Contractor have signed the Field Order, the work is authorized and the Field Order will be included in the next Change Order.

4 Liquidated Damages (see UGC 9.11, 12.1.4 and 25.2)

- 4.1 If assessed, liquidated damages will be withheld from progress payments beginning with the first payment after the Contract completion date and until all work of the contract is complete. The amount assessed shall be deducted from the contract price through a written Change Order.

5 Site Use Issues

- 5.1 The Contractor is responsible for the actions of its entire work force, including Subcontractor and Supplier employees, whenever they are on the campus. Harassment of any kind toward any person will not be tolerated. Offending workers will be removed from the project immediately and permanently. Harassment includes any action such as jeering, whistling, calling-out, staring, snickering, making rude or questionable comments, or similar behavior. Any offending worker or employee will be removed.
- 5.2 The Contractor shall provide and submit a program plan for worker orientation, identification and control of access to the site and for managing personnel records, including payroll records. All workers on the project shall participate in this program before beginning work of the project. This plan shall include, as a minimum:
- 5.2.1 Employee identification badges with a photo of the employee, the employer and employees' name. Badges shall be provided for all employees and produced by a system on site. This identification shall be worn at all times while on the project site. Lack of an ID badge shall be grounds for removal from the project until the badge is produced.
- 5.2.2 Identification badges for workers, busing of workers from remote parking lots, frequent written and verbal reminders to the work force of appropriate behavior and avoidance of campus facilities and publication of acceptable access and egress routes from the work site are all minimum requirements of the plan.

6 Shop Drawings and Submittals (see UGC 8.3)

- 6.1 Refer to the UGC for requirements not identified in this section.
- 6.2 The Contractor shall assign an identifying number to each submittal following a format to be established at the Pre-Construction Conference. The same number with a numerical or alphabetical suffix will be used to identify re-submittals.
- 6.3 The burden of timeliness to complete the submittal process is on the Contractor. The Contractor shall allow sufficient time within the construction schedule for the A/E and Owner to review and approve all submittals, including time for all re-submittals on any unaccepted/rejected submittal.
- 6.4 Any deviation from the Construction Documents shall be conspicuously noted on the submittal and the transmittal cover sheet. Failure to so note deviations

will void any action taken on the submittal.

- 6.5 All manufacturers' data contained within the submittal shall have all inapplicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.
- 6.6 Equipment of larger sizes than shown, even though of a specified manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operations and maintenance.
- 6.7 The Owner will not be responsible for payment of any item that has not been submitted and approved through the established submittal process. (UGC 10.5.1.4)
- 6.8 The exact number of submittal copies required for distribution will be determined at the Pre-Construction Conference. The Contractor shall anticipate providing a minimum of four (4) copies of each submittal in addition to those needed by the Contractor and its subcontractors. Two (2) of the approved copies will be returned to the Contractor and one (1) shall be set aside for subsequent turn over to Owner at Project Closeout.

7 Substitution of Materials, Labor and Equipment (see UGC 8.3.5 and 01 00 00 Part 17)

- 7.1 Refer to the UGC for requirements not identified in this section.
- 7.2 The specified products referenced in the Construction Documents establish minimum qualities for which substitutions shall at least equal to be considered acceptable. The burden of proof of equality rests with the Contractor. The Owner retains sole authority for acceptance of substitutions.
- 7.3 All substitutions shall be submitted with ninety (90) days of the Notice to Proceed for Construction and be clearly marked as such on the transmittal cover sheet for the submittal.
- 7.4 The Contractor shall allow a minimum of four (4) weeks for review of each substitution by the A/E and/or Owner in addition to the requirements identified in Section 7.3 above.
- 7.5 When requested by the A/E, the Contractor shall provide a sample of the proposed substitution item. In some cases, samples of both the specified item and the proposed item shall be required for comparison purposes.
- 7.6 Acceptance of materials and equipment will be based on the

supplier/manufacturer's published data and will be tentative subject to submission of complete shop drawings and/or specifications indicating compliance with the Construction Documents. Acceptance of materials and/or equipment under this provision shall not be construed as authorizing any deviation from the Construction Documents, unless specifically directed in writing from the A/E.

- 7.7 Any and all additional costs or time resulting from the acceptance or rejection of any substitution shall be the sole responsibility of the Contractor. These include costs that are not presented at the time of the substitution request and those costs that become known after the approval of the substitution. This includes direct as well as indirect costs.
- 7.8 If a substitution is accepted, and the substitute proves defective, or otherwise unsatisfactory as determined by the Owner for the service intended within the warranty period, the substitute shall be replaced with the material or equipment specified in the Construction Documents, or as approved by the Owner, at no additional cost to the Owner.

8 Allowances (see 13.1 and Exhibit 6 of CSP contract)

- 8.1 Allowances shall include:
- Cost of materials to Contractor.
 - Delivery to project site; handling, storage and installation at project site.
 - Protection, security, including insurance.
 - Contractor's overhead and profit and other costs.
- 8.2 At contract closeout, monies remaining in any allowance line item will be credited to the Owner by Change Order.

9 Alternates

- 9.1 Alternates will be exercised and added to the proposed contract sum at the option of the Owner.
- 9.2 For any or all additive alternates selected or otherwise approved for addition to the contract sum by the Owner, the Contractor shall coordinate all related work and modify the surrounding work as required to complete the work, including changes under each alternate, only if acceptance is designated in the contract.

10 Unit Prices (see UGC 11.2)

10.1 The Contractor shall provide unit prices for specific portions of the work identified by the Owner during the pre-bid process. Unit pricing shall include all costs of materials, including, but not limited to shipping, and their related labor cost, including, but not limited to all appropriate burdens and markups.

11 Applications for Payment (see UGC Article 10 and 12.3)

11.1 Such requests shall be presented on (AIA) style G702 & G703 Pay Application forms. The G702 & G703 forms which may be supplemented with columnar continuation sheets shall separately identify each update to the original contract or GMP amounts.

11.2 The Contractor's project accounting records shall be kept on the basis of generally accepted accounting principles in accordance with cost accounting standards issued by the Federal Office of Management and Budget Cost Accounting Standards Board and organized by each pay request period.

11.3 Prior to the submission of the initial Application for Payment the Contractor shall submit the following documents to the A/E and Owner for review:

11.3.1 Contract Price of GMP Schedule of Values: A single document itemizing the breakdown of the Contract Price/GMP, including general conditions, contingencies and allowances shall be submitted using HCC standard Schedule of Values format. The Contractor shall submit a draft breakdown and such submittal shall be a condition precedent to the processing of the first pay application. The Contractor shall submit subsequent draft copies of the Schedule of Values no later than five (5) working days prior to formal submission of each monthly pay request.

11.3.1.1 The breakdown shall follow the trade divisions of the specifications.

11.3.1.2 No adjustment to the original detailed breakdown of the contract line item shall be made once accepted by the Owner and A/E, unless such adjustment is directed by the Owner in writing.

11.3.1.3 Construction Manager or Design-Builders will be allowed to reallocate among General Conditions line items after consultation with, and agreement from, the Owner. In the event the contractual limits on General Condition's costs are exceeded, the overruns shall be subtracted from the Fee.

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- 11.3.2 The Contractor shall not use subcontractor invoices/pay applications in lieu of a single Schedule of Values from the Contractor.
 - 11.3.3 The breakdown shall anticipate future Change Orders and make provisions for incorporating all changes into the breakdown listing. If issued, Change Orders shall be identified separately and shall itemize the GMP Change Orders, Change Proposals and/or Field Orders, which are incorporated into each Change Order for payment on a line-item basis. Contracts with Guaranteed Maximum Price proposals shall repeat the process outlined in this section every time a subcontract is added to the monthly Schedule of Values for payment.
 - 11.3.4 Submission and approval of Construction Staging Plans, Parking Plans, Quality Control Plans and Trenching Plans are a prerequisite for starting Work at the site and for receiving the first monthly partial payment.
- 11.4 At a minimum, the Contractor shall provide attachments to each month's payment request as follows:
- 11.4.1 Four copies of the monthly Small Business Progress Assessment reports.
 - 11.4.2 Four copies of the updated Submittal Schedule.
 - 11.4.3 Four copies of all invoices required by the contract.
 - 11.4.4 Four copies of the certified wage rate notification form for each member of the workforce not previously submitted.
 - 11.4.5 Four copies of the updated RFI and ASI logs.
 - 11.4.6 Four copies of the updated Work Progress Schedule as specified herein.
- 11.5 All regular monthly applications for payment shall be submitted to the Owner and A/E for review and approval in draft form no less than five working days prior to the formal submission. The Contractor shall be prepared to review the draft copy at the project site, or at such other location as may be agreed to by the parties. Failure to comply with the requirements outlined in this section shall relieve the Owner from its obligation to make payments on any/all line items until the Contractor meets all requirements.
- 11.5.1 Payments cannot exceed the contract, work in-place, or subcontract amounts as noted on the Schedule of Values line items.
 - 11.5.2 All as-built drawings shall be up to date and available for review by the A/E and Owner.

11.5.3 When requesting payment for materials stored off site, all such materials shall be specifically identified, including supporting documentation, photos and insurance. The Contractor should be available to escort the Owner to visit and personally verify the stored materials in a physically separated and secure area.

11.6 Request for payments in association with release of, or reduction in retainage, or completion of work have additional requirements outlined in the UGC.

12 Procurement of Subcontracts (Applies to Construction Manager at Risk and Design-Build Contracts Only) – (see 5.6 & 5.7 of the CM@R contract)

12.1 The Construction Manager at Risk (CM) or Design/Build Contract (DB) shall provide a written Bid/Proposal Package Strategy (B/PPS) for procuring subcontracts including self-performance work (other than General Conditions), prior to the approval of the Guaranteed Maximum Price, but no later than twenty calendar days prior to the first advertisement for subcontractor proposals. The B/PPS shall be a written plan submitted to, and reviewed by the Owner.

12.1.1 The plan shall identify bid packages that are most advantageous to the Project and align with the CM/DB's HCC SB Good Faith Effort by providing at least three qualified respondents (including CM/DB). Each bid package shall include the UGC, Owner's Division 1 Specifications, Drawings and Specifications and any other HCC requirements included in the CM/DB Contract pertaining to the scope of work covered in the packages.

12.1.2 The B/PPS shall include the following for each bid package contemplated:

- Anticipated scope of work to be procured;
- A current Work Progress Schedule;
- Anticipated selection criteria and questions;
- Self-perform work proposals to be submitted by the CM/DB;
- Proposed advertising dates;
- Proposed pre-proposal meeting(s) dates;
- Proposed receipt, review and award dates;
- Anticipated notice to proceed dates.

12.2 The CM/DB shall update the B/PPS monthly at a minimum, as conditions change,

or as proposed dates are revised.

- 12.3 Per the Texas Higher Education Code 51.782: “A Construction Manager at-Risk shall publicly advertise, in the manner prescribed by HCC, and receive bids or proposals from trade contractors or subcontractors for the performance of all major elements of the work other than the minor work that may be included in the general conditions”.
- 12.4 The goal of the Project Team shall be to have all work procured through advertised competitive proposals, however, if a “minor procurement” condition arises during the process, the following procurement guidelines may be used by the CM/DB, with Owner approval, for procurement of work: Less than \$5,000.00 No requirements Between \$5,000.01 to \$25,000.00 Obtain three solicitations Greater than \$25,000.00 Advertised competitive proposals If the CM does not receive at least three competitive proposals on procurements over \$5,000.00, the CM shall re-package the scope and reissue the proposal without additional cost to the Owner, or delay to the project “Substantial Completion” date. This solicitation requirement does not pertain to Change Orders to existing subcontracts.
- 12.5 Work shall be divided into reasonable lots; however, material and labor acquired through purchase order/vendor type contracts are subject to the entire project (i.e. Concrete material shall be procured as a unit price time an estimated total project quantity provided by the CM/DB to equal a total construction cost). Work shall not be incrementally divided for the purpose of circumventing the procurement guidelines of 12.4 above.
- 12.6 The CM/DB may establish selection criteria for each phase of work for review and approval by the Project Team. Criteria shall be qualifications based and consistent with the information needed by the CM/DB to make a proper evaluation and selection. The CM/DB shall establish a selection matrix including cost, criteria, weighting and ranking procedures for evaluation and work with the Project Team to tailor the selection criteria to be project and scope specific to ensure the questions are proper and relevant to the goals of the project. SB participation/status cannot be used as criteria for determining “best value,” only for determining if the respondent is responsive.
- 12.6.1 The CM/DB shall establish clear criteria and questions so that those reading the Request for Proposals will understand how they will be evaluated.

- 12.6.2 If criteria are not included in the advertisement for proposals, the proposal shall be considered a lump sum bid, and the CM/DB shall award the work to the lowest qualified, responsive bidder.
- 12.6.3 After selection criteria have been established, the CM/DB shall publicly advertise the work in general circulations and trade associations in accordance with TEC 51.782 for CM, Article 7 of the current Contract for DB and the Texas Administrative Code 111.14 –“HUB” for both CM and DB. This advertisement shall included, at a minimum, the following:
- HCC Project Number and Project Name;
 - Institution/Campus name;
 - CM/DB name and address;
 - CM/DB contract name and phone number;
 - Location for viewing of plans and specifications;
 - Date, time and location of Pre-proposal meeting(s);
 - Date, time deadlines(s), and location for receiving proposals;
 - Instruction to respondents for submitting proposals;
 - Selection criteria, questions and submittal requirements.
- 12.7 At the time and location identified in the advertisement, the CM/DB shall hold a Pre-proposal meeting(s) for all potential subcontractors with the Project Team and Owner present. The CM/DB shall review the following at a minimum:
- The general scope of the project and specific scope of work included in this package;
 - Instructions to respondents for submitting proposals;
 - Selection criteria and questions;
 - HUB Good Faith Effort requirements;
 - Project safety requirements;
 - Project schedule requirements;
 - Payment procedures and requirements, including retainage;
 - Commissioning and Close-out requirements.
- 12.8 If the CM/DB identifies any self-performance in the B/PPS (work to be performed by its own employees), the CM/DB shall submit a proposal to the Owner at least 24 hours before the advertised time and location in a manner so as not to compromise the competitive process.

- 12.9 The CM/DB shall accept all proposals at the advertised location until the advertised deadline. Upon receipt, the Owner shall be allowed to review the proposal and confirm the time and date received. Any proposals received after the deadline shall not be considered by the CM/DB, and shall be returned to the respondent unopened. Fax proposals shall not be accepted unless the ODR, prior to the initial advertisement for proposals, approves a detailed plan by the CM/DB for proper care and custody.
- 12.10 After compiling, reviewing and verifying the costs and scope associated with all proposals, the CM/DB shall provide a “bid tabulation” matrix and a proposed Schedule of Values for review by the project team.
- 12.10.1 The bid tabulation matrix shall compare all equivalent scope proposals to the CM/DB’s estimate.
- 12.10.2 Each matrix shall indicate the CM/DB estimate(s) for each scope of work and identify the respective cost savings/over-runs.
- 12.10.3 The CM/DB may use values/quantities from its own estimate to provide full scope comparisons between each respondent, however, these “plug” numbers shall be clearly identified in the matrix to the Project Team and be used only to compare various proposals.
- 12.10.4 The proposed updated Schedule of Values shall summarize all executed and recommended “best value” subcontracts to provide a current status of the Guaranteed Maximum Price Proposal.
- 12.10.5 Once the proposals are compiled into a bid tabulation matrix and the proposed Schedule of Values has been updated, the CM/DB shall request a meeting with the Project Team to review the proposals.
- 12.11 The CM/DB shall lead the proposal review meeting and identify any exclusions or conditions, identify any non-qualifying respondents and any other problems that may have occurred during the process.
- 12.11.1 The CM/DB shall confirm that the respondents are qualified, meet the established selection criteria, and identify the amount of the proposals.
- 12.11.2 The CM/DB shall identify the “best values” and the current status of the buyout savings to the project team. If the “best value” causes the CM/DB to exceed the Cost of Work line item, including contingencies in the GMP the CM/DB shall acknowledge that the overage will be deducted from the CM/DB’s Construction Phase Fee.
- 12.12 Once the “best value” respondent has been identified by the CM/DB, without

exception by the Owner, the CM/DB shall finalize negotiations with the selected “best value” respondent. If the CM/DB is unsuccessful in its negotiations with the selected respondent, the CM/DB shall notify the ODR that it intends to begin negotiations with the second “best value” and report the cost implications to the Schedule of Values. Once negotiations are successfully completed the CM/DB shall notify the Owner in writing that it intends to write a subcontract to the selected “best value” respondent and identify the bid package number, value of the contract, along with any changes from the bid day value, changes in scope, report the current status of the GMP identifying the current savings/overages and provided a copy of the executed subcontract or purchase order prior to any request for payment by the CM/DB for applicable work.

- 12.13 The Owner reserves the right to object to the “best value” identified by the CM/DB and may conduct an evaluation of the selection process. If after evaluation the Owner disagrees with the CM/DB “best value” recommendation, the Owner may instruct the CM/DB to re-bid the scope of work or use the Owner’s “best value” selection. If the value of the Owner’s selection causes an increase in the Total Contract Price, the increase will be the responsibility of the Owner.
- 12.14 The process identified in this section shall be repeated for each bid package until the project is entirely bought-out.

13 Contractor Daily Reports

- 13.1 The Contractor shall provide the Owner with a report detailing its daily activities on the Project in a format acceptable to the Owner. All tests performed by the Contractor are to be attached to these daily reports. All work reports required of subcontractors shall be attached to the Contractor’s daily report. As a minimum, the report shall include the following information as it relates to the day’s activities on site: subcontractors on site, equipment on site, areas of work, type of work performed, materials received, tests performed, any injuries or accidents, any oral instructions received from the Owner or A/E, any material damage, any change in supervisory personnel and anything that might impact the projects quality or schedule. These reports shall be submitted to the Owner on a daily basis. Not receiving these reports in a timely manner may be grounds for the Owner withholding payments until they are submitted.

14 As-Built Drawings and Record Drawings (see UGC 10.3 and 11.4)

- 14.1 One copy of all record documents shall be kept up to date and available at the Project Site. "As-Built" drawings, specifications, detail manuals, and submittals shall be continuously annotated by the Contractor to reflect actual record field conditions, addenda, issuance of all Change Orders and clarifications, and actual dimensional records for underground and all other services. One copy of all approved submittals and material selections shall also be kept available.
- 14.2 Maintenance of current documentation by the Contractor is required in order to process pay applications. The Owner and A/E will review the status of such documentation monthly, at a minimum. Also refer to the Commissioning Procedures and Project Close-out Procedures for detailed instructions on As-Built drawings and specifications.

15 Utility Outages

- 15.1 The Contractor shall notify the Owner, in writing, of any planned utility outages ten business days in advance of the anticipated outage date. The notice shall identify the utility(s) to be shutdown, the anticipated duration of the outage and the subcontractor responsible for initiating and terminating the outage. The Owner has final authority to approve or disapprove of the requested outage date and time.
- 15.2 A standard form for processing a request for utility shutdown or any other disruption shall be provided by the Owner at the Pre-Construction Conference. The Contractor shall utilize this form, with attachments as necessary, in requesting an outage.

16 Coordination of Space (see UGC Section 3.3 and 3.3.6.2 in particular)

- 16.1 The Contractor and subcontractors should coordinate the use of Project space and sequence of installation of mechanical, electrical, plumbing, HVAC and Communications work which is indicated diagrammatically on the drawings. The Contractor and subcontractors should follow routing shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space. The Contractor and subcontractors should utilize space efficiently to maximize accessibility for other and future installations, maintenance and repairs. Making adjustments due to field conditions is considered a part of the work.

- 16.2 Within finished areas all pipes, ducts and wiring should be concealed, unless otherwise directed in the plans and specifications. The Contractor and subcontractors should coordinate locations of fixtures and outlets with finish elements.
- 16.3 The Contractor and subcontractors should verify that mechanical and electrical controls, valves, cut-offs, cleanouts, switches and other items are located in such a manner as to make them readily accessible to the user.
- 16.4 In no case shall locations of equipment be established by scaling the drawings. In the event exact dimensions are not provided with the drawings either supplemental instructions should be obtained from the A/E, or approval of placement from the Owner, should be obtained prior to final placement.
- 16.5 All work should be arranged in a neat and orderly manner while maximizing clearances.
- 16.6 All operating system components which will be approved through the submittal process should be reviewed prior to submittal to confirm there is physically adequate space to accommodate the device.

17 Repair of Damage (see UGC 3.3.11.3)

- 17.1 The Contractor shall be responsible for any loss or damage caused by Contractor, his workers or his subcontractors, to the Work, materials stored on site, to tools and equipment, to adjacent property and to persons. The Contractor shall make good any loss, damage or injury at Contractor's own expense and take particular care to protect adjacent buildings, utilities, landscape and lawn sprinkler systems.

18 Deliveries

- 18.1 The Owner will not accept delivery of products and materials bound for the Contractor. The Owner will not be responsible for material losses, or make arrangements to have someone present for acceptance of deliveries.
- 18.2 The name and address of Owner shall not be used for delivery of materials and equipment.
- 18.3 The Contractor should make arrangements for deliveries in accordance with construction schedules and in ample time to facilitate inspection prior to installation without causing delay to the project.

19 Protection of Utilities, Etc. (see UGC 3.3.11.3)

- 19.1 The Contractor and all subcontractors and vendors should take precaution to protect and leave intact the streets, site and work previously accomplished, including buildings, streets, utility poles, fire hydrants, utility lines, catch basins and storm drainage systems.

END OF SECTION

SECTION 01 32 00 – PROJECT PLANNING AND SCHEDULING
(See UGC Article)

1 Definitions:

- 1.1 Project Schedule (a.k.a. Work Progress Schedule) – the schedule developed, monitored Construction phases of the project.
- 1.2 Project Team – refers to the Owner, Architect/Engineer (A/E), Design Consultants, Users, Contractor and Subcontractors that are contracted and/or specifically assigned to the Project.
- 1.3 Work Day – refers to a day in which work is planned, excluding weekends and legally recognized state holidays.
- 1.4 Critical Path – is the sequence of activities that determines the longest duration for the project when the Total Float is equal to, or less than zero.
- 1.5 Total Float – the number of days an activity on the longest path can be delayed without delaying the Substantial Completion Date. Total float should not be shown as a single activity, but rather the relationship between the early and late finish dates or early and late start dates of each activity.

2 Purpose

- 2.1 Time is an essential part of this contract. Therefore, the timely and successful completion of the Work requires careful planning and scheduling of all activities inherent in the completion of the project.
- 2.2 The Contractor shall participate with the Owner and A/E in a project planning workshop promptly upon execution of the contract unless specified differently in the Construction Documents. The Schedule shall be coordinated with the Contract Price Breakdown, or Schedule of Values, and shall include all significant procurement actions (including long lead time delivery items and related approval activities), all work placement activities (including start and completion dates), identification of the timing of overhead inspections, system startup and commissioning activities, pre-final and final inspections, and punch list corrections as a minimum.
- 2.3 Acceptance of the Project Schedule; or any subsequent update thereof, by the Owner is for format and extent of detail of the Project Schedule only. Such “acceptance” does not indicate approval of the Contractor’s means or methods, or of any change to the contract terms including without limitation any required

contract milestones.

- 2.4 The Project Schedule shall be developed with a certain amount of float time. This float, which shall be no less than ten percent of the total duration of the project, shall be presented in a format which facilitates reporting of progress and trends and can be used to identify risk and opportunities, project upcoming activities and forecast project milestones.
- 2.5 The Owner must be able to reasonably rely on the Contractor's Project Schedule in order to make accurate commitments to the Project Team, campus administration and other parties as necessary.

3 Contractor Responsibilities

- 3.1 The Contractor is responsible for planning, managing, coordinating and scheduling all activities from a Notice to Proceed to Final Completion of the project within the time allotted by the contract.
- 3.2 The Contractor is responsible for keeping the Owner and Project Team fully informed of schedule status and upcoming activities throughout the project.
- 3.3 The Contractor's Pre-Construction and Construction project management personnel shall actively participate in the planning and development of the Project Schedule and shall be prepared to review such development and progress with the Owner, A/E and any other members of the Project Team so the planned sequences and procedures are clearly understood by all parties.
- 3.4 The Contractor is to plan for appropriate activity durations to allow for thorough review, procurement, submittal, installation, inspection, testing and commissioning of all work in order to confirm compliance with the project plans and specifications.

4 Schedule Development Requirements

- 4.1 Appropriate logic relationships must be in place and complete, while the Project Schedule shall be free of any mandatory and/or late finish constraints, except for the Substantial Completion Date.
- 4.2 The estimated activity duration of an activity shall be expressed in work days only.
- 4.3 During Pre-Construction Services, the Project Team will establish the maximum duration for every activity included in the schedule.

- 4.4 The Project Schedule should be coordinated with the Contractor's Submittal Schedule and Schedule of Values.

5 Planning and Scheduling Workshop

- 5.1 Within fifteen calendar days after the Notice of Proceed is issued the Contractor will conduct a Planning and Scheduling Workshop with the Contractor's Project Manager, Superintendent, the Owner, A/E, User Representative and any available subcontractors prior to submitting the initial Project Schedule to the Owner.
- 5.2 Two separate Planning and Scheduling Workshops should be held with the aforementioned parties prior to the Contractor submitting the baseline Preconstruction Project Schedule.
- 5.3 The baseline schedule shall be submitted within 10 work days after the Planning and Scheduling Workshops are complete.

6 Construction Phase Baseline Schedule Submittal

- 6.1 The Baseline Project Schedule shall be submitted to the Owner with the required Total Float and a current data date (within five days of the date of submission). The Baseline Schedule will be updated within ten days of the date when each subcontractor is procured and brought on to the project.
- 6.2 Once the full scope of the Project has been approved (i.e. the last stage GMP Change Order has been executed), the Project Manager shall coordinate with the Owner to reset the Baseline Project Schedule.
- 6.3 The Owner reserves the right to withhold any and all payments related to the Project Schedule and/or General Conditions if a Baseline Project Schedule is not submitted, or is not acceptable to the Owner.
- 6.4 The Project Schedule shall be presented in a graphic time-scaled view including all activities, early start and finish dates, estimated durations and total float, sorted by early start.

7 Updating the Project Schedule

- 7.1 Once the Baseline Project Schedule has been accepted, the Project Manager shall update the Project Schedule on at least a monthly basis and submit the updated Project Schedule with the draft application for payment.
- 7.2 Project Schedule updates shall be based on actual work progress, current logic and remaining durations.

7.3 Total Float is intended to be used proportionally with the duration of the project; therefore, there should be no remaining Total Float at the actual Substantial Completion Date.

8 Excusable Delays and Time Extensions

8.1 Excusable delays shall be administered per the UGC.

8.2 If an excusable delay extends the Contract Substantial Completion Date, the ODR may extend the contract time by the number of excusable calendar days lost on the Project Schedule, or take other actions as appropriate under the terms of the contract.

8.2.1 Any Change Order Proposal that the Contractor claims, or will claim, justifies an extension of contract time must contain the information necessary to justify the time extension.

8.2.2 Change Order Proposals that do not affect the Critical Path for the Project and delay the Substantial Completion Date, or does not include a request for additional time prior to approval by the ODR, shall not be due a time extension.

8.3 Once the ODR accepts a time extension, and authorizes the Contractor to proceed with the contract change, the proposed revision shall be incorporated in the Project Schedule.

END OF SECTION

SECTION 01 32 20 – PHOTOGRAPHIC DOCUMENTATION

1 Photographic Media

- 1.1 Digital Images: Provide images in uncompressed TIFF format produced with a minimum 4.0 mega pixels and image resolution of not less than 1024 by 768 pixels.
- 1.2 Video Format: Provide DVD+/-R video discs.

2 Construction Photographs

- 2.1 Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photos with blurry or out-of-focus areas will not be accepted.
- 2.2 Maintain key plan with each set of construction photos that identifies each photo location.
- 2.3 Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- 2.4 Date and Time: Include date and time filename for each image.
- 2.5 Preconstruction Photos: Before commencement of work on the project take digital photos of the project site and surrounding properties, including existing items to remain during construction, for different vantage points.
- 2.6 Take photos to show existing conditions adjacent to the project site.

3 Construction Videos

- 3.1 Preconstruction DVD's: Before starting construction on the project site prepare a video recording of the site and surrounding properties from different vantage points. Show existing conditions of the site and adjacent buildings. Show protection efforts by Contractor including, but not limited to, tree protection and storm water controls.

END OF SECTION

SECTION 01 35 20 – LEED REQUIREMENTS (IF LEED PROJECT)

1 Definitions

1.1 LEED – Leadership in Energy and Environmental Design.

2 Submittals

2.1 The Contractor shall provide preliminary submittals of its LEED Action Plan, indicating how the Owner’s requirements will be met, within thirty days after the Start date established by the Notice to Proceed. Submit additional LEED submittals required by other specification sections.

3 Quality Assurance

3.1 LEED Coordinator: Engage an experienced LEED–Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

END OF SECTION

SECTION 01 35 23 – PROJECT SAFETY REQUIREMENTS
(see UGC Article 7)

1 Purpose

- 1.1 The Contractor shall bear overall responsibility for all aspects of safety at the project.
- 1.2 The Contractor shall, at all times, provide adequate resources, equipment, training and documentation to:
 - 1.2.1 Assure compliance with all applicable regulatory and contract requirements.
 - 1.2.2 Assure a safe work environment at the Project.
 - 1.2.3 Instill a culture for safe behavior in all supervisors and workers.
 - 1.2.4 Ensure a universal understanding that safety and health issues take precedence over all other considerations at the Project.
- 1.3 The Contractor and every subcontractor shall comply with the requirements of this section and all Federal, State, and local statutes, standards, and regulations. In any circumstance where this Section differs from, or is in conflict with any statutory requirement, the more stringent shall apply.
- 1.4 The Owner reserves the right to have any manager, supervisor or worker removed from the project for disregarding the Project's safety requirements.
- 1.5 The Owner reserves the right to deduct from the contract any safety related expenses that the Owner incurs as a result of the Contractor's, or any subcontractor's, failure to comply with the requirements of this Section.
- 1.6 The Owner will deny requests for time extensions and/or monetary considerations whenever the Owner intercedes on behalf of safety compliance as a result of Contractor failure to act as required by the contract.

2 Contractor's Project Safety Coordinator (PSC)

- 2.1 The Contractor shall provide a Project Safety Coordinator, who shall be responsible for safety training, inspections, investigations, record keeping, reporting, incident response, and claims management, and shall serve as the technical advisor to the Contractor's Project staff for all safety issues.
- 2.2 If the contract value is less than \$3,000,000 the Contractor's project superintendent may perform these duties. If the contract value exceeds

\$3,000,000 the Contractor shall furnish a construction safety specialist.

3 Subcontractors' Project Safety Representative (PSR)

- 3.1 Every subcontractor shall identify one employee to be its Project Safety Representative who will be on-site during all the subcontractor's activities and will participate in all training activities, audits, etc. related to the safety program.
- 3.2 The PSR shall attend all safety meetings while the company is actively performing work at the project and shall be responsible for reporting all incidents to the PSC.
- 3.3 The PSR shall transport or accompany any injured co-worker that requires medical attention at facilities outside the project.
- 3.4 The PSR shall be responsible for either conducting or making arrangements for all training, equipment and materials that workers need to perform their duties in the safest possible manner.

4 Project Safety Program

- 4.1 The Contractor shall develop a written, site specific, safety program. It shall be printed in English and an initial draft shall be submitted to the Owner for review and comment as a prerequisite to issuance of the Notice to Proceed with construction services'
- 4.2 The Contractor shall incorporate Owner comments into a final draft which shall be resubmitted to the Owner for concurrence.

5 Personal Protective Equipment (PPE)

- 5.1 PPE shall be required for all workers in construction areas. The followings items shall be furnished, inspected, and maintained by the employer. The Contractor shall maintain an adequate inventory to furnish these items for five Owner representatives who may visit the project from time to time:
 - 5.1.1 Hard Hats (safety helmets): shall be ANSI stamped (Z89.1-1997, Type I, Class E, G and C and be worn at all times while in the construction areas.
 - 5.1.2 Eye protection (safety glasses): shall be ANSI stamped Z87. If a worker wears prescription glasses (plastic lenses only) that are marked Z87, the employer shall furnish goggles or safety glasses that are designed to fit

over another pair of glasses and be worn at all times while in the construction areas.

5.1.3 Vests shall be at a minimum a Class II reflective traffic vests and be worn at all times while in the construction areas.

5.1.4 Hand protection, Hearing Protection, Respiratory Protection, Fall Arrest Equipment, Other PPE: shall all be furnished as required to comply with OSHA Standards.

6 Medical Equipment

6.1 The Contractor shall maintain at least one first aid kit on the project site at all times per ANSI Z308.1.

7 Certifications

7.1 Supervisors, Competent Persons, Equipment and Crane Operators, and Emergency Responders shall all be identified in lists submitted by employers to the PSC prior to commencement of work. In addition to lists, the employers shall include copies of all available training certificates or formal documentation to support the declared positions. For all operations that require a “competent person” (per OSHA definition), the PSC shall maintain a project file containing the transmittals from each employer naming each person declared to be competent for each operation. For operations requiring independent certification, a copy of the certificates shall be attached.

8 Project Safety Signs and Posters

8.1 The Contractor shall post safety regulation signs at every point of entry to the project in English and Spanish. The content of the sign should at a minimum indicate that visitors are required to check in at the project office, persons entering the construction area must be appropriately attired, no weapons, tobacco, alcohol, controlled substances and related paraphernalia may be brought onto the premises, a posted speed limit will be identified and copies of the MSDS sheets are available at the project office.

8.2 The Contractor shall post emergency contacts and notification, including phone numbers, notification of insurance carrier for Worker’s Compensation Coverage and any and all other required State and Federal postings.

9 Project Safety Training and Meetings

- 9.1 Within fifteen days of the issuance of the Notice to Proceed the Contractor shall hold the initial safety meeting and all Project Team members are strongly encouraged to participate.
- 9.2 The PSC shall present orientation training to every person who is to be allowed into the construction area without an escort. A translator shall be present when there are workers in attendance who do not speak English.
- 9.3 The PSC shall maintain a site safety orientation log signed by all persons receiving safety training.
- 9.4 Project safety meetings will be held on a weekly basis and will be chaired by the PSC and attended by all companies' PSRs who are currently on site. The topics of discussion should focus on safety and loss control issues.
- 9.5 "Tool Box Talks" shall be conducted on a weekly basis by each PSR and will cover safety issues related to upcoming work, current site conditions and review of any recent incidents.
- 9.6 Special task training should occur when new equipment or non-routine activities are scheduled.

10 Safety Inspections

- 10.1 Daily - The PSC shall observe work operations in all areas of the project and note any violations in the daily progress reports.
- 10.2 Weekly - A comprehensive safety inspection shall be conducted by the PSC and each PSR for their respective work areas. A written record of the observations and recommended corrections should be made and placed in the project files.
- 10.3 Quarterly - The PSC shall facilitate an inspection which shall include, but not be limited to the following: fall arrest equipment, fire extinguishers, rigging, ladders, hand tools, power tools, cords, welding leads, hoses, alarms, respirators, ground fault circuit interrupters, first aid stations, eye wash stations, and emergency rescue equipment.
- 10.4 Semi-Annually - The PSC shall facilitate an inspection of all hoists, cranes, mobile equipment, motorized lift platforms, stages, generators and compressors to assure proper operational condition.
- 10.5 The PSC shall notify the Owner within one hour of the arrival at the project site

by any representative of a regulatory agency and provide the Owner with a copy of any published findings or citations issued to any employer and shall ensure that statutory posting requirements are met.

11 Records and Reports

- 11.1 The PSC shall prepare a written report for each incident that involves any injury that may not be resolved by first aid response and/or each incident that involves damage to property or equipment. The report should contain a list of factual details that created the incident, the responsive actions that occurred during and immediately following the incident and recommendations for modifications to prevent repetition of the incident. A copy of the report should be submitted to the Owner within 24 hours of the incident.

12 Construction Operations

12.1 Cranes:

12.1.1 Tower cranes and related power supply equipment shall be surrounded by at least an eight foot high, 5/8" plywood enclosure with lock controlled entrance.

12.1.2 Operators of cranes, derricks and/or hoisting equipment shall possess certification from a nationally accredited training organization.

12.2 Demolition:

12.2.1 Safe egress paths and barrier isolation of impacted areas shall be monitored and maintained to prevent entry by other trades and members of the public. This includes removal of materials and trash from elevated locations.

12.3 Electrical Power:

12.3.1 Ground fault circuit interruption (GFCI) shall be the primary protection from exposure to electrical current for all workers on the project. Only exit lighting and medium-high (greater than 240) voltage service will not be GFCI protected.

12.3.2 All strings of temporary lights shall be fully lamped and guarded regardless of height, and shall be continuously maintained. Adequate levels of illumination for the work operations must be maintained at all times.

12.3.3 All receptacles and switches shall have trim plates installed before they

are energized.

12.3.4 All power distribution panels shall have full covers installed before primary power is brought into the panel.

12.4 Excavations:

12.4.1 Prior to starting, each excavation shall be reviewed with the Owner to obtain any historical knowledge about existing utilities in the area. Where applicable, "utility locates" will be called for seventy two hours in advance of commencement of the excavation. Potholing and/or hand excavation shall be required within two horizontal feet of located centerlines and in areas where knowledge is lacking.

12.4.2 When a trench excavations cannot be backfilled in the same day as it is created, a highly visible barricade shall be erected no less than six feet from all approachable edges. All portable means of access shall be removed at the end of each workday.

12.4.3 Earth ramps that are to be used for walking access shall not exceed twenty percent in grade slope. Steeper slopes shall be gated and used for equipment only.

12.5 Fall Protection and Prevention:

12.5.1 Any walking/working surface shall be defined to have a fall exposure that has one or more sides, ends or edges without a guardrail system attached or a solid continuous wall of at least forty-two inches in height above the walking/working surface, and within twelve horizontal inches from the edge. The Contractor shall require engineered or conventional fall protection measures for each and every fall exposure that involves vertical distances equal to or greater than six feet. The recognized exemptions/exceptions are as follows:

- Portable step ladders.
- Extension and straight ladders.
- Erection and dismantling of scaffolding.
- Limited exposure for engaging and disengaging a hook.
- Vertical fall exposure protected by a warning line and six foot setback.

12.5.2 Provide covers over holes which are secured and clearly marked as covers.

- 12.5.3 Job built ramps and bridges must be covered with non-skid materials.
 - 12.5.4 Materials, scraps, waste and tools shall never be allowed to free-fall from a height greater than twenty feet, unless it is contained within a chute or controlled by a hoist.
- 12.6 Fire Protection
- 12.6.1 The Contractor shall review fire prevention needs and procedures with the Owner and shall post appropriate information and warnings.
 - 12.6.2 The Contractor shall maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes.
 - 12.6.3 The Contractor shall provide supervision of welding operations, combustion type temporary heating units and similar sources of ignition.
 - 12.6.4 All floors that have combustible materials present shall be accessible from ground level by a usable stair system. For structures greater than three stories in height shall have a fire sprinkler stand pipe installed and it shall be charged to within two stories (or thirty vertical feet) of all floors containing combustible materials. A Siamese connection shall be installed at every second level to provide access for fire hoses.
 - 12.6.5 All fire extinguishers that are not task-specific shall be adequate in number and description to comply with OSHA declared limits for egress points, floor area and travel distances. They shall be situated in highly visible locations.
 - 12.6.6 All fire extinguisher that are task specific shall be inspected and furnished in advance by the employer that will be conducting the work that requires such fire fighting provisions. Such extinguishers shall be located with twenty-five feet from the perimeter of the task operation.
- 12.7 Housekeeping – The Contractor shall ensure that all subcontractors effectively clean the project site continuously throughout each workday. Effective cleanup shall address all of the following housekeeping issues:
- 12.7.1 All construction waste, trash, and debris shall be placed in designated receptacles. No glass bottles will be permitted on the project site.
 - 12.7.2 Stack all whole and scrap materials in locations that do not obstruct a clear pathway nor create a risk of toppling causing injury or damage to the work.

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- 12.7.3 Place all hoses, cords, cables and wires in locations that prevent them from being damaged by tires, sharp edges, or pinch points and from creating trip or hook hazards.
 - 12.7.4 Secure and effectively cover all materials on roofs and elevated levels to prevent displacement by wind.
 - 12.7.5 All materials and equipment shall be protected from the elements while staged on the project site.
 - 12.7.6 All signs, barricades, fire extinguishers, guardrails, gates, etc. are to be restored to their proper locations in sound condition after they have been moved for work purposes.
 - 12.7.7 Properly store and secure all flammable and combustible liquids and gases.
 - 12.7.8 Collect and place all cut-off or waste pieces of rolling stock into waste and scrape containers as they are created.
 - 12.7.9 Live rounds ejected from powder-actuated tools shall be immediately placed in designated containers and periodically returned to the tool dealer or law enforcement agency for proper disposal.
 - 12.7.10 All puncture and impalement exposures shall be covered or eliminated as soon as they are created.
- 12.8 Ladders:
- 12.8.1 Portable aluminum ladders are prohibited.
 - 12.8.2 Extension, straight and job built ladders shall be secured from movement at the top and bottom.
 - 12.8.3 Manufactured portable ladders shall display ANSI heavy duty rating (Class 1-A) and be inspected daily.
- 12.9 Medical Assistance and Screening:
- 12.9.1 The PSC shall maintain a First Aid Log for all treatment administered on the project.
 - 12.9.2 Drug and alcohol screening shall be mandatory for every supervisor and/or worker who sustains or contributes to the cause of any injury (beyond first aid) or property damage incident.
 - 12.9.3 Minimum requirements for chemical screening shall at least match the threshold limits for a NIDA 5-panel protocol and for alcohol screening shall at least match the Texas DOT vehicle operator's limit for blood

alcohol content.

12.9.4 Any supervisor or worker who tests positive shall be ejected and excluded from return to work at the project. Successful completion of an acceptable rehabilitation program may be considered by the Owner for restoring a person's ability to return to the project. The final decision rest solely with the Owner.

12.10 Petroleum Fuel Operated Equipment:

12.10.1 Where possible, equipment operator cabs shall be locked during non-working hours. Only equipment operators and direct supervisors shall have access to keys.

12.10.2 Any combustion engine equipment with less than ninety-eight percent clean air exhaust shall not be operated in enclosed spaces unless the exhaust is piped to outside air, and fresh air is brought into the space to replace the amount being consumed. This includes generators/welders and compressors as well as mobile equipment.

12.10.3 For hose and termination fittings on air compressors, whip checks shall be used at all connection points. Emergency shut off valves shall be installed on every discharge fitting of all air compressors.

12.11 Public Protection – The public boundary perimeter shall be secured from public intrusion. Attractive nuisance items such as tower cranes, tall ladders, fire escapes, large excavations, etc. shall require additional and separate security measures.

12.12 Project Service Water:

12.12.1 Potable water: Comply with city health requirements.

12.12.2 Non-potable water: Water storage containers, hose bibs and faucet shall be posted in English and Spanish "Danger – Do Not Drink"

12.13 Welding and Burning:

12.13.1 Oxygen and fuel gas cylinders shall not be stored together, including on bottle carts. At the end of any workday bottles must be moved to OSHA prescribed storage arrangements.

12.13.2 Anti-flashback arrestors shall be installed at the pressure regulator gauges of all Oxy-Acetylene cutting rigs.

12.13.3 Welding operations shall not be allowed to present an opportunity for flash burn exposures to the eyes of any workers in the vicinity. All

welding operations shall provide appropriate screening measures, erected in advance to contain the high energy light.

END OF SECTION

SECTION 01 42 00 – REFERENCE STANDARDS

1 Governing Regulations/Authorities

- 1.1 The Architect/Engineer (A/E) has contacted the appropriate authorities having jurisdiction for the listed regulations and codes to obtain information for preparation of the Construction Documents. The Contractor may contact the authorities having jurisdiction directly for information and decisions having bearing on the work. **Refer to the coversheet of the plans issued for construction to identify the appropriate authorities having jurisdiction.**

2 Standards

- 2.1 Reference to standards, codes, Specifications, recommendations and regulations refer to the latest edition or printing prior to the date of issue of the Construction Documents.
- 2.2 Applicable portions of standards listed that are not in conflict with the Construction Documents are hereby made a part of the Specifications
- 2.3 Modifications or exceptions to Standards shall be considered as amendments and unmodified portions shall remain in full effect. In cases of discrepancies between standards, the more stringent requirements shall govern.
- 2.4 Copies of Standards: Each entity engaged in construction of the Project is required to be familiar with industry standards applicable to its respective construction activity. Copies of applicable standards are not bound with the Construction Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

3 Schedule of Standards

AA Aluminum Association
1525 Wilson Blvd. Suite 600
Arlington, VA 22209
703.358.2960
Fax 703.358.2961
www.aluminum.org

AABC Associated Air Balance Council

1518 K St. NW
Washington, DC 20005
202.737.0202
www.aabchq.com

AAMA American Architectural Manufacturers Assoc.
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173-4268
847.303.5664
Fax 847.303.5774
www.aamanet.org

AAN American Association of Nurserymen
1250 Eye St., NW, Suite 500
Washington, DC 20005
202.789.2900

ANLA American Nursery and Landscape Association
1000 Vermont Ave., NW, Suite 300
Washington, DC 20005-4914
202.789.2900
www.anla.org

AASHTO American Association of State Highway and Transportation
Officials
444 North Capitol St., Suite 225
Washington, DC 20001
202.624.5800
www.transporation.org

ACI American Concrete Institute
38800 Country Club Dr.
Farmington Hills, MI 48331
248.848.3700
Fax 248.848.3701
www.aci-int.org

ACIL American Council on Independent Laboratories
1629 K St. NW
Washington, DC 20006
202.887.5872
www.acil.org

ACPA American Concrete Pipe Association
1303 West Walnut Hill Lane, Suite 305
Irving, TX 75038-3008
972.506.7216
Fax 972.506.7682
www.concrete-pipe.org

ADC Air Diffusion Council
1901 N. Roselle Rd., Suite 800
Schaumburg, IL 60195
847.706.6750
Fax 847.706.6751
www.flexibleduct.org

AF&PA American Forest & Paper Products
(Formerly National Forest Products Assoc. (NFPA))
1111 Nineteenth St., NW, Suite 800
Washington, DC 20036
800.878.8878
Fax 202.463.2700
www.afandpa.org

AI Asphalt Institute
2696 Research Park Dr.
Lexington, KY 40512-4052
606.288.4960
<http://www.washpaltinstitute.org>

AIA American Institute of Architects
1735 New York Ave. NW
Washington, DC 20006

202.626.7300

www.aia.org

AIHA American Industrial Hygiene Assoc.

P 2700 Prosperity Ave., Suite 250

Fairfax, VA 22031

703.849-888

www.aiha.org

AISC American Institute of Steel Construction

One East Wacker Dr., Suite 3100

Chicago, IL 60601-2001

312.670.2400

www.aisc.org

ISI American Iron and Steel Institute

1140 Connecticut Ave., NW, Suite 705

Washington, DC 20036

202.452.7100

www.steel.org

AITC American Institute of Timber Construction

7012 S. Revere Parkway, Suite 140

Centennial, CO 80112

303.792.9559

303.792.0669

www.aitc-glulam.org

ALI Associated Laboratories, Inc.

500 S. Vermont St.

Palatine, IL 60067

800.685.0026

www.associatedlabs.org

ALSC American Lumber Standards Committee

P.O. Box 210

Germantown, MD 20875

301.972.1700
www.alsc.org

AMCA Air Movement and Control Assoc.
30 W. University Dr.
Arlington Heights, IL 60004-1893
847.394.0150
www.amca.org

ANSI American National Standards Institute
1819 L St., NW, 6th Fl.
Washington, DC 20036
202.293.8020
Fax 202.293.9287
www.ansi.org

APA American Plywood Assoc.
7011 S. 19th
Tacoma, WA 98466
253.565.6600
Fax 253.565.7265
www.apawood.org

ARI Air Conditioning and Refrigeration Institute
4100 North Fairfax Dr., Suite 200
Arlington, VA 22203
703.524.8800
Fax 703.528.3816
www.ari.org

ARMA Asphalt Roofing Manufacturers Assoc.
Public Information Dept.
1156 15th St., NW, Suite 900
Washington, DC 20005
202.207.0917
Fax 202.223.9741
www.asphaltroofing.org

ASA Acoustical Society of America
2 Huntington Quadrangle, Suite 1N01
Melville, NY 11747-44502
516.576.2360
Fax 516.576.2377
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www.asaa.aip.org

ASC Adhesive and Sealant Council
7979 Old Georgetown Rd. Suite 500
Bethesda, MA 20814
301.986.9700
Fax 301.986.9795
www.ascouncil.org

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning
Engineers
1791 Tullie Circle, NE
Atlanta, GA 30329
404.636.8400
Fax 404.321.5478
www.ashrae.org

ASME American Society of Mechanical Engineers
Three Park Ave.
New York, NY 10016-5990
800.843.2763
www.asme.org

ASPE American Society of Plumbing Engineers
8614 Catalpa Ave., Suite 1007
Chicago, IL 60656-1116
773.693.2773
Fax 773.695.9007
www.aspe.org

ASSE American Society of Sanitary Engineers
901 Canterbury, Suite A
Westlake, OH 44145
440.835.3040
Fax 440.835.3488
www.asse-plumbing.org

ASTM American Society for Testing and Materials
100 Barr Harbor Dr.
West Conshohocken, PA 19428-2959
610.832.9500
Fax 610.832.9555

AWCMA American Window Covering Manufacturers Assoc.
355 Lexington, AVE, 17th Fl.
New York, NY 10017
212.297.2122
Fax 212.370.9047
www.wcmanet.org

AWI Architectural Woodwork Institute
46179 Westlake Dr., Suite 120
Potomac Falls, VA 20165
571.323.3636
Fax 571.323.3630
www.awinet.org

AWPA American Wood-Preservers' Assoc.
P.O. Box 361784
Birmingham, AL 35236-1784
205.733.4077
www.awpa.com

AWPB American Wood Preservers Bureau
4 D. Washington, St
Newnan, GA 30263

404.254.9877

AWS American Welding Society

50 N.W. LeJeune Rd.

Miami, FL 33126

800.443.9353

Fax 305.443.9353

www.aws.org

BHMA Builder's Hardware Manufacturers Assoc.

355 Lexington Ave., 15th Fl.

New York, NY 10017

212.297.2122

Fax 212.370.9047

www.buildershardware.com

BIA The Brick Industry Association

1850 Centennial Park Dr., Suite 301

Reston, VA 20191

703.620.0010

Fax 703.620.3928

www.bia.org

BIFMA Business and Institutional Furniture Manufacturers Assoc.

2680 Horizon, Dr., SE, Suite A-1

Grand Rapids, MI 49546-7500

616.285.3963

Fax 616.285.3765

www.bifma.org

CFFA Chemical Fabrics & Film Assoc., Inc.

c/o Thomas Assoc., Inc

1300 Sumner Ave.

Cleveland, OH 44115-2851

216.241.7333

www.chmicalfabricsandfilm.com

CISCA Ceiling and Interior Systems Construction Assoc.
5700 Old Orchard Rd., 1st Fl.
Skokie, IL 60077
708.965.2776
www.cisca.org

CISPI Cast Iron Soil Pipe Institute
5959 Shallowford Rd., Suite 419
Chattanooga, TN 37421
615.892.0137
Fax 615.892.0817
www.cispi.org

CRI Carpet and Rug Institute
P.O. Box 2048
Dalton, GA 30722
706.278.8835
Fax 706.278.8835 www.carpet-rug.org

CRSI Concrete Reinforcing Steel Institute
933 North Plum Grove Rd.
Schaumburg, IL 60173-4758
847.517.1200
Fax 847.517.1206
www.crsi.org

CTIOA Ceramic Tile Institute of America
12064 Jefferson, Blvd.
Culver City, CA 90230-6219
310.574.7800
Fax 310.821.4655
www.ctioa.org

DHI Door and Hardware Institute
14150 Newbrook Dr., Suite 200
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Chantilly, VA 20151
703.222.2010
Fax 703.222.2410
www.dhi.org

ETL ETL Testing Laboratories, Inc.
P.O. Box 2040
Route 11, Industrial Park
Cortland, NY 13045
607.753.6711
www.etl.com

ECDS Energy Conservation Design Standards for New State Buildings
State Energy Conservation Office
Texas Facilities Commission
P.O. Box 13047
Austin, TX 78711-3047

FGMA Flat Glass Marketing Assoc.
(The Flat Glass Marketing Assoc. included Glass Tempering Association, and members of the Laminators Safety Glass Association consolidated to form the Glass Assoc. of North America)
2495 SW Wanamaker Dr., Suite A
Topeka, KS 66614
785.271.0208
Fax 785.271.0166
www.glasswebsite.com

FM Factory Mutual Research Organization
500 River Ridge
P.O. Box 9102
Norwood, MA 02062
617.762.4300

GA Gypsum Association
810 First St., NE #510

Washington, DC 20002
202.289.5440
Fax 202.289.3707
www.gypsum.org

HMA Hardwood Manufacturers Assoc.
400 Penn Center Blvd., Suite 350
Pittsburg, PA 15235
412.829.0770
Fax 412.829.0844
www.hmamembers.org

HPMA Hardwood Plywood Manufacturers Assoc.
1825 Michael Farraday Dr.
Reston, VA 20190
703.435.2900
Fax 703.435.2537
www.hpva.org

IBC International Building Code
International Code Council
500 New Jersey Ave., NW 6th Fl.
Washington, DC 20001-2070

IBD Institute of Business Designers
341 Merchandise Mart
Chicago, IL 60654
312.647.1950

ICC International Code Council
500 New Jersey Ave., NW, 6th Floor
Washington, DC 20001
888.422.7233
Fax 202.783.2348
www.iccsafe.org

IECC International Energy Conservation Coder

www.iccsafe.com

IEEE Institute of Electrical and Electronic Engineers

3 Park Ave., 17th Fl.

New York, NY 10016-5997

212.419.7900

Fax 212.752.4929

www.ieee.org

IESNA Illuminating Engineering Society of North American

120 Wall Street, Fl. 17

New York, NY 10005

212.248.5000

Fax 212.248.5017

www.iesna.org

IFC International File Code

www.iccsafe.org

IGCC Insulating Glass Certification Council

c/o ETL Testing Laboratories, Inc.

P.O. Box 9

Henderson Harbor, NY 13651

315.646.2234

Fax 315.646.2297

www.igcc.org

ILI Indiana Limestone Institute of American

400 Stone City Bank Bldg.

Bedford, IN 47421

812.275.4426

Fax 812.279.8682

www.iliai.com

IPC International Plumbing Code

www.iccsafe.org

ISA Instrument Society of America
67 Alexander Dr.
Research Triangle Park, NC 27709
919.549.8411
Fax 919.549.8288
www.isa.org

LIA Lead Industries Assoc., Inc.
Sparta, New Jersey
www.leadinfo.com

LPI Lightning Protection Institute
25475 Magnolia Dr.
P.O. Box 99
Maryville MO 64468
800.488.6864
www.lightning.org

MBMA Metal Building Manufacturers Assoc.
1300 Sumner Ave.
Cleveland OH 44115-2851
216.241.7333
Fax 216.241.0105
www.mbma.com

MCAA Mechanical Contractors Assoc. of America
1385 Piccard Dr.
Rockville, MD 20850
301.869.5800
Fax 301.990.9690
www.mcaa.org

MFMA Maple Flooring Manufacturers Assoc.
60 Revere Dr., Suite 500
Northbrook, IL 60062
888.480.9138
Fax 847.480.9282

www.maplefloor.org

MIA Marble Institute of America
28901 Clemens Rd., Suite 100
Cleveland, OH 44145
440.250.9222
Fax 440.250.9223
www.marble-institute.com

ML/SFA Metal Lath/Steel Framing Assoc.
(A Division of the National Association of Architectural Metal
Manufacturers)
800 Roosevelt Rd., Bldg. C, Suite 312
Glen Ellyn, IL 60137
630.942.6591
Fax 630.7903095
www.naamm.org

NAAMM National Association of Architectural Metal Manufacturers
800 Roosevelt Rd., Bldg. C, Suite 312
Glen Ellyn, IL 60137
630.942.6591
Fax 630.7903095
www.naamm.org

NAIMA North American Insulation Manufacturers Assoc,
44 Canal Center Plaza, Suite 310
Alexandria, VA 22314
703.684.0084
Fax 703.684.0427
www.naima.org

NAPA National Asphalt Pavement Association
NAPA Building
5100 Forbes Blvd.
Lanham, MD 20706
888.468.6499

www.hotmix.org

NCMA National Concrete Masonry Assoc.

13750 Sunrise Valley Dr.
Herndon, VA 20171-4662
703.713.1900
Fax 703.713.1910

www.ncma.org

NEC National Electrical Code (NFPA)

NECA National Electrical Contractors Assoc.

3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814
301.657.3110
Fax 301.215.4500

www.necanet.org

NEII National Elevator Industry, Inc.

1677 County Route 64
P.O. Box 838
Salem, NY 127865-0838
518.854.3100
Fax 518.854.3257

www.neii.org

NEMA National Electrical Manufacturers Assoc.

1300 North 17th St., Suite 1752
Rosslyn, VA 22209
703.841.3200
Fax 703.841.5900

www.nema.org

NFPA National Fire Protection Assoc.

1 Batterymarch Park
Quincy, MA 02169-7471
617.770.3000

Fax 617.770.0700

www.nfpa.org

NHLA National Hardwood Lumber Assoc.

6830 Raleigh–LaGrange Rd.

Memphis, TN 38184–0518

901.377.1818

www.natlhardwood.org

NLGA National Lumber Grades Authority

#302 960 Quayside Dr.

New Westminster, BC V3M 6G2 Canada

604.524.2393

Fax 604.524.2893

www.nlga.org

NPA National Particleboard Assoc.

18928 Premiere Court

Gaithersburg, MD 20879–1569

301.670.0604

Fax 301.840.1252

www.pbmdf.org

NPCA National Paint and Coatings Assoc.

1500 Rhode Island Ave., NW

Washington, DC 20005

202.462.6272

Fax 202.462.8549

www.paint.org

NRCA National Roofing Contractors Assoc.

10255 W. Higgins Rd., Suite 600

Rosemont, IL 60018–5607

708.299.9070

Fax 847.299.1183

NTMA National Terrazzo and Mosaic Assoc.

201 North Maple, Suite 208
Purcellville, VA 20132
540.751.0930
Fax 540.751.0935
www.ntma.com

NWWDA National Wood Window and Door Assoc.
1400 E. Touhy Ave.
Des Plaines, IL 60018
800.223.2301
Fax 708.299.1286

PCA Portland Cement Assoc.
5420 Old Orchard Rd.
Skokie, IL 60077
847.966.6200
Fax 847.966.8389
www.cement.org

PCI Precast/Prestressed Concrete Institute
209 W. Jackson Blvd. #500
Chicago, IL 60606
312.786.0300
Fax 312.786.0353
www.pci.org

RFCI Resilient Floor Covering Institute
401 E. Jefferson St., Suite 102
Rockville, MC 20850
301.340.8580
Fax 301.340.7283
www.rfci.com

RMA Rubber Manufacturers Assoc.
1400 K St., NW, Suite 900
Washington DC 20005
202.682.4800

www.rma.org

SDI Steel Deck Institute
P.O. Box 25
Fox River Grove, IL 60021
847.458.4647
Fax 847.458.4648

SECO State Energy Conservation Office
LBJ State Office Bldg.
111 E. 17th St., Rm 1114
Austin, TX 78701
512.463.1931
Fax 512.475.2569
www.seco.cpa.stat.tx.us

SGCC Safety Glazing Certification Council
P.O. Box 730
Sackets Harbor, NY 13685
315.646.2234
Fax 315.646.2297
www.sgcc.org

SIGMA Sealed Insulating Glass Manufacturers Assoc.
401 N. Michigan
Chicago, IL 60611
312.644.8610
www.sigmaonline.org

SJI Steel Joist Institute
3127 Mr. Joe White Ave.
Myrtle Beach, SC 29577-6760
843.626.1995
Fax 843.626.5565
www.steeljoist.org

SMACNA Sheet Metal and Air Conditioning Contractors National Assoc.

4201 Lafayette Center Dr.
Chantilly, VA 20151-1209
703.803.2980
703.803.3732
www.smacna.org

SPIB Southern Pine Inspection Bureau
P.O. Box 10915
Pensacola, FL 32524-0915
850.434.2611
Fax 850.433.5594
www.spib.org

SPRI Single Ply Roofing Institute
77 Rumford Ave., Suite 3B
Waltham, MA 02453
781.647.7026
Fax 781.647.7222
www.spri.org

TCA Tile Council of America
100 Clemson Research Blvd.
Anderson, SC 29625
864.646.8453
Fax 864.646.2821
www.tileusa.com

TIMA Thermal Insulation Manufacturers Assoc.
29 Bank St.
Stanford, CT 06901
203.324.7533
(Standards now issued by NAIMA, www.naima.org)

UFAC Upholstered Furniture Action Council
Box 2436
High Point, NC 27261
919.885.5065

www.ufac.org

UL Underwriters Laboratories, Inc.
333 Pfingsten Rd.
Northbrook, IL 60062-2096
847.272.8800
Fax 847.272.8129
www.ul.com

WSFI Wood and Synthetic Flooring Institute
4415 W. Harrison St., Suite 242-C
Hillside, IL 60162
708.449.2933

WWPA Western Wood Products Assoc.
522 SW Fifth Ave., Suite 500
Portland, OR 97204-2122
503.224.3930
Fax 503.224.3934
www.wwpa.org

W.W.P.A. Woven Wire Products Assoc.
2515 N. Nordica Ave.
Chicago, IL 60635
312.637.1359
www.wovenwire.org

Government Agencies:

CPSC Consumer Products Safety Commission
4330 E. West Highway
Bethesda, MD 20814
301.504.7923
Fax 301.504.0124
www.cpsc.gov

CS Commercial Standard

(U.S. Department of Commerce)
1401 Constitution Ave., NW
Washington, DC 20230
Page 49 of 69
Date 3/02/09
202.482.2000
www.commerce.gov

DOC U.S. Department of Commerce
1401 Constitution Ave., NW
Washington, DC 20230
202.482.2000
www.commerce.gov

EPA Environmental Protection Agency
1445 Ross Ave., Suite 1200
Dallas, TX 75202
214.665.6444
www.epa.gov

FS Federal Specifications (from GSA Specifications Unit WFSIS)
7th and D St., SW
Washington DC 20407
202.708.9205
www.apps.fss.gsa.gov/pub/fedspecs

GSA General Services Administration
1800 F. St., SW
Washington DC, 20405
202.708.9205
www.gsa.gov

GSC Texas Building and Procurement Commission
1711 San Jacinto
Austin, TX 78701
512.463.6363
www.tbpc.state.tx.us

NIST National Institute of Standards and Technology
100 Bureau Dr., Stop 1070
Gaithersbury, MD 20899-1077
301.975.6478
Fax 301.975.8295
www.nist.gov

OSHA Occupational Safety and Health Administration
Federal Office Building
1205 Texas Ave., Rm 806
Lubbock, TX 79401
806.472.7681
Fax 806.472.7686
www.osha.gov

PS Product Standard of NBS
(U.S. Department of Commerce)
Washington, DC 20230
202.482.2000
www.thenbs.com

USDA U.S. Department of Agriculture
1400 Independence Ave., SW
Washington, DC 20250
202.447.2791
www.usda.gov

END OF SECTION

SECTION 01 43 00 – QUALITY ASSURANCE

1 General Requirements

- 1.1 The Contractor is responsible for controlling the quality of the Work of its forces and its subcontractors and all of the Work of the Project in general and as set forth in the Construction Documents. The Contractor shall provide qualified personnel, approved by the Owner, to perform daily supervision, reviews and inspections of subcontractor work to insure quality, accuracy, completeness and compliance.
- 1.2 The Owner will employ a testing laboratory and/or geotechnical engineering service to perform quality assurance test and to transmit copies of test reports to the Contractor. Sampling and testing that the Owner may require is specified in this section and in the various technical sections requiring quality assurance testing. The Contractor shall cooperate with the Owner's testing personnel, provide access to the work, to manufacturer's and fabricator's operations, furnish incidental labor and facilities and samples for test and inspection as specified.
 - 1.2.1 Employment of the testing laboratory to perform quality assurance tests is for the benefit of Owner in confirming that performance and quality of the work is in conformance with the Construction Documents.
 - 1.2.2 Employment of the testing laboratory by Owner in no way relieves Contractor's obligation to perform the work in accordance with the Construction Documents and Owner's testing laboratory shall not be the same as Contractor's testing laboratory.
 - 1.2.3 The testing firm shall make all inspections and perform all tests in accordance with the rules and regulations of the building code, local authorities, the specifications of the ASTM and these Construction Documents.
 - 1.2.4 Any costs incurred by the Owner due to re-testing of materials or re-inspection of work due to non-compliance with the Construction Documents by the contractor shall be at the expense of the Contractor and shall be deducted from the next pay request accordingly.
- 1.3 Limits of testing laboratory authority: Laboratory is not authorized to:
 - 1.3.1 Approve or reject any portion of the work.
 - 1.3.2 Perform any duties of the Contractor and subcontractors.

- 1.3.3 Revoke, alter, relax, expand, or release any requirement of the Construction Documents or to approve or accept any portion of the Work, except where such approval is specifically called for in the specifications.
- 1.3.4 Work will be checked as it progresses, but failure to detect any defective work or materials shall not, in any way, prevent later rejection when such defect(s) are discovered.
- 1.4 When requested by the Owner, the Contractor will demonstrate a material's compliance with the specifications in one of the following ways:
- Manufacturer's Certificate of Compliance
 - Mill Certificate
 - Testing Laboratory Certifications
 - Report of actual test results from Owner's designated laboratory, or a laboratory satisfactory to the Owner. Materials so tested shall be provided by the Contractor and selected by the Owner, or in the presence of the Owner, and the method of testing shall comply with the professional societies' standard specifications.
- 1.5 The Owner may require Special Inspections, Testing or Approval of certain materials or Work in addition to those clearly specified in the Construction Documents. Upon notification by the Owner of such requirements, the Contractor shall promptly arrange for such Special Inspections, Testing and Approval procedures. The costs associated with these efforts shall be borne by the Owner, except that if such materials or Work fail the initial Owner-paid inspections, tests and approvals, then subsequent tests required to prove the materials or Work suitable for inclusion in the Project Work shall be borne by the Contractor.
- 1.6 If the Contractor covers any of the Work that is required to be inspected, tested or approved by the Construction Documents, then that Work shall be uncovered, inspected, tested or approved and then recovered at the Contractor's sole expense.
- 1.7 The Contractor shall have the right to have tests performed on any material at any time for its own information and job control so long as the Owner is not charged for these tests or forced to rely on these tests when appraising quality of the materials. The tests specified in the Construction Documents for a specific material shall take precedence over any testing initiated by and paid for

by the Contractor.

2 Below Grade Inspections

- 2.1 Before covering or backfilling of any improvement below grade, cover up inspections will be conducted to see that all items meet the plans and specifications. Only after all the deficiencies have been corrected will the Contractor be allowed to install any backfill.

3 Concrete Inspections

- 3.1 Before the placing of any cast-in-place concrete structure, an inspection will be conducted to see that all items meet the intent of the Construction Documents. Only after all deficiencies have been corrected will the Contractor be allowed to proceed.

4 Wall Closure/Above-Ceiling Inspections

- 4.1 Before the installation of any ceiling or the closing of walls chases, an inspection will be conducted to see that all items fully meet the contract document requirements before being covered. Only after all the deficiencies have been corrected will the Contractor be allowed to install the ceiling or close-up the wall. As a minimum, the following should be in place before an above-ceiling inspection is scheduled:

- All light fixtures installed and working;
- All plumbing installed and insulation complete;
- All rigid and flexible ducts installed;
- All required valve identification tags installed;
- All air devices installed and connected;
- All control wiring and devices installed and connected;
- The ceiling support structure installed.

5 Substantial Completion Inspection (see UGC 12.1.1)

- 5.1 When the Contractor feels that the work is complete and ready for the Owner's intended use, it will notify the A/E and Owner at least seven days prior to the date the Contractor is ready for a Substantial Completion Inspection. The A/E and appropriate members of the design team along with the Owner will perform a detailed inspection of the all work and furnish the Contractor with a list of

incomplete or unsatisfactory items. When the Contractor has completed all the work related to these items the Pre-Final Inspection will be complete.

6 Final Inspection & Acceptance (see UGC 12.1.2 & 12.3)

6.1 Upon verification by the A/E and Owner that the deficiencies found during the Pre-Final Inspection have been corrected, and the work is ready for Final Inspection and Acceptance, the A/E and Owner will schedule a Final Inspection. When the work is found to be acceptable under the Construction Documents without exception and the contract is fully performed, then a Final Acceptance Notice will be issued by the A/E.

7 One-year Warranty Inspection

7.1 Within thirty-days prior to the expiration of the one year anniversary of the Substantial Completion date the Owner shall prepare a list of deficiencies related solely to the workmanship and material warranties provided by the Contractor through the Construction Documents. The Contractor shall make the necessary repairs and replacements and notify the Owner that all work is complete and Owner shall review and approve the work and provide written acceptance.

8 Execution

8.1 Pier Drilling Operations:

8.1.1 A representative of the soils testing laboratory shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before pouring concrete.

8.1.2 Soils testing laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, bell size, actual penetration into bearing stratum, elevation of top of bearing stratum, and volume of concrete used.

8.2 Reinforcing Steel Mechanical Splices:

8.2.1 Visually inspect and report on the completed condition of each mechanical splice of reinforcing steel.

8.2.2 Each mechanical splice shall be visually inspected to ensure compliance with building code and the manufacturer's published criteria for acceptable completed splices.

-
- 8.2.3 Special emphasis shall be placed on inspection of the end preparation of each bar to be spliced.
- 8.2.4 Submit copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
- 8.2.5 Reports on each splice shall indicate location, size of bars and acceptability or rejection of splice. Reasoning for rejection shall be provided in the report.
- 8.3 Reinforcing Steel and Embedded Metal Assemblies – Inspect all concrete reinforcing steel for compliance with Construction Documents and approved shop drawings prior to placing concrete. All instances of noncompliance shall be immediately brought to the attention of the Contractor for correction and then, if not corrected, reported to the A/E.
- 8.3.1 Observe and report on the following:
- Number and size of bars;
 - Bending and lengths of bars;
 - Splicing;
 - Clearance to forms including chair heights;
 - Clearance between bars or spacing;
 - Rust, form oil and other contaminants;
 - Grade of steel;
 - Securing, tying and chairing of bars;
 - Excessive congestion of reinforcing steel;
 - Installation of anchor bolts and placement of concrete around such bolts;
 - Fabrication of embedded metal assemblies, including visual inspection of all welds;
 - Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with the Construction Documents.
- 8.4 Concrete Inspection & Testing:
- 8.4.1 Receive, evaluate and certify all proposed concrete mix designs submitted by the Contractor which comply with the Construction Documents. Mix designs not complying shall be returned by the laboratory as unacceptable.

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- 8.4.2 Secure composite samples of concrete at the jobsite and perform the appropriate tests as specified in the Construction Documents. Test results will be provided to the appropriate design team members, the Contractor and the Owner.
- 8.4.3 Inspect the application of curing compounds and monitor all curing conditions to assure compliance with the Construction Documents.
- 8.5 Post-tensioning of Concrete:
- 8.5.1 Verify certification of calibration of jacking equipment used in the post-tensioning operations.
- 8.5.2 Observe and report on placement and anchorage of tendons immediately prior to placement of concrete.
- 8.5.3 Provide a registered professional engineer experienced in posttension operations to observe and report on the placement, posttensioning and elongation measurement of each tendon.
- 8.5.4 Observe and report on grouting of tendons noted to be bonded.
- 8.6 Masonry:
- 8.6.1 Provide a qualified inspector to inspect all structural masonry work on a periodic basis.
- 8.6.2 Inspect the following:
- Preparation of masonry prisms for testing;
 - Placement of reinforcing;
 - Grout spaces;
 - Mortar mix operations;
 - Bedding of mortar for each type of unit and placing of units;
 - Grouting operations;
 - Condition of units before laying for excessive absorption.
- 8.6.3 Provide a report of each inspection.
- 8.7 Structural Steel:
- 8.7.1 Inspect all structural steel during and after erection for conformance with the Construction Documents and shop drawings. Any cases of insufficient bracing or guying, or other unsafe conditions shall be immediately called to the attention of the Contractor and reported to the A/E and Owner.

8.7.2 Inspect the following:

- Proper erection of all pieces;
- Proper installation of all bolts;
- Plumbness of structure and proper bracing;
- Proper field painting;
- Visual examination of all field welding;
- Inspect all shop fabricated members, upon arrival at the jobsite, for
- Inspection of shop and field welding shall be in accordance with the AWS Structural Welding Code – Steel, latest edition;
- Inspection of bolted construction shall be in accordance with AISC specifications for structural steel buildings;
- Inspection of stud field welding shall be in accordance with AWS structural welding code latest edition.

8.8 Expansion Bolt Installations:

8.8.1 Inspect the drilling of holes and installation of expansion bolts for compliance with the Construction Documents and shop drawings.

8.8.2 Verify the installation torque of the expansion bolts for compliance with the manufacturer's installation instructions.

8.9 Metal Floor Deck – Field inspection shall consist of the following:

- Check types, gauges and finishes for conformance with Construction Documents and shop drawings;
- Exam for proper erection of all metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting and other coatings.

8.10 Metal Roof Deck – Field inspection shall consist of the following:

- Check types, gauges and finishes for conformance with Construction Documents and shop drawings;
- Exam for proper erection of all metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting and other coatings.

END OF SECTION

SECTION 01 43 39 – SITE MOCK-UPS
(see UGC 8.4)

1 General

- 1.1 The Contractor shall direct all the appropriate subcontractors in the construction of all site mock-ups for review by the Owner and Architect/Engineer (A/E) as required by the Construction Documents.
- 1.2 The mock-up(s) when approved by the A/E and Owner shall become the site reference for quality of the incorporated features of materials and workmanship.
- 1.3 The mock-up shall not be part of the work and shall remain in place until Substantial Completion, or otherwise directed by the Owner.

END OF SECTION

SECTION 01 45 00 – QUALITY CONTROL
(see 01 40 00)

1 General Requirements

- 1.1 Quality control shall be the sole responsibility of the Contractor, unless specifically noted otherwise. The Contractor shall be responsible for all testing, coordination, start-up, operational checkout and commissioning of all items of work included in the project. All costs for these services shall be included in the Contractor's cost of work and general conditions.
- 1.2 Specific quality control requirements for individual construction activities are specified in sections that govern those activities.
- 1.3 The Contractor employed testing agency shall comply with the requirements of ASTM C – 1021, 1077, 1093, E – 329, 543 and 548.
- 1.4 The Contractor shall develop design mixes for products to be used and have the appropriate test performed by the Contractor's employed testing agency at its own expense.

END OF SECTION

SECTION 01 45 18 – FIELD ENGINEERING

1 Quality Assurance

- 1.1 Surveyor Qualifications: Engage a land surveyor, registered in the State of Texas, to perform required land surveying services.

2 Examination

- 2.1 Verify layout information shown on the construction documents, in relation to the property survey and existing benchmarks and building locations and finish floor elevations before proceeding to lay out the work. Protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 2.1.1 Do not change or relocate benchmarks or control points without prior written approval from the Owner.
 - 2.1.2 Establish and maintain a minimum of two permanent benchmarks on the site.

3 Performance

- 3.1 Work from lines and levels established by the Construction Documents. Calculate and measure required dimensions with indicated and recognized tolerances. Do not scale drawings to determine dimensions.
- 3.2 Record deviations from required lines and levels and advise A/E immediately when deviations exceed indicated or recognized tolerances.
- 3.3 Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines services, or other appurtenances located in or affect by construction.
- 3.4 The as-built documents shall include a final Title I property survey.

END OF SECTION

SECTION 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
(see UGC 3.3.4, 8.1 & 13.1)

1 General Requirements

- 1.1 Contractor shall provide all construction facilities and temporary controls specified in this section and as necessary for the proper and expeditious prosecution of the work. The Contractor will be provided with a description of the Project Site and the Limits of Construction either by the Construction Documents, or by the Owner. At any time such a description has not been provided, the Contractor should request it of the Owner in writing.
- 1.2 The Contractor shall erect a wire mesh fence around the Project Site. The Contractor and all its personnel, assigns, material suppliers and subcontractors shall confine and limit their work to the Project Site and shall confine their construction activities to within the Limits of Construction. All areas beyond these defined areas are patrolled either by the Campus Police or by the Police Department of the City. All public and University laws, ordinances, rules and regulations shall be obeyed. No tools, construction vehicles or construction materials shall be permitted to be outside the Project Site. Loitering of construction-related personnel in areas outside the Project Site is strongly discouraged and it will be discontinued if it becomes persistent, or otherwise a nuisance to the ordinary and normal functioning of the campus. **(UGC 3.3.11)**
- 1.3 All campus roads, drives, fire lanes and sidewalks/pedestrian routes (other than those specifically given over to the Contractor for its use) must be kept open and clean at all times. The Contractor shall make advanced preparations for, and obtain security clearance for, all significant materials and equipment movements that will disrupt traffic and pedestrian flows. The Contractor shall provide all traffic controls, warning signs, barricades and flag persons needed to minimize disruptions during such approved movements. When such movements cause damage or leave debris, the Contractor shall immediately repair and clean up afterwards. **(UGC 3.3.11.3)**
- 1.4 Contractor shall pay all charges for all connections to and distribution from existing services and sources of supply.
- 1.5 Requirements of service and utility companies relating to the work shall be ascertained by Contractor, and the Contractor shall comply with all requirements, including those relating to continued protection and maintenance

until completion of the work.

- 1.6 Materials and construction for construction facilities and temporary controls may be new or used, must be in adequate capacity, must not create unsafe conditions and shall not be unsightly.
- 1.7 Contractor shall relocate temporary services and facilities at it own expense, as required by progress of construction. **(See UGC 7.2.1)**
- 1.8 Contractor shall remove all temporary services and facilities when their use is no longer required or at completion of the project. **(See UGC 3.3.11)**
- 1.9 Contractor shall clean and repair damage caused by temporary services and facilities to new condition for new work and to a condition as good as or better than existing prior to start of work for existing construction projects. **(See UGC 3.3.11.3)**

2 Yard Repairs

- 2.1 Where compaction of the soil has occurred in turf or other plant material areas within the limits of construction, the areas shall be rejuvenated by deep cultivation of the compacted soil. After completion of construction, the Contractor shall scarify the construction site within the limits of construction to a minimum depth of eight inches, except within thirty feet of trees where it shall be a six inch depth. The Contractor will either place sod or hydro mulch on the rejuvenated areas, as may be mutually agreed to between the Owner and the Contractor, depending on the season and availability of irrigation.

3 Temporary Utilities and Services

- 3.1 The Contractor shall provide for all necessary and appropriate temporary utilities and services for execution and protection of the work.
- 3.2 Schedule of Costs and Fees for Utility Services are different on different campuses. The Contractor must review the Construction Documents carefully and communicate with the Owner to determine the status on each Project.
 - 3.2.1 **Temporary Water** – The Contractor shall provide and install temporary lines for all water required for the Work and will arrange with the Owner’s Utility Department for connection to the campus system and for services.
 - 3.2.2 **Temporary Electrical** – The Contractor shall arrange with the local Utility Company for temporary power and for metering. When using this

temporary power, the Contractor shall be responsible for all related costs, including energy costs and fuel costs. If such power is available from the campus power systems, then the Contractor will make the same arrangements, but the Owner will pay for the power used unless the Contractor wastes energy and is not consuming it in a reasonable and prudent manner. The Contractor shall not energize the permanent power on the Project it is constructing until the Owner specifically approves.

- 3.2.3 **Temporary Heating, Cooling and Ventilation** – If temporary heating/cooling/ventilation is required for the protection of the Work or the work forces, the Contractor shall provide, at its cost, Owner-approved apparatus.
- 3.2.4 **Temporary Lighting** – The Contractor shall provide adequate temporary lighting to facilitate quality workmanship and appropriate inspection of the Work. Temporary lighting provided by the Contractor also must be adequate for site security, inspections of excavations, night work if pursued and for personal and general safety of operations. Provide the following minimum standards:
- 3.2.4.1 Provide and maintain lighting for construction operations to achieve a minimum lighting level of two watts per square foot.
- 3.2.4.2 Provide and maintain one watt per square foot lighting for exterior staging and storage areas after dark for security purposes.
- 3.2.4.3 Provide and maintain one-quarter watt per square foot lighting to interior work areas after dark for security purposes.
- 3.2.4.4 Permanent building lighting may be utilized during construction.
- 3.2.5 **Temporary Services Provided by Owner** – When approved by the Owner, the Contractor may request that Project mechanical and electrical systems be put into service prior to Substantial Completion, even if only to facilitate Contractor operations. However, the Contractor shall NOT open or close any valve connecting to the campus systems without specific Owner approval. During operation of the equipment prior to Substantial Completion the Contractor shall keep the equipment in good operating condition, properly and legally flushed with chemical treatment systems, properly started and stopped, properly maintained,

including regular replacement and/or cleaning of filters. Without exception the filters will be newly replaced just prior to turning the equipment over to the Owner for operation. The actual warranty periods will not start until the equipment is officially turned over to the Owner at Substantial Completion.

- 3.2.6 **Temporary Facilities/Equipment Removal** – Prior to turning the Project over to the Owner for operation and maintenance, the Contractor shall completely remove all temporary facilities and equipment from the Project Site and shall repair or replace any material, equipment, finished surfaces or landscaping that has been damaged by its activities on the site.

4 Construction Aids

- 4.1 **Material and Personnel Hoists:** The Contractor shall provide material and personnel hoist as required for normal use by all trades without charge. All necessary guards, signals and safety devices required for safe operation of these hoists shall be provided and properly maintained at all times.
- 4.2 **Stairs:** Provide temporary protective treads, handrails and wall coverings at stairways.

5 Barriers and Enclosures

- 5.1 Contractor shall construct temporary barricades, warning signs, hazard and warning lights, walks, passage-ways and similar temporary barriers and enclosures that are necessary to protect persons and property from hazards or damage due to construction operations, and required by the Owner, city, state or federal laws, ordinances or codes.
- 5.2 Contractor shall furnish and install construction fences and gates within the limits of construction, prior to beginning any other work on the project.
- 5.3 Contractor shall furnish and install movable fences as may be necessary and appropriate to facilitate execution of the work.
- 5.4 The Contractor shall be responsible for the protection of existing building surfaces (both interior and exterior), utilities, exterior structures, pavements, sidewalks, landscape, vegetation and irrigation systems. Any damage to existing areas will be repaired by the Contractor at its expense and to the satisfaction of the Owner. Such needed repairs that are not timely undertaken or completed by

the Contractor may, at the Owner's sole discretion, be repaired by the Owner and the related expenses deducted from the Contract Amount by change order.

- 5.5 All existing trees, shrubs or endangered plants within the Project Site or near access ways to the Project Site, shall be protected by the Contractor as indicated on the Drawings and maintained in sound condition unless ordered by the Owner to remove them. Contractor shall furnish and install barricades, fences and guards as necessary to prevent damage to existing trees, shrubs or endangered plants indicated to remain after construction is completed. Contractor shall not remove, cut or trim any tree, shrub or endangered plant before first notifying the Owner and receiving prior approval for the action. The Contractor will be responsible for repair or replacement in kind of damaged vegetation including watering and maintenance until fully restored.
- 5.6 All fencing, gates, barricades and guards shall be maintained to be straight, level and having a neat and uniform appearance while in place. Upon removal all holes and damage caused by the placement and use of the fences shall be repaired to its original condition.
- 5.7 Contractor shall provide temporary roofing and weather tight insulated closures for openings in exterior surfaces as required to maintain specified working conditions and moisture content of all project materials.

6 Security

- 6.1 The Contractor shall provide security and facilities to protect the Work, materials and equipment from unauthorized entry, vandalism, or theft until Substantial Completion has been achieved. If deemed necessary the Contractor may, at its own expense, employ unarmed security personnel. The Contractor must first notify the Owner and provide particulars about the security firm and its personnel prior to its employment.
- 6.2 The Campus Police will not provide security for the Project Site or the areas that are given over to the Contractor's control.

7 Temporary Controls

- 7.1 Cleaning during construction: Contractor at all time shall keep the premises free from accumulation of waste materials and rubbish caused by operations for the work. Provide a collection can at each area used for eating. Pick up garbage daily. Keep project site free of garbage, trash, vermin and rodent infestation.

- Require each subcontractor to collect and deposit waste and rubbish caused by subcontractor operations at designated locations. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations. Protect installed equipment and seal installed ductwork and piping to prevent intrusion of dust. When the Work is within or adjacent to existing spaces that continue to be occupied, protect finishes, seal off occupied spaces and open ductwork and piping. The Contractor shall provide personnel for janitorial work to clean up (both on the Project Site and in adjacent spaces) any dust or debris that results from its operations. (see UGC 3.3.8)
- 7.2 Noise control: In and around occupied areas, minimize use of noise producing equipment and sequence the Work to minimize its affect of occupants. Work with noise producing equipment adjacent to occupied spaces will be coordinated with the Owner. Curtail such use to accommodate specific meetings or activities when requested by the Owner.
- 7.3 Water control: Provide methods to control surface water to prevent damage to the project and adjoining properties. Control fill, grade and ditch to direct surface drainage away from excavations, pits, tunnels and other construction areas. Direct runoff to proper runoff paths.
- 7.4 Storm Water Pollution Prevention Plan (SWPPP): Contractor shall be responsible for securing the appropriate SWPPP permit and paying all related fees, penalties, fines, etc., related thereto, from Texas Commission on Environmental Quality (TCEQ). The Contractor shall implement the SWPPP plan and insure that all devices and structures are properly maintained through the course of the project. Upon completion of the project the Contractor shall provide TCEQ with a Notice of Termination within thirty days of final stabilization achievement. Refer to SWPPP for additional requirements and to ensure compliance with its requirements.
- 7.5 Pollution controls: Provide methods, means and facilities required to prevent contamination of soil, water, or atmosphere by discharge of noxious or hazardous substances from construction operations. The Contractor shall notify the Owner immediately of all pollutant spills. The Contractor shall be solely responsible for cleaning up and properly disposing of, in accordance with applicable laws and regulations, all spilled pollutants brought to the Site as a part of the Work including oil, paint, fuels, antifreeze, solvents, etc. The

Contractor must keep accurate records of these clean up and disposal actions.

7.6 Protection of installed work: (see UGC 10.3.4.1)

7.6.1 Protect installed work and provide special protection where specified in individual specification sections.

7.6.2 Provide temporary and removable protection of installed products and control activity in the immediate area to prevent damage.

7.6.3 Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

7.6.4 Protect finished floors, stairs and other surfaces from dirt traffic, wear, damage, or movement of heavy objects.

7.6.5 Prohibit traffic or storage upon waterproofed or roofed surfaces, or in the alternative obtain the manufacturer's recommendations for protection.

7.6.6 Prohibit traffic from landscaped areas.

8 Parking: (see UGC 3.3.11.1)

8.1 Parking for workmen employed on the site shall be provided within the Limits of Construction or on such remote site as may be designated by the Owner from time to time. Any costs involved in Contractor parking shall be borne by the Contractor. The Contractor's forces shall not park on campus in areas outside the Project Site.

8.2 In some, but not all circumstances, Owner may provide remote parking spaces near the campus. In these cases the parking may be available for Contractor use at no cost, but permits issued by the campus police will be necessary to use this parking. In providing remote parking the Owner will not take on any responsibility for the vehicles, or contents of the vehicles, when they are parked in the remote locations provided.

8.3 The contractor shall provide adequate reserved parking for the Owner's and the A/E's Project Team members who regularly visit the Project Site.

8.4 The Contractor shall be responsible for restoration of all pavement, curbs, signage, sidewalks, etc., damaged by the construction operations and/or the workmen.

9 Field Offices and Sheds

- 9.1 The office shall be weather tight, with lighting, electrical outlets, highspeed internet connection, telephone, heating, cooling and ventilation and equipped with sturdy furniture, a drawing table and plan racks.
- 9.2 Provide adequate space for projects meetings.

10 Temporary Toilets (see UGC 3.3.4)

- 10.1 Provide, maintain and pay for required temporary sanitary facilities and enclosures. Provide at time of project mobilization and do not remove until Substantial Completion. Locate these facilities away from public view as much as practical.
- 10.2 Clean and empty these facilities at least weekly unless it is needed more often to keep them sanitary. Post notices, remove deposited debris and take all steps necessary to keep the facilities clean and sanitary.
- 10.3 Do not use the Owner's toilet facilities, unless specifically approved by the Owner.

END OF SECTION

SECTION 01 50 10 – PROJECT SIGNAGE

1 Installation of Temporary Project Signage

- 1.1 When permitted by the Owner, an exterior construction project sign shall be installed immediately after contract award. The sign will make specific reference to the Houston Community College Campus Location.
- 1.2 Prior to any construction or installation of the sign, submit to the Owner for approval a quarter scale drawing, complete with all graphics and lettering.
- 1.3 The Contractor shall ensure the exterior construction project signage is properly set-back from all street intersections and pedestrian walkways such that it does not conflict with or impede fields of view necessary to vehicular and pedestrian traffic circulation.
- 1.4 The Contractor may install one sign bearing the company name, logo, project address and point of contact.
- 1.5 The sign shall remain the property of the Contractor and shall be removed from the Project Site and legally disposed of at the completion of the Work.

2 Signage Dimensions and Materials

- 2.1 The exterior construction project sign shall be constructed of a single four foot by eight foot sheet of three-quarter inch thick marine plywood placed on two four inch by four inch treated posts. The Architect/Engineer (A/E) shall provide the Contractor with the lettering, font background and rendering of the project, which will be installed by a professional sign company. All related costs shall be included in the General Conditions costs of Construction Manager and Design-Build contracts.

END OF SECTION

SECTION 01 52 40 – CONSTRUCTION WASTE MANAGEMENT

1 Definitions

- 1.1 Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- 1.2 Disposal: Removal off-site of demolition and construction waste and deposited in landfill or incinerator acceptable to authorities having jurisdiction.
- 1.3 Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- 1.4 Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- 1.5 Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.

2 Performance Goals

- 2.1 The Contractor shall develop a waste management plan that will result in end of project rates for salvage/recycling as directed by the Owner during the Pre-construction conference.

3 Quality Assurance

- 3.1 The Contractor shall continuously monitor the disposal, recycling, salvage and reuse of materials generated by the Project to confirm compliance with the waste management plan and provide a report to the project team at each progress meeting.

4 Waste Management Plan

- 4.1 The Contractor shall develop a plan consisting of waste identification, waste reduction work plan and cost/revenue analysis. The plan should include separate sections for demolition and construction waste.

5 Salvaging Demolition Waste

- 5.1 Salvage of items for sale or donation by the Contractor or subcontractors is not permitted.
- 5.2 Salvaged items for Owner's use:
 - 5.2.1 Clean salvaged items;

- 5.2.2 Pack or crate items and properly identify contents on the container;
- 5.2.3 Store items in a secure area until delivery to Owner;
- 5.2.4 Transport items to Owner's designated storage area.

6 Recycling Demolition and Construction Waste, General

- 6.1 Separate recyclable waste by type at project site to maximum extent practical.
- 6.2 Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from the project site.
- 6.3 Remove recyclable waste off Owner's property and transport to recycling receiver or processor within a reasonable time after an appropriate amount has been accumulated.

END OF SECTION

SECTION 01 70 00 – CONTRACT CLOSE-OUT

1 General (see UGC Article 12)

- 1.1 Project closeout is hereby defined to include requirements near the end of the contract time, in preparation for Substantial Completion acceptance, occupancy by Owner, release of retainage, final acceptance, final payment and similar actions evidencing completion of the work.
- 1.2 Time of closeout is directly related to completion and acceptance and may either be a single time period for the entire project, or a series of times for individual portions or phases of the project that have been certified as substantially complete at different times.
- 1.3 If the project is to be accepted in phases, whether by originally specified project scope or by subsequent agreement between the parties, then the project closeout requirements shall pertain to each separately accepted portion or phase of the project. All required documentation for the portion of the project to be occupied early shall be furnished by the Contractor to the Owner on, or before, the date of early occupancy by the Owner. Such early occupancy of any portion of the Work will not waive the Contractor's obligations to complete the remaining Work within the Contract Time specified in the contract.

2 Record Documents (see UGC 6.2)

- 2.1 Record documents for project closeout shall include, but not necessarily limited to the following, which are required for substantial completion:
 - As-built record drawings;
 - As-built record specifications;
 - Operating & maintenance manuals;
 - Record approved submittals and samples;
 - Certificate of no asbestos products incorporated in project;
 - Completed punch lists.

3 Required Documents

- 3.1 Required documents for final payment to be released included final versions of all of the above and the following:
 - Final release of claims and liens; (see 12.3.5 through 12.3.8 of the CSP contract)

- Affidavit of payment of debts and claims;
- Consent(s) of surety;
- Completed SWPPP documents and Notice of Termination;
- Completed commissioning and closeout manuals.

4 Requirements for Substantial Completion (see UGC 12.1.1)

- 4.1 Prior to requesting Architect/Engineer (A/E) and Owner to schedule a Substantial Completion, or Pre-Final inspection, the Contractor shall complete the following and list known exceptions in the request:
- 4.1.1 Contractor's payment request should reflect a minimum of 95% completion for all applicable work.
 - 4.1.2 Provide A/E and Owner with a complete copy of the Contractor's most current punch list.
 - 4.1.3 Submit to the A/E for review a full set of as-built record drawings and specifications.
 - 4.1.4 Submit to the A/E for review preliminary copies of the operating and maintenance manuals.
 - 4.1.5 Submit release enabling Owner's full and unrestricted use of the work and access to service and utilities, including operating certificates and similar releases.
 - 4.1.6 Contractor shall make provisions for final changeover of locks with the Owner's personnel.
 - 4.1.7 Complete initial clean up requirements as described in the specifications.
- 4.2 The Contractor shall ensure that the work is ready for inspection and/or reinspection. If the work is found not to be as stated in the Contractor's punch list or the items have not been substantially corrected/completed; the inspection will be terminated.

5 Requirements for Final Acceptance (see UGC 12.1.2)

- 5.1 Prior to requesting A/E and Owner to schedule final inspection for the project, the Contractor shall complete the following:
- 5.1.1 Prepare draft payment request showing 100% completion for each line item on the schedule of values, including all appropriate releases and

supporting documentation.

- 5.1.2 Submit a copy of the pre-final punch list which includes evidence that each item has been completed or otherwise resolved.
- 5.1.3 Submit final meter readings for utilities as of the time when the Owner took possession.
- 5.1.4 Transmit completed commissioning and close-out manuals to the Owner.
- 5.1.5 Complete final cleaning and touch-up.
- 5.1.6 Submit final payment request.
- 5.1.7 Submit evidence of final and continuing insurance coverage complying with applicable insurance requirements.

6 Operating and Maintenance Manuals (see UGC 6.2.3 & 6.2.4)

- 6.1 Contractor shall organize operating and maintenance manual information into suitable sets of manageable size, and bind into individual binders properly tabbed and indexed. Two complete copies of each bound operating and maintenance manual shall be provided to the Owner and one complete copy for the A/E.
- 6.2 The requirements of this section are separate, distinct and in addition to product submittal requirements that may be established by this and other sections of the specifications.
- 6.3 Material and equipment data required by this section is intended to include all data necessary for the proper installation, removal, normal operation, emergency operation, startup, shutdown, maintenance, cleaning, adjustment, calibration, lubrication, assembly, disassembly, repair, inspection, trouble shooting and service of the equipment or materials.

7 Record Product Submittals

- 7.1 During progress of the work, maintain approved copies of each product data submittal and shop drawings, and mark-up significant variations in the actual work in comparison with submitted information. A separate binder with one copy of all MSDS sheets for any and all products incorporated into the project shall be maintained during the course of the project, this binder shall be included in the record submittal documents.

8 Record Sample Submittals

- 8.1 Immediately prior to the date(s) of Substantial Completion, arrange for A/E and Owner to meet with Contractor at the project site to determine which (if any) of the submitted samples or mock-ups maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes.

9 Commissioning and Close-out Manual

- 9.1 The Contractor shall incorporate all commissioning and closeout documentation and/or verification not included in the operating and maintenance manuals, into a manual for transmittal to the Owner

END OF SECTION

SECTION 01 91 00 – GENERAL COMMISSIONING REQUIREMENTS

1 Scope of Work Included

- 1.1 It is of primary concern that all operable systems installed in the project perform in accordance with the Construction Documents and the specified Owner's operational needs. This is particularly critical for systems affecting life safety, building controls, plumbing, HVAC, lighting and power delivery systems. The process of assuring such performance is achieved is commonly referred to as "Commissioning".
- 1.2 This section establishes minimum general and administrative requirements pertaining to start-up and commissioning of equipment, devices, and building systems. Additional technical and operational requirements for particular systems and components are established in the various technical sections of the specifications. The Contractor is solely responsible for the Commissioning process.

2 Commissioning Plan

- 2.1 The Contractor shall prepare a detailed commissioning plan to identify the following:
 - Project commissioning team members;
 - Commissioning activities;
 - Pre-functional tests;
 - Start-up tests;
 - Functional tests;
 - System integration testing.
- 2.2 The Contractor shall properly document the results of each phase of the commissioning plan and notify Architect/Engineer (A/E) and Owner of any failures to achieve the specified performance levels.
- 2.3 The Contractor shall incorporate the commissioning plan into the project baseline schedule to reflect dates and durations of all commissioning activities.

3 Equipment Documentation Requirements

- 3.1 The Contractor shall develop a complete equipment matrix/list of all equipment, devices and systems which will be presented to the project commissioning team at the Pre-commissioning conference. The following information should be

included on the matrix/list:

- Brief equipment identification text;
- Equipment or device i.d. number;
- Start-up inspection required;
- Associated building system;
- Governing specification section;
- Appropriate submittal reference number(s);
- Installation location (room number or column coordinates).

4 Test Equipment

- 4.1 The Contractor and subcontractors shall provide all specialized tools, test equipment and instruments required to execute start-up, checkout and functional performance testing of equipment under their contracts.
- 4.2 Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance within tolerances specified. A testing laboratory shall have calibrated the test equipment within the previous twelve months. Calibration shall be NIST traceable and in accordance with the manufacturer's recommendations.

5 Pre-commissioning Meeting

- 5.1 The Contractor shall conduct the Pre-commissioning meeting and review all aspects of the commissioning plan. All documentation will be discussed and test procedures will be reviewed for approval by the Owner.
- 5.2 The Contractor shall establish target dates for each of the commissioning activities and these will be discussed at all future project progress meetings.

6 Pre-installation Meeting

- 6.1 The Contractor shall schedule a pre-installation meeting for the work of each major building system. This meeting shall be scheduled following approval of system submittals and prior to commencement of system installation work.

7 Contractor's Verification of Installation

- 7.1 The Contractor shall perform a review of all tests to confirm completion and compliance with the specified performance specifications. The Contractor shall verify:

- Each component device has been properly installed;
- All shop drawings and product data submittals have been approved;
- All valve charts, wiring diagrams, control schematics, electrical panel directories, etc. have been submitted, approved and properly installed;
- All tabulated data has been submitted for each system and/or device as required by the specifications;
- All test reports and/or certifications required have been submitted and accepted;
- Any and all deficiencies have been corrected and re-tested to conformance with the specifications.

8 Contractor's Operational Testing

- 8.1 The Contractor shall operate, or cause to be operated each system, device or equipment item, both intermittently and continuously, for the appropriate duration as set forth in the specifications and/or in accordance with the manufacturer's recommendations. These operations will be documented as a functional test.
- 8.2 Each component device and each building system shall be exercised to the full extent of its capability, from minimum to maximum, and under automatic control, where it is applicable, as well as checking manual operation.

9 Integrated System Demonstration

- 9.1 After successful completion and subsequent documentation of all system operations, the Contractor shall schedule a meeting with the project commissioning team to review the demonstration of all integrated systems within the facility.
- 9.2 The demonstration(s) shall included not only normal operating conditions over the entire operating range, but also failure modes such as major component failure and loss of power.

10 Owner Training

- 10.1 Training shall consist of classroom type sessions followed by on-site demonstrations of system operations.
- 10.2 The Contractor shall provide a minimum of eight hours of video recording of the training, with audio. The Owner will designate which portions of the training will

be recorded. The video shall be produced in a professional manner.

END OF SECTION

SECTION 01 56 39 – TEMPORARY TREE AND PLANT PROTECTION

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
- C. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- D. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.3 QUALITY ASSURANCE

- A. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where Project is located.
- B. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)." (RE: Section 31 13 16)

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a **2-1/2-inch (63-mm)** sieve and not more than 10 percent passing a **3/4-inch (19-mm)** sieve.
- B. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than **1 inch (25 mm)** in diameter; and free of weeds, roots, and toxic and other nonsoil materials. Obtain topsoil only from well-drained sites where topsoil is **4 inches (100 mm)** deep or more; do not obtain from bogs or marshes.
- C. Tree Protection Fence: As noted on Drawing L1.00.
- D. Organic Mulch: Ground or shredded bark free from deleterious materials.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Temporary Fencing: Install temporary fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence and remove when construction is complete.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Mulch areas inside tree protection zones and within drip line of trees to remain and other areas indicated. Apply **2-inch (50-mm)** average thickness of organic mulch. Do not place mulch within **6 inches (150 mm)** of tree trunks.

- D. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.

3.2 EXCAVATION

- A. Do not excavate within tree protection zones, unless otherwise indicated.
- B. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
- C. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

3.3 REGRADING

- A. Minor Fill: Where existing grade is **6 inches (150 mm)** or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.4 TREE PRUNING

- A. (RE: Section 31 13 16-3/3.03)
- B. Chip removed tree branches and dispose of off-site.

3.5 TREE REPAIR AND REPLACEMENT

- A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.

3.6 DISPOSAL OF WASTE MATERIALS

- A. Burning is not permitted.

- B. Disposal: Remove excess excavated material and displaced trees from Owner's property.

END OF SECTION 01 56 39

Section 01 73 01 – TRAFFIC CONTROL AND REGULATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- 1 Requirements for signs, signals, control devices, flares, lights and traffic signals, as well as construction parking control, designated haul routes and bridging of trenches and excavations.
2. Requirement for and qualifications of flagmen.

1.02 SUBMITTALS

- 1 A traffic control plan responsive to the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and sealed by a Registered Professional Engineer is incorporated into the Drawings. If the Contractor proposes to implement traffic control without modification to the plan provided, he shall submit a letter confirming that decision. If the Contractor proposes to implement traffic control different than the plan provided, he shall submit a traffic control plan in conformance with the TMUTCD and sealed by a Registered Professional Engineer.
 - 2 For both the traffic control plan and flagmen use, submit schedules of values within 30 days following the Notice to Proceed. Refer to Section 01292 – Schedule of Values.
- C. The Contractor shall provide such information and records regarding the use of qualified flagmen to verify that the Contractor’s use of “peace officers” as flagmen is in compliance with the Contract Documents and Texas law, including but not limited to, Article 4413 (29bb), commonly referred to as the Private Investigators and Private Security Agencies Act, and Article 2.12, Texas Code of Criminal Procedure.
- D. The Contractor shall provide such information and records regarding the use of qualified flagmen to verify that the Contractor’s use of “certified flagmen” as flagmen is in compliance with the Contract Documents and applicable City ordinance.
- E. Make submittals in accordance with Section 013100 – Project Administration.

1.03 UNIT PRICES

- A. Traffic Control and Regulation. Measurement is on a lump sum basis for traffic control and regulation, including submittal of a traffic control plan if different from the plan shown on the Drawings, provision of traffic control devices, and provision of equipment and personnel as necessary to protect the work and the public. The amount invoiced shall be determined based on the schedule of values submitted for traffic control and regulation.
- B. Flagmen. Measurement is on a lump sum basis for flagmen as required for the Project. The amount invoiced shall be determined based on the schedule of values submitted for flagmen.
- C. Refer to Section 013100 – Project Administration for unit price procedures.

1.04 FLAGMEN

- A. Use flagmen, qualified as described under paragraph 1.04.B, Uniformed Peace Officers, or paragraph 1.04.C, Certified Flagmen, to control, regulate, and direct the even flow or movement of vehicular or pedestrian traffic when construction operations encroach on public traffic lanes.
- B. Uniformed Peace Officer: A person who has full-time employment as a peace officer and who receives compensation as a flagman for private employment as an individual employee or independent contractor. Private employment may be either an employee-employer relationship or on an individual basis. A flagman may not be in the employ of another peace officer and may not be a reserve peace officer.
 - 1. A peace officer is defined as:
 - a. Sheriffs and their deputies;
 - b. Constables and deputy constables;
 - c. Marshals or police officers of an incorporated city, town, or village; or
 - d. As otherwise provided by Article 2.12, Code of Criminal Procedure, as amended.
 - 2. A person who has full-time employment as a peace officer is one who is actively employed in a full-time capacity as a peace officer working, on average, a minimum of 32 paid hours per week, being paid at a rate of pay not less than the prevailing minimum hourly wage rate as set by the federal Wage and Hour Act and entitled to the full benefits of participation in any retirement plan, vacation, holidays, and insurance benefits. A reserve peace officer does not qualify, under this definition, as a peace officer.

- C. Certified Flagman: A person who receives compensation as a flagman and who meets the following qualifications and requirements:
1. Formally trained and certified in traffic control procedures through the City's Department of Public Works & Engineering's E. B. Cape Center.
 2. Required to wear a distinctive uniform, bright-colored vest, and be equipped with appropriate flagging and communication devices.
 3. English speaking, with Spanish as an advantageous, but not required, primary or secondary language.
 4. Paid as a Certified Flagman, equivalent to the hourly wage rate set for Rough Carpenter under RFCSP, Wage Scale for Engineering Construction.
 5. Required to carry proof of training / certification, such as photographic identification card issued by the training institute, to allow the City Engineer to easily determine that necessary full-time traffic control is actually provided, when and where construction work encroaches upon traffic lanes.

PART 2 – PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

1. Comply with Texas State Manual on Uniform Traffic Control Devices.
2. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

PART 3 – EXECUTION

3.01 PUBLIC ROADS

1. Abide by laws and regulations of governing authorities when using public roads. If the Contractor's work requires that public roads be temporarily impeded or closed, approvals shall be obtained from governing authorities and permits paid for before starting any work. Coordinate activities with the City Engineer.
2. Contractor shall maintain at all times a 10-foot-wide all-weather lane

adjacent to work areas which shall be kept free of construction equipment and debris and shall be for the use of emergency vehicles, or as otherwise provided in the traffic control plan.

3. Contractor shall not obstruct the normal flow of traffic from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m. on designated major arterials or as directed by the City Engineer.
4. Contractor shall maintain local driveway access to residential and commercial properties adjacent to work areas at all times.
5. Cleanliness of Surrounding Streets:
 1. Keep streets used for entering or leaving the job area free of excavated material, debris, and any foreign material resulting from construction operations. Comply with City of Houston Ordinance No. 5705, Construction or Demolishing Privileges.

3.02 CONSTRUCTION PARKING CONTROL

1. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and City's operations.
2. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
3. Prevent parking on or adjacent to access roads or in non-designated areas.

3.03 FLARES AND LIGHTS

1. Provide flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.04 HAUL ROUTES

1. Utilize haul routes designated by authorities or shown on the Drawings for construction traffic.
2. Confine construction traffic to designated haul routes.
3. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.05 TRAFFIC SIGNS AND SIGNALS

1. Install traffic control devices at approaches to the site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
2. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
3. Relocate traffic signs and signals as Work progresses to maintain effective traffic control.

3.06 BRIDGING TRENCHES AND EXCAVATIONS

1. Whenever necessary, bridge trenches and excavation to permit an unobstructed flow of traffic.
2. Secure bridging against displacement by using adjustable cleats, angles, bolts or other devices whenever bridge is installed:
 1. On an existing bus route;
 2. When more than five percent of daily traffic is comprised of commercial or truck traffic;
 3. When more than two separate plates are used for the bridge; or
 4. When bridge is to be used for more than five consecutive days.
3. Install bridging to operate with minimum noise.
4. Adequately shore the trench or excavation to support bridge and traffic.
5. Extend steel plates used for bridging a minimum of one foot beyond edges of trench or excavation. Use temporary paving materials (premix) to feather edges of plates to minimize wheel impact on secured bridging.
6. Use steel plates of sufficient thickness to support H-20 loading, truck or lane, that produces maximum stress.

3.07 REMOVAL

1. Remove equipment and devices when no longer required.
2. Repair damage caused by installation.
3. Remove post settings to a depth of 2 feet.

END OF SECTION 01 73 01

SECTION 01 73 29 – CUTTING AND PATCHING

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible. If identical materials are unavailable or cannot be used,

use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay. Cut in-place construction to provide for installation of other

components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 73 30 – TRENCH SAFETY SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The work specified in this section consists of furnishing, installation, maintenance and removal of all necessary shoring, bracing, sheeting, shields, piling, deterring equipment and incidentals for all trench excavation, five feet or more in depth. The systems shall be in accordance with Occupational Safety and Health Administration (OSHA) Standards, 29CFR Part 1926 (Amended) October 31, 1989, Subpart P, Excavations.
- B. This section applies to all required trenching, including but not limited to, excavation for storm sewers, water lines, sanitary sewer lines, and other underground improvements.

1.2 SUBMITTALS

- A. The Contractor shall be responsible for selecting the excavation safety system as approved by OSHA 29CFR Part 1926 (amended October 31, 1989) and shall provide written notification of the protective system selected for project reference. The written notification shall include any tables, charts, diagrams, drawings or tabulated data applicable to the manufacturer's equipment.

1.3 PAYMENT

- A. A line item shall be added for this section in the schedule of values. The Contract Total Bid Price shall include this item.

PART 2 – PRODUCTS

2.1 SHORING MATERIALS

- A. Materials used for sheeting and sheet piling, bracing, shoring, and underpinning, shall be in good serviceable condition, and timbers used shall be sound and free from large or loose knots, and shall be designed and installed so as to be effective to the bottom of the excavation.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Trench Safety System shall be installed in accordance with the OSHA requirements.
- B. In trenches four (4) feet deep or deeper, the Contractor shall provide adequate means of trench egress using ladders or steps. Ladders must extend three (3) feet above original ground level. Ladders shall be positioned in accordance with the following:

TRENCH LENGTH	POSITION OF LADDER
Less than 25 Feet	At third points
Less than 50 Feet	Each end and center
Greater than 50 Feet	At 25 foot intervals

3.2 REMOVAL

- A. Temporary trench shoring shall be removed concurrently with backfill operations.

END OF SECTION 01 73 30

SECTION 02 41 13 – REMOVING EXISTING PAVEMENTS AND STRUCTURES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Removing concrete paving, asphaltic concrete pavement, and base courses.
- B. Removing concrete curbs, concrete curbs and gutters, sidewalks and driveways.
- C. Removing pipe culverts and sewers.
- D. Removing existing inlets and manholes.
- E. Removing miscellaneous structures of concrete or masonry.

1.2 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for disposal of debris.
- B. Coordinate removal work with utility companies.

PART 2 – PRODUCTS – Not Used

PART 3 – EXECUTION

3.1 PREPARATION

- A. Obtain advance approval from Architect/Engineer for dimensions and limits of removal work.
- B. Identify known utilities below grade. Stake and flag locations.

3.2 PROTECTION

- A. Protect the following from damage or displacement:
 - 1. Adjacent public and private property.
 - 2. Trees, plants, and other landscape features designated to remain.
 - 3. Utilities designated to remain.
 - 4. Pavement and utility structures designated to remain.
 - 5. Bench marks, monuments, and existing structures designated to remain.

3.3 REMOVALS

- A. Remove pavements and structures by methods that will not damage underground utilities. Do not use a drop hammer near existing underground utilities.
- B. Minimize amount of earth loaded during removal operations.
- C. Where existing pavement is to remain, make straight saw cuts in existing pavement to provide clean breaks prior to removal. Do not break concrete pavement or base with drop hammer unless concrete or base has been saw cut to a minimum depth of 2 inches.
- D. Where street and driveway saw cut locations coincide or fall within 3 feet of existing construction or expansion joints, break out to existing joint.
- E. Remove sidewalks and curbs to nearest existing dummy, expansion, or construction joint.
- F. Where existing end of pipe culvert or end of sewer is to remain, install an 8-inch-thick masonry plug in pipe end prior to backfill.

3.4 BACKFILL

- A. Backfill of removal areas shall be in accordance with requirements of Section 312300 – Excavation, Grading and Fill.

3.5 DISPOSAL

- A. Inlet frames, grates, and plates; and manhole frames and covers, may remain property. Disposal shall be in accordance with requirements of Section 311100 – Clearing & Grubbing.

- B. Remove from the site debris resulting from work under this section in accordance with requirements of Section 311100 - Clearing & Grubbing.

END OF SECTION 02 41 13

SECTION 02 41 17 – DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for demolition of facilities and structures.
- B. Extent of demolition work is shown on Drawings. Demolition may, but not necessarily, require removal and disposal, off of the Work Site, of the following:
 - 1. Building structures, as indicated on Drawings, except items to be removed by HCCS prior to start of work.
 - 2. Entrances, drives, parking lots and structures, and adjacent landscape work to limits indicated on Drawings.
 - 3. Building foundations and supporting walls to a uniform depth of 12 inches below lowest foundation elevation.
 - 4. Paving, curbs, gutters, walkways, and related concrete and asphalt.

1.2 SUBMITTALS

- A. In accordance with Section 013100 – Project Administration, the following shall be submitted:
 - 1. Proposed methods and operations of building demolition to HCCS for review and approval prior to start of Work. Include required coordination by agencies for shut-off, capping, and continuation of utility services as required. Provide a detailed sequence of demolition and removal work to ensure uninterrupted progress of HCCS operations.

1.3 QUALITY ASSURANCE/JOB CONDITIONS

- A. Reference Standards Applicable to this Section
 - 1. ANSI: American National Standards Institute
 - a. A10.6 Safety Requirements for Demolition Operations

2. NFPA: National Fire Protection Association.

- a. 30: Flammable and Combustible Liquids Code
- b. 241: Standard for Safeguarding Building Construction and Demolition Operations.

B. Regulations

Comply with applicable OSHA and EPA regulations and codes and local ordinances.

C. Occupancy

Structures to be demolished will be discontinued in use prior to start of Work.

D. Condition of Structures and Work Site

HCCS assumes no responsibility for actual condition of structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by HCCS insofar as practicable. However, variations within structure and Work Site may occur prior to start of demolition work.

E. Partial Removal

Items of value to Contractor may be removed, as directed, as Work progresses. Salvaged items shall become the property of the Contractor and shall be transported from Site as they are removed. Storage or sale of removed items on-Site will not be permitted.

F. Explosives

Use of explosives will not be permitted.

G. Traffic

Contractor shall comply with Section 017301 – Traffic Control and Regulation of these Specifications. Conduct demolition operations and removal of debris to ensure minimum interference with HCCS operations, roads, streets, walks, and adjacent facilities. Do not close or obstruct streets, walks or other facilities without written permission from authorities having jurisdiction. Provide and identify alternate routes around closed or obstructed traffic ways as required by governing regulations.

H. Protection

Contractor shall comply with Section 015000 – Construction Facilities and Temporary Controls of these Specifications. Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to persons and adjacent buildings, structures, and facilities. Erect temporary covered passageways as required by authorities having jurisdiction. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

I. Damages

Promptly repair damages caused by demolition operations at no cost to HCCS or adjacent property owners.

J. Utility Services

Maintain existing utilities indicated to remain, keep in like service, and protect against damage during demolition operations. Do not interrupt existing utilities serving facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary service during interruptions to existing utilities, as acceptable to governing authorities. Contractor shall disconnect and seal utilities serving structures to be demolished, prior to start of demolition work, upon written direction of HCCS and utility owner.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION

3.1 DEMOLITION

A. General

Contractor shall comply with NFPA 241 and ANSI A 10.6 prior to and during commencement of demolition.

B. Pollution Control

Contractor shall use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing EPA, OSHA, and local regulations pertaining to environmental protection. Do not create hazardous or

objectionable conditions such as flooding and water pollution. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by governing authorities. Return adjacent areas to condition existing prior to start of Work.

C. Building Demolition

Demolish building and structures completely and remove from Work Site. Use such methods as required to complete Work within limitations of governing regulations.

1. Proceed with demolition in systematic manner, from top of structure to ground.
2. Demolish concrete and masonry in small sections.
3. Break up and remove concrete and asphalt slabs-on-grade, unless otherwise shown to remain.

D. Below-Grade Construction

Demolish foundation walls to a depth of not less than 12 inches below subgrade or lowest foundation element. Demolish and remove below-grade wood, metal construction, floor construction, and concrete and asphalt slabs.

E. Filling Voids

1. Completely fill below-grade areas and voids resulting from demolition. Coordinate with work of Sections 311100 - Clearing & Grubbing, and 312300- Excavation, Grading and Fill of these Specifications.
2. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots and other organic matter.
3. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris.
4. Place fill materials in horizontal layers not exceeding 8 inches in loose depth. Compact each layer at optimum moisture content of fill material to a density as specified in Section 312300- Excavation, Grading and Fill of these Specifications.
5. After fill placement and compaction as specified, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

3.2 DISPOSAL OF DEMOLISHED MATERIALS

A. General

Remove from Work Site debris, rubbish, and other materials resulting from demolition operations. Burning of removed materials from demolished structures will not be permitted on Site.

B. Removal

Safely transport demolished materials and dispose of legally off Site. Contractor shall comply with NFPA 241, ANSI A 10.6, and NFPA 30, as applicable to the Work of disposal and transport.

END OF SECTION 02 41 17

SECTION 03 21 00 – CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

- A. Submittal procedures.
- B. Concrete formwork.
- C. Cast-in-place concrete.

1.2 QUALITY ASSURANCE:

- A. Comply with the following:
 - 1. ACI 315, Details and Detailing of Concrete Reinforcement.
 - 2. ACI 318, Building Code Requirements for Reinforced Concrete.
 - 3. AWS D1.4, Recommended Practice for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction.
 - 4. CRSI 63, Recommended Practice for Placing Reinforcing Bars.
 - 5. CRSI 65, Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1.3 SUBMITTALS:

- A. Shop Drawings: Indicate layout, sizes, bends, spacing and supports.
- B. Mill Reports: Manufacturer's certificate describing steel used.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. Bars: ASTM A 615, grade 60.
- B. Welded Wire Fabric: ASTM A185, flat sheets.
- C. Ties: 16-gauge annealed wire or clip system.
- D. Chairs: Stainless steel and solid plastic at exposed surfaces; galvanized steel elsewhere. Chairs shall be spaced at intersection of crossing bars.

2.2 FABRICATION:

- A. Cut and bend bars cold in compliance with ACI 315.

PART 3 – EXECUTION

3.1 PLACEMENT:

- A. Comply with CRSI 63 and 65.
- B. Place reinforcing after forms have been coated with release agent.
- C. Place reinforcing supported and secured against displacement, without deviation from true alignment.
- D. Place clean, reinforcing free of loose scale, dirt, and other foreign coatings which would reduce bond to concrete.
- E. Place cast-in items for Work of other Sections; support and secure against displacement.
- F. Set bar ties so wire is embedded in concrete.

END OF SECTION 03 21 00

SECTION 26 01 20 – OPERATION AND MAINTENANCE OF LOW-VOLTAGE ELECTRICAL DISTRIBUTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Preparation and submission of operation and maintenance manuals.
- B. Each section included in Division 26 – Electrical incorporates this section by reference and is incomplete without the provisions stated herein.

1.2 RELATED SECTIONS

- A. Division 01 – General Requirement.
- B. Section 01 31 00 – Submittal Procedures.
- C. Section 26 01 26 – Maintenance & Testing of Electrical Systems.

1.3 PREPARATION

- A. Furnish four copies of complete operation and maintenance instructions, service manuals and parts list applicable to each manufactured item of equipment furnished. Bind operation and maintenance information in four separate loose leaf binders and deliver to A/E at least four weeks prior to final review of the project.
- B. Organize binders to contain like equipment in separate divisions. Provide a complete double index for each binder to include:
 - 1. An alphabetized list of the products by name.
 - 2. An alphabetized list of manufacturers whose products have been incorporated in the work together with their addresses and the name, addresses and telephone numbers of the local sales representative or supplier.
- C. For each section of product, equipment or system, organize the data as follows:
 - 1. Furnish a general description of the equipment or system listing the major components, intended service and other general data.

2. Furnish technical data including nameplate data, design parameters, ratings, capacity, performance data, operating curves, characteristics, and the like. Clearly distinguish between information which does and does not apply.
3. List warnings and cautions to be observed during both installation and operations.
4. Fully detailed installation and operation instructions including special tools required, alignment instructions, start-up, and shut-down sequences.
5. Furnish maintenance, service and repair instructions including maintenance and service schedules, materials, and methods for performing routine and annual service.
6. Furnish a troubleshooting guide and check list indicating common failures, test methods and procedures for determining component fault or failure.
7. Furnish a spare parts list indicating part and order number with name, address, and telephone number of supplier. Include current prices of replacement parts and supplies.
8. Furnish diagrams including controls, wiring, installation or operation of the equipment or system.
9. Furnish copies of all approved submittals.
10. Furnish copies of all test reports.
11. Print copies of the "RECORD" drawings.
12. Furnish all warranties and guarantees.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION 26 01 20

SECTION 26 01 26–MAINTENANCE & TESTING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The Conditions of the Contract and applicable requirements of Division 1, "General Requirements", and Section 26 01 02, "Electrical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK

- A. Provide testing of electrical work installed under Division 26, as specified herein and in other Division 26 sections. Feeders and equipment shall not be placed in service until they have been checked out and tested.
- B. Test all electrical systems and equipment.
- C. These tests are required to determine that the equipment involved may be safely energized and operated.
- D. Perform tests by and under the supervision of fully experienced and qualified personnel. Advise each respective manufacturer's representative of tests on their equipment.
- E. Record all test data.
- F. Each section of Division 26 that has products or systems listed herein incorporate this section by reference and is incomplete without the required tests stated herein

1.3 QUALITY ASSURANCE

- A. Personnel: Submit evidence to show that the personnel who will actually test the systems are qualified.
- B. The Engineer reserves the right to require that the originally approved personnel be replaced with other qualified personnel if, in his opinion, the

original personnel is not qualified or is not properly conducting the system testing.

1.4 SUBMITAL

- A. Testing Procedures: Submit four copies of all proposed testing procedures to the Engineer for review at least 30 days prior to conducting any testing.
- B. Reporting Forms: Submit four copies of proposed forms to be used in recording testing data and results to the Engineer for review at least 30 days prior to conducting any testing on the project.
- C. Test Data and Results: Submit four copies of complete data and certified test results for each test performed, including, but not limited to:
 - 1. Test performed.
 - 2. Test procedure.
 - 3. System and area tested.
 - 4. Date(s) and time(s) of test.
 - 5. Weather conditions.
 - 6. Test criteria.
 - 7. Test results.
 - 8. Additional pertinent information.
- D. Operational Certification: Submit four certified copies of an operational certification which documents that all equipment and systems have been fully tested to verify proper operation in accordance with the design shown in the Construction Documents and manufacturer's recommendations.
- E. Certification: Certifications stating that submitted test data and results are true and correct shall be provided for all submittals under this Section. Certification shall be executed by an authorized officer if the Contractor is a corporation, by a partner if the Contractor is a partnership, by the Owner if the Contractor is a sole proprietorship or by the authorized representative if the Contractor is a joint venture.

- F. Calibration List: Submit four copies of a listing of testing devices to be used for the project to the Engineer for approval. Listing shall include documentation that devices are properly calibrated.
- G. Test Log: The Contractor shall maintain a test log at the site to document the results of all successful and unsuccessful testing and balancing as it is performed. This log shall be available for review by the Engineer and a copy of the log shall be submitted to the Engineer prior to the Substantial Completion inspection. A space shall be provided on the test log for signoff by the OR.

1.5 NOTICE:

- A. General: Notify the Engineer in writing two weeks prior all scheduled testing to allow time for Engineer to schedule witnessing of testing, where elected by the Engineer.

1.6 STANDARDS

- A. National Fire Protection Agency (NFPA)
- B. NFPA 70 (NEC)
- C. Institute of Electrical and Electronic s Engineers (IEEE)
- D. American Society Of Testing and Materials (ASTM)
- E. National Electrical Manufacturers Association (NEMA)
- F. International Electro-technical Commission(IE)
- G. American National Standard Institute (ANSI)
- H. Insulated Cable Engineers Association (ICEA)
- I. National Electrical Contractor Association (NECA) – Standard of Installation.
- J. National Electrical Testing Association (NETA-ATS) – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.7 SUBMITALS

- A. Submit test report forms for review a minimum of 90 days prior to requesting a final review by A/E.
- B. Furnish six individually bound copies of test data. Neatly type and arrange data. Include with the data the date tested, personnel present, weather conditions, nameplate record of test instrument and list all measurements taken, both prior to and after any corrections are made to the system. Record all failures and corrective action taken to remedy incorrect situation.
- C. A/E will retain one copy. Remaining copies will be returned to Contractor for inclusion in the operation and maintenance manuals.

PART 2 – PRODUCTS

- A. General: Provide all materials and test equipment required for testing of specified electrical systems, including retesting until acceptable test results are obtained.
- B. Products: Tested products which fail to provide acceptable test results shall be repaired or replaced with suitable materials as required to obtain acceptable test results.

PART 3 – EXECUTION

3.1 GENERAL

- A. The requirements of this section complement the requirements set forth in other sections. General: Tests shall be made during the course of construction as specified and as required by authorities having jurisdiction. Such tests shall be conducted by this Division as a part of the Work and shall include all personnel, material, and equipment required to perform tests until satisfactory results are obtained. Any defects detected during testing shall be satisfactorily repaired or the equipment involved shall be replaced and the tests re-executed.

- B. Tests: Testing shall include but not be limited to all items listed in other Sections of this Division and the following:
1. Thermographic Testing: Conduct a thermographic test of the electrical distribution apparatus and connections using an infrared temperature scanning unit. The test shall be performed by an independent testing laboratory (General Electric, Eaton Electrical Systems and Solutions or Siemens Industrial Service). Connections indicating higher temperature levels than are acceptable shall be tightened or corrected as required to eliminate the condition. Conduct test, using test reporting forms, between 6 and 8 months after beneficial occupancy, but in no case beyond the one year warranty period. Correct unacceptable conditions prior to end of the warranty period.
 2. Refer to the following section:
 - a. 26 05 19, "300/600 Volt Cable, Wire and Connectors."
 - b. 26 05 26, "Electrical Grounding."
 - c. 26 27 26, "Wiring Devices."
 - d. 26 56 29, "Site Lighting."

3.2 PREPARATION

- A. Furnish proposed test procedures, recording forms, list of personnel and test equipment for A/E review.
- B. Follow recommended procedures for testing as published by test equipment manufacturer.

3.3 WIRE AND CABLE

- A. Test insulation resistance of each main feeder and service after the installation is complete but before the connection is made to its source and point of termination.
- B. Test insulation resistance using Biddle Megger or equivalent test instrument at a voltage not less than 1,000 volts DC. Measure resistance from phase-to-phase and phase-to-ground. In circuits where insulation test value is lower than 1 megohm, remove and replace conductor and retest.

- C. Visually inspect connections of every circuit for tightness.
- D. Insure that grounding conductor is electrically continuous.
- E. Test circuits against grounds, shorts or other faults.
- F. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- G. Measure ground resistance from system neutral connection at service entrance to ground reference point using suitable ground testing equipment.
- H. Test the system for stray currents, ground shorts, etc. If stray currents, shorts, etc., are detected, eliminate or correct as required.
- I. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

END OF SECTION 26 01 26

SECTION 26 05 19 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install wire and cable, including:
 - 1. Cable.
 - 2. Wiring connections and terminations.

1.2 RELATED SECTIONS

- A. Section 26 01 26 – Maintenance Testing of Electrical System
- B. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- D. Section 26 27 26 – Wiring Devices.

1.3 REFERENCES

- A. NEMA WC 3 – Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- B. NEMA WC 5 – Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Wire and Cable
 - 1. Carol.
 - 2. Southwire.
 - 3. Triangle PWC, Inc.
 - 4. American Insulated Wire Corp.

5. BFCC Brand REX.
6. Senator Wire and Cable.

B. Connectors

1. Burndy.
2. T & B.
3. 3M.
4. Amp Incorporated.
5. General Signal.
6. Square D.
7. Monogram.

C. Power Distribution Blocks

1. IlSCO.
2. Square D.

2.2 BUILDING AND SITE WIRE

- A. Thermoplastic-Insulated Building Wire: NEMA WC 5.
- B. Rubber-Insulated Building Wire: NEMA WC 3.
- C. Feeders and Branch Circuits Larger Than #6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN, XHHW, RHW.
- D. Feeders and Branch Circuits #6 AWG and Smaller: Copper conductor, 600 volt insulation, THW, THHN/THWN; smaller than #8 AWG, solid conductor.
- E. Control Circuits: Copper, stranded conductor 600 volt insulation, THW, THHN/THWN.
- F. Wiring types BX and MC will not be acceptable for use on this project.

2.3 WIRING CONNECTIONS AND SPLICES

- A. Connect and splice wire #8 AWG and smaller with self-insulating, wire nut connectors.
- B. Terminate and splice all #6 AWG and larger copper conductors, except for load side lugs on Class I and II panelboards, fusible switches, circuit breakers, transformers and lighting contactors, wrought copper, color-keyed compression connector similar to T & B Series 54100 for terminal connection; Series 54500 for two-way copper-to-copper splices; and Series 54700 for tapping and pig-tailing copper conductors.
- C. Set screw type connectors are only acceptable on the load side lugs of Class I and II switchboards, panelboards, circuit breakers, fusible switches and on individual motor controllers.
- D. Where three or more conductors larger than #8 AWG are installed in wiring gutter, utilize a screw-type power distribution block. Utilize split-bolt mechanical connector, filled and taped for smooth joint, only where specifically requested by Contractor and approved by A/E.

PART 3 – EXECUTION

3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than No. 12 AWG for power and lighting circuits, and no smaller than No. 14 AWG for control wiring. Provide minimum of No. 12 AWG for all switch legs. Provide neutral conductor of the same size as the phase conductors to which it is associated.
- B. Use No. 10 AWG conductor minimum for 20 ampere, 120 volt branch circuits longer than 100 feet, and for 20 ampere, 277 volt branch circuits longer than 200 feet.
- C. Provide homerun conductors of continuous length without joint or splice from over-current device to first outlet.
- D. Provide main service and feeder conductors of continuous length without joint or splice for their entire length.

- E. Install wiring in conduit.
- F. Neatly train and lace wiring inside boxes, panelboards, wiring gutters, and other equipment using Thomas & Betts "Tie-Wraps."
- G. Provide equal conductor lengths for all parallel circuits.
- H. Provide individual neutral for branch circuits.
- I. Drawings indicate proposed circuiting only, and do not indicate every conductor unless intent is unclear and further clarification is required. Provide the necessary travelers for all three-way and four-way switches.
- J. Tag each circuit in an outlet box where two or more circuits run to a single outlet as a guide for the fixture hanger in making connections.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant. Do not exceed manufacturer's recommended tension.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors
- D. Remove and discard conductors cut too short or installed in wrong raceway. Do not install conductors, which have been removed from a raceway.
- E. Do not install conductors in conduit, which contains wires already in place.

3.3 WIRING CONNECTIONS AND TERMINATIONS

- A. Make taps and splices in accessible junction or outlet boxes only.
- B. Thoroughly clean wires before installing lugs and connectors.
- C. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

- D. Provide joints in branch circuits only where such circuits divide. Where circuits divide, provide one through circuit to which the branch is spliced from the circuit. Do not leave joints in branch circuits for fixture hanger to make. Make all taps and splices with approved type compression connector.
- E. Terminate spare conductors with electrical tape.
- F. Identify and label all conductor terminations as specified in electrical identification.
- G. Properly terminate indicated conductors in equipment furnished and provide properly sized lugs.

3.4 COLOR CODING

- A. Color code all distribution systems as follows:

1. 120/208V System

Phase	Color
A	Black
B	Red
C	Blue
N	White
G	Green

2. 277/480V System

Phase	Color
A	Brown
B	Purple
C	Yellow
N	Gray/White
G	Green

3. For areas where local authority color coding differs from that specified, contact A/E for instructions.

- B. Provide color coding throughout the full length of all wire No. 6 and smaller. Identification by permanent paint bands or tags at the outlets will be acceptable for wire sizes larger than No. 6. Provide the same color and shade of color throughout the project.

3.5 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to the manufacturer's recommended values.

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors; equipment grounding conductors; bonding methods and materials.
- B. Power system grounding.
- C. Electrical equipment and raceway grounding and bonding.
- D. Structural steel grounding.
- E. Miscellaneous system grounding.
- F. Related Sections:
 - 1. 26 01 26 Maintenance Testing of Electrical Systems
 - 2. 26 05 26 Grounding and Bonding for Electrical Systems
 - 3. 26 05 33 Raceway and Boxes for Electrical Systems
 - 4. 26 05 63 Identification for Electrical Systems
 - 5. 26 27 26 Wiring Devices
 - 6. 26 56 29 Site Lighting

1.2 REFERENCES

- A. NECA – Standard of Installation.
- B. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. NFPA 70 – National Electrical Code.

1.3 SYSTEM DESCRIPTION

- A. Grounding systems use the following elements as grounding electrodes:
 - 1. Rod electrode.
 - 2. Ground loop.
 - 3. Cold water service.
 - 4. Concrete reinforcing re-bars.
- B. Grounding System Resistance: 3 ohms.

1.4 SUBMITTALS

- A. Product Data: Submit grounding electrodes and connections; for fastening components; and nameplates, labels, and markers.
- B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- C. Manufacturer's Installation Instructions: Submit for active electrodes.
- D. Project Record Documents: Record actual locations of components and grounding electrodes.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience, and with service facilities within 100 miles of project.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Rod Electrodes: Copper-encased steel, 3/4-inch diameter, minimum length 10 feet.
- B. Mechanical Connectors:
 - 1. Manufacturers:
 - a) Burndy.
 - b) O.Z. Gedney.
 - 2. Heavy-duty, bolt-type, copper alloy or bronze for grounding and bonding applications, in configurations required for particular installation.
- C. Exothermic Connections:
 - 1. Type for underground and structural steel; Cadweld.
 - 2. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.
- D. Wire:
 - 1. Stranded, copper cable.
 - 2. Foundation Electrodes: 2/0 AWG.
 - 3. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.
- E. Grounding Well Components:
 - 1. Well Pipe: 8 inch NPS by 24-inch long concrete pipe with belled end.
 - 2. Well Cover: Cast iron with legend "GROUND TEST" embossed on cover.

PART 3 – EXECUTION

A. GROUNDING AND BONDING INSTALLATION

1. Install rod electrodes as indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
2. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
3. Provide bonding to meet Regulatory Requirements.
4. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
5. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
6. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
7. Do not use spring steel clips and clamps.
8. Do not use powder-actuated anchors.
9. Do not drill or cut structural members.
10. Do not use compression or mechanical connectors underground.

B. EQUIPMENT GROUND

1. Coordinate with individual building contractors to ensure a continuous grounding system.
2. Provide OZ Type "BJ" bonding jumper at all expansion joints, points of electrical discontinuity or connections in conduit where firm mechanical bond is not possible, such as flexible connections, insulating couplings, etc.

3. Site lighting and fountains: bond every item of equipment served by the electrical system to the building equipment ground system. Coordinate with building contractor.
4. Ground each light pole.

C. FIELD QUALITY CONTROL

1. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION 26 05 26

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install supporting devices, including:
 - 1. Conduit and equipment supports.
 - 2. Fastening hardware.

1.2 COORDINATION

- A. Coordinate size, shape and location of concrete pads with section on cast-in-place concrete.
- B. Coordinate size, shape and requirements for utility company equipment with local utility company.

1.3 QUALITY ASSURANCE

- A. Provide support systems adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. B-Line.
- B. Kindorf.
- C. Unistrut.

2.2 MATERIAL

- A. Support Channel: Galvanized or painted steel.
- B. Hardware: Galvanized or painted steel.
- C. Provide epoxy or PVC coated materials for corrosive environments.
- D. Spring steel clips.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps or bolts.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; sheet metal screws in sheet metal studs and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Do not use powder-actuated anchors on new concrete structure.
- E. Do not drill structural steel members.
- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. Provide concrete pads and equipment bases for all outdoor equipment on

grade, floor mounted equipment, areas with floors below grade, pent-house equipment rooms and where shown on Drawings.

- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- J. Do not support conduit from ceiling wire supports.
- K. Do not support conduits by individual hanger wires.
- L. Where multiple runs of conduit can be run grouped together, run conduit in racks supported from the building structure. Provide for future use of rack by properly planning routing of conduits in and through restricted areas such as through walls and around mechanical and electrical equipment.
- M. Use spring steel clips only with EMT for individual branch circuits and device boxes in drywall construction.

END OF SECTION

SECTION 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install wall and ceiling outlet boxes, and pull and junction boxes.
- B. Furnish and install raceway systems for site lighting and site lighting controls.
- C. Furnish and install raceway systems, including:
 - 1. Rigid metal conduit and fittings.
 - 2. Flexible metal conduit and fittings.
 - 3. Liquidtight flexible metal conduit and fittings.
 - 4. Nonmetallic conduit and fittings.

1.2 RELATED SECTIONS

- A. Section 26 05 63 – Identification for Electrical Systems.
- B. Section 26 05 19 – Low Voltage Power Conductors and Cables.
- C. Section 26 27 26 – Wiring Devices.

1.3 REFERENCES

- A. NEMA OS 1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
- B. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. NFPA 70 – National Electrical Code.
- D. ANSI C80.1 – Rigid Steel Conduit, Zinc-Coated.
- E. NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies.
- F. NEMA RN 1 – PVC Externally-Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.

- G. NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.

PART 2 – PRODUCTS

2.1 OUTLET BOXES

- A. Provide galvanized or cadmium-plated pressed steel outlet boxes suitable for the conditions of each outlet. Provide multi-gang outlets of single box design; sectional boxes will not be acceptable.
- B. Provide deep type cast metal outlet boxes located in damp locations exposed to weather or exposed areas subject to damage, or where surface mounted below 8' above finished floor, complete with casketed in use cover-plates and threaded hubs.
- C. Provide outlet boxes of sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of NFPA 70, and not less than 4 inches square and 1-1/2 inch deep unless shallower boxes are required by structural conditions and are specifically approved by A/E.
- D. Provide non-metallic type outlet boxes only in corrosive areas.

2.2 PULL AND JUNCTION BOXES

- A. Provide galvanized sheet metal boxes conforming to NEMA OS 1. Provide hinged enclosures for any box larger than 12 inches in any dimension.
- B. Provide cast metal boxes for outdoor and wet locations conforming to NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain tight with cover and ground flange, neoprene gasket, and stainless steel cover screws.
- C. Provide pre-cast concrete or fiberglass hand-holes for underground installations. Where fiberglass hand-holes are provided, provide die-molded type with pre-cut 6"x6" cable entrance at center bottom of each side and fiberglass weatherproof cover with non-skid finish.

- D. Provide pre-cast reinforced concrete type pull/splice boxes with flush cover as manufactured by Brooks Products, for underground circuits. Size boxes as indicated.
- E. Provide separate pull boxes and junction boxes for electric power, control, and communication systems.
- F. Duct Bank Pull Boxes
 - 1. Provide man hole pull boxes constructed of cast-in-place concrete with steel reinforcing bars; pre-cast concrete with steel reinforcing bars; or fiberglass.
 - 2. Design and test manufactured pull boxes to temperatures of minus 50 degrees F. Provide pull boxes with material compressive strength no less than 11,000 psi.
 - 3. Provide cover with a minimum coefficient of friction of .5 and which is full vehicular traffic H-20 rated. Provide "logo" on cover to indicate "Medium Voltage Power". Provide lockable covers with two penta-head bolts and pull slot(s) for easy removal. Provide of adequate size to allow easy access for maintenance.

2.3 CONDUIT

A. MANUFACTURERS

- 1. Rigid Metal Conduit, Intermediate Metal Conduit, Electrical Metallic Tubing and Fittings
 - a. Allied Tube and Conduit Corporation.
 - b. Triangle PWC, Inc.
 - c. Wheatland Tube Co.
- 2. Flexible Conduit and Fittings
 - a. Anamet, Inc.
 - b. Electri-Flex Co.
 - c. Triangle PWC, Inc.
- 3. Nonmetallic Conduit and Fittings
 - a. Can-Tex Industries.
 - b. Carlon.
 - c. Certain-Teed.

B. MATERIALS

1. Rigid Metal Conduit and Fittings
 - a. Rigid Steel Conduit: ANSI C80.1; hot-dip galvanized.
 - b. PVC Externally Coated Conduit: NEMA RN 1; rigid steel conduit with external PVC coating and internal galvanized surface.
 - c. Fittings and Conduit Bodies: NEMA FB 1; threaded type, material to match conduit.
2. Flexible Metal Conduit and Fitting
 - a. Conduit: Galvanized steel strips, spirally wound.
 - b. Fittings and Conduit Bodies: NEMA FB 1.
3. Liquidtight Flexible Conduit and Fittings
 - a. Conduit: Flexible metal conduit with PVC jacket and integral grounding conductor.
 - b. Fittings and Conduit Bodies: NEMA FB 1; Liquidtight, zinc coated steel.
4. Nonmetallic Conduit and Fittings
 - a. Conduit: NEMA TC 2; Schedule 40 PVC.
 - b. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 – EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
- B. Electrical box locations shown on Drawings are approximate unless dimensioned. Verify with A/E the location of floor/pavement boxes in work areas prior to rough-in.
- C. Locate and install boxes to allow access. Provide access doors where installation is inaccessible. Coordinate locations and sizes of required access doors with those specified in Division 22 and 23.
- D. Locate and install to maintain headroom and to present a neat appearance.

3.2 OUTLET BOX INSTALLATION

- A. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- B. Provide knockout closures for unused openings. Provide blank plates for all junction boxes.
- C. Securely fasten boxes to the building structure using an approved bracket (i.e., "H" bracket), independent of the conduit, except for splice boxes that are connected to two metal conduits, both supported within 12 inches of box.
- D. Provide access to all boxes.
- E. Label junction boxes as to circuits located within and panelboards serving those circuits

3.3 PULL AND JUNCTION BOX INSTALLATION

- A. Support pull and junction boxes independent of conduit.
- B. Provide pull boxes in feeder circuits as required but at least every 150 feet in straight runs.
- C. Identify all junction boxes by circuit number on cover with legible permanent ink marker.
- D. Duct Bank Pull Boxes
 - 1. Where installed outside, set pull boxes level with above finish grade.
 - 2. Rate all pull boxes for H-20 heavy traffic. Concrete encase pull boxes.
 - 3. Stack pull boxes or provide extensions as required for routing of conduits as indicated on Drawings.
- E. Provide weatherproof pull boxes or junction boxes where installed outdoors with watertight gasketed covers fastened by means of corrosion resistant screws.

3.4 EMPTY RACEWAY SYSTEM INSTALLATION

- A. Provide underground system service as shown on drawings. Verify exact system requirements for each vendor or utility.
- B. Provide pull boxes in conduit runs spaced not greater than 100 feet apart. Install no more than two right angle bends between junction boxes for all empty raceway systems.
- C. Place label on pull and junction boxes indicating system type.

3.5 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

- A. Minimum size of conduit is 3/4-inch. Minimum size of homerun and feeder conduits is 3/4-inch. Indicated sizes are minimum based on THW copper wire and larger sizes may be used for convenience of wire pulling.
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Install all conduits parallel or perpendicular to walls and adjacent piping. Neatly route conduit in a common rack where possible.
- D. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit securely to building structure using clamps, hangers and threaded rod.

3.6 GENERAL CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends before joining.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Install no more than the equivalent of three 90-degree bends between boxes.
- D. Use conduit bodies to make sharp changes in direction, as around beams.

- E. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point. Seal conduit which crosses a boundary between areas of extreme temperature difference.
- F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- G. Drawings indicate intended circuiting and are not intended to be scaled for exact conduit location.
- H. Do not install conduit in floor slab of ground floor of building.

3.7 NONMETALLIC CONDUIT INSTALLATION

- A. Wipe nonmetallic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

3.8 METALLIC CONDUIT INSTALLATION

- A. Make joints mechanically tight and all conduit electrically continuous.
- B. Use conduit hubs for fastening conduit to sheet metal boxes in damp or wet locations. In wet areas, use sealing locknuts and other approved techniques for moisture proofing of raceway.
- C. Use hydraulic one shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
- D. Install expansion joints where conduit crosses building expansion joints and at 150 foot intervals in straight runs.

3.9 UNDERGROUND DUCT BANK INSTALLATION

- A. Install top of duct bank minimum 24 inches below finished grade, unless indicated otherwise.
- B. Slope duct banks, which extend beyond the building outside walls, downward 4 inches per 100 feet from point of origin inside of building to manholes or junction boxes outside the building.

- C. Terminate conduit in end bell at manhole entries.
- D. Stagger conduit joints.
- E. Use suitable separators and chairs installed 5 feet on centers. Band conduit together with suitable banding devices. Securely anchor conduit to prevent movement during concrete placement.
- F. Provide minimum 3 inches red concrete cover at top and bottom and 3 inches concrete at sides of duct bank.
 - G. Provide two No. 5 steel reinforcing bars at each corner and at 12 inches on center on top and sides of all duct banks and at 6 inches on center on the bottom. Provide No. 3 steel reinforcing stirrups at 5 feet on center. Provide 3" minimum clear spacing between ducts.

3.10 EXTERIOR FEEDER CONDUIT INSTALLATION

- A. Install top of conduit minimum 24 inches below finished paving and 18" below grade. Hand excavate around existing trees, protect trees and roots as much as possible.
- B. Exterior
 - 1. Exposed
 - a. Rigid metal conduit.
 - b. PVC coated rigid metal conduit at all concrete slab penetrations.
 - c. Liquidtight flexible metal conduit for connection to vibrating equipment including motors, transformers and control devices.
 - 2. Underground
 - a. Rigid nonmetallic conduit for all branch circuits.
 - b. Rigid nonmetallic conduit for all feeders with concrete encasement as specified.

- c. PVC coated rigid metal factory elbows for all bends and for concrete slab penetrations.
- C. Electrical nonmetallic tubing, flexible polyethylene or PVC tubing will not be acceptable for use on this project.

END OF SECTION 26 05 33

SECTION 26 05 63 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install items for identification of electrical products installed under this Division.

1.2 SUBMITTALS

- A. Submit product data.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. W.H. Brady Co.
- B. Carlton Industries, Inc.
- C. Seton Nameplate Co.

2.2 MATERIALS

- A. Nameplates: Provide engraved three-layer laminated plastic nameplates with white letters on a black background.
- B. Wire and Cable Markers: Provide vinyl markers with split sleeve or tubing type, except in manholes provide stainless steel with plastic ties.
- C. Underground Warning Tape
- D. Manufactured polyethylene material and unaffected by acids and alkali's.
- E. 3.5 mils thick and 6 inches wide.
- F. Tensile strength of 1,750 psi lengthwise.

- G. Printing on tape shall include an identification note BURIED ELECTRIC LINE, and a caution note CAUTION. Repeat identification and caution notes over full length of tape. Provide with black letters on a red background conforming to APWA recommendations.
- H. Panelboard Directories: Provide a typed circuit directory for each panelboard. Mount circuit directory in a permanent, clear Lexan card holder located on inside of door on panelboard.
- I. Conduit Markers: Flexible vinyl film with pressure sensitive adhesive backing and printed markings.
- J. Electrical conduit markers shall include three identifying titles on an orange background except as noted.

1. Examples

a. Type AC 60 Hertz
 Load Lighting
 Voltage 480 VAC/3 Phase

–OR–

b. Type AC 60 Hertz
 Load Power
 Voltage M. V. 35kV, 3 phases, 4 wires.

- 2. If more than one type of power is available in a conduit, then it shall be marked with the title “Electrical” on orange background.
- 3. Conduit that contains protective or communication systems shall have the exact content and title on blue background and installed and located as specified for conduit.
- 4. Conduit Markers and Letter Size Dimensions:

Outside Diameter of Conduit in Inches	Width of Color Band in Inches	Height of Letter & Numerals in Inches
1/2 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/4 to 3-1/4	10	1
3-1/2 & Larger	12	1-1/4

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations.
- D. Embossed tape will not be accepted.
- E. Provide underground tape at all electrical installations.

3.2 WIRE AND CABLE LABELING

- A. Provide wire markers on each conductor in splice boxes, pull boxes, and at first load connection on homerun. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.
- B. Identify branch circuit or feeder number for power and lighting circuits on cover of pull and junction boxes with indelible marker.

3.3 EQUIPMENT LABELING

- A. Provide nameplates to identify all electrical distribution and control equipment.
- B. Engraved, Laminated Plastic Nameplates: 1/4-inch letters, equipment designation; 1/8-inch letters, source circuit number. Provide for:
 - 1. Meters.
 - 2. 35 kV Load-break Switchgear including each individual device or piece of equipment within the switchgear. .
 - 3. 35 kV Loop switches
 - 4. 35 kV Transformer
 - 5. Identify all junction boxes by circuit number with legible permanent ink marker.

3.4 BOX COLOR CODING

- A. Boxes and covers for fire alarm wiring shall be painted red with white FA stenciled on cover.
- B. Boxes and covers for emergency system wiring shall be painted red.

3.5 CONDUIT MARKERS

- A. Location of Identifying Markers: At each end of conduit run and at intermediate points 50' on center maximum.

END OF SECTION 26 05 63

SECTION 26 24 16 – PANELBOARDS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install distribution, lighting and appliance branch circuit panelboards.

1.2 RELATED SECTIONS

- A. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- B. Section 26 05 63 – Identification for Electrical Systems.

1.3 REFERENCES

- A. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.4 SUBMITTALS

- A. Include outline and support point dimensions, NEMA enclosure type, voltage, main bus ampacity and material, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.5 SPARE PARTS

- A. Keys: Furnish two keys to Owner for each panelboard, all keyed alike.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. General Electric.
- B. Square D.
- C. Siemens.
- D. Cutler – Hammer.

2.2 GENERAL

- A. Conform to UL standards and bear UL label. Form cabinets from code gauge galvanized steel. Form fronts of code gauge cold rolled steel bonderized after fabrication.
- B. Provide cabinet fronts with concealed hinges, concealed adjustment means and master keyed flush lock. Finish front in manufacturer's standard gray enamel.
- C. Provide with main lugs and breakers or fuses as scheduled on the drawings. Provide main lug connection to accommodate T & B compression connector on end of cable. Attach connector to panel bus with two bolts per lug. Provide captive type bolts or studs to facilitate reinstallation of the lugs with the wire attached.
- D. Provide all panelboards with copper bus of the ratings scheduled and designed for all indicated devices and spaces, complete with taps and trim.
- E. Minimum integrated short circuit rating 10,000 amps RMS symmetrical for 240 volt panelboards; 14,000 amperes RMS symmetrical for 480 volt panelboards or as shown on the drawings. Integrated ratings may be based on tested series ratings in conjunction with feeder breaker actually used.
- F. Size bus bars to limit the temperature rise within the panelboard to 50 degrees C over a 40 degrees C ambient temperature.
- G. Provide adequate space and provisions for wire No. 6 AWG and larger conductors to terminate with compression type connector to main lugs.
- H. Connect all two-section panelboards with copper cable of an ampacity greater than the main bus ampacity.

2.3 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: Circuit breaker type.
- B. Enclosure: Type 3R; unless indicated otherwise. Provide with door in door construction with full opening hinged door.
- C. Provide insulated neutral bus and separate copper grounding bus bonded to enclosure.
- D. Molded Case Circuit Breakers: Bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled.
- E. Sequence phase all adjacent breakers. All circuit breaker connection straps shall be rated at 100 amperes minimum.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Height: Install wall mounted panelboards at 6 feet to the top of the enclosure.
- B. Provide filler plates for unused spaces in panelboards.
- C. Provide typewritten circuit directory for each branch circuit panelboard mounted in permanent, clear Lexan card holder located on inside of door. Prepare directories only after permanent room numbers have been assigned.
- D. Distribute loading on circuits in panelboards to balance the load as evenly as possible in each phase.
- E. Terminate only one conductor under each lug of branch circuit breakers.
- F. Do not make splices or taps in panelboard gutters.

3.2 FIELD QUALITY CONTROL

- A. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 26 24 16

SECTION 26 27 26 WIRING DEVICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install specification grade wiring devices, including:
 - 1. Wall switches.
 - 2. Wall dimmers.
 - 3. Receptacles.
 - 4. Floor mounted service fittings.
 - 5. Occupant sensors.
 - 6. Device plates and box covers.

1.2 RELATED SECTIONS

- A. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

1.3 REFERENCES

- A. NEMA WD 2 – Semiconductor Dimmers for Incandescent Lamps.

1.4 SUBMITTALS

- A. Furnish samples upon request of A/E.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Switches and Receptacles
 - 1. Hubbell.
 - 2. Leviton.
 - 3. Pass & Seymour

- B. Dimmers
 - 1. Leviton.
 - 2. Lutron.

- C. Cover Plates: Match device manufacturer.

- D. Floor Mounted Service Fittings
 - 1. Hubbell.
 - 2. RCI.
 - 3. Square D.
 - 4. wiremold.

- E. Occupant Sensors
 - 1. Hubbell.
 - 2. Leviton.
 - 3. Pass & Seymour.

2.2 DEVICE COLOR

- A. All devices shall be white except in selected high finish areas where the color selection shall be coordinated with Architect during submittal phase.

2.3 SWITCHES

- A. 20A, 120–277V Single Pole: "1221", Hubbell.
- B. 20A, 120–277V Double Pole: "1222", Hubbell.
- C. 20A, 120–277V Three Way: "1223", Hubbell.
- D. 20A, 120–277V Four Way: "1224", Hubbell.
- E. 20A, 277V Single Pole with Pilot Light: "1221PL", Hubbell.
- F. 20A, 120–277V Single Pole, locking type: "1221L", Hubbell.

2.4 DIMMERS

- A. NEMA WD 2; slide type, solid-state, positive off, Lutron "Nova" series.
- B. 1500 watts minimum rating; larger size as necessary to accommodate load shown on contract drawings. Fully rated, gangable without breaking off cooling fins.
- C. Rated for incandescent or fluorescent as shown.

2.5 RECEPTACLES

- A. 15A, 125V, 2P3W Clock: NEMA 5-15R; "5235", Hubbell.
- B. 20A, 125V, 2P3W Duplex: Tamper resistant, NEMA 5-20R; "SC63H", Hubbell.
- C. 20A, 125V, 2P3W Simplex: NEMA 5-20R; "5361", Hubbell.
- D. 20A, 125V, 2P3W Duplex: NEMA 5-20R; "5362", Hubbell.
- E. 20A, 125V, 2P3W Duplex Ground Fault Interrupting: NEMA 5-20R; "GF5362", Hubbell.
- F. 20A, 125V, 2P3W Duplex Isolated Ground: NEMA IG5-20R; "IG5362", Hubbell.
- G. 20A, 125V, 2P3W Duplex Surge Suppression with Light and Alarm: NEMA 5-20R; "5352S", Hubbell.
- H. 20A, 125V, 2P3W Duplex Surge Suppression, Isolated Ground with Light and Alarm: NEMA IG5-20R; "IG5352S", Hubbell.
- I. 20A, 125V, 2P3W Duplex Hospital Grade: NEMA 5-20R; "8300", Hubbell.

- J. 20A, 125V, 2P3W Duplex Hospital Grade, Ground Fault Interrupting: NEMA 5-20R; "GF8300", Hubbell.
- K. 20A, 125V, 2P3W Duplex Hospital Grade, Isolated Ground: NEMA IG5-20R; "IG8300", Hubbell.
- L. 20A, 250V, 2P3W Simplex: NEMA 6-20R; "5461", Hubbell.
- M. 30A, 125V, 2P3W Simplex: NEMA 5-30R; "9308", Hubbell.
- N. 30A, 250V, 2P3W Simplex: NEMA 6-30R; "9330", Hubbell.
- O. 50A, 125V, 2P3W Simplex: NEMA 5-50R; "9360", Hubbell.
- P. 50A, 250V, 2P3W Simplex: NEMA 6-50R; "9367", Hubbell.
- Q. Heat trace or other loads continuously plugged in outdoors. Provide Crouse-Hinds WRLD-1 cover. Install round plug on cord supplied with heat trace or other equipment to match weatherproof bushing on receptacle cover.

2.6 OCCUPANT SENSORS

- A. Self-Contained
 - 1. Leviton ODS10-ID.
 - 2. Single gang, gangable device designed to fit behind a standard decorator switch plate.
 - 3. Infrared detector behind a fresnel lens.
 - 4. Detection Range
 - a. 2100 square feet field of view.
 - b. 180-degree sensing field.
 - 5. Adjustable Time-Out Delay: 30 seconds – 30 minutes.
 - 6. Adjustable Ambient Override: 4 foot candles to full daylight.
- B. Network
 - 1. Sensor.

- a. Leviton ODC series.
- b. Self-mounting, ceiling bracket.
- c. Infrared detector behind a fresnel lens.
- d. Detection Range
 - 1) 8 to 14 micrometer frequency spectrum of bodily emitted infrared radiation.
 - 2) 110-degree sensing field over 400 gross square feet.
- e. Time Delay: 30 seconds – 30 minutes.
- 2. Control Unit
 - a. Leviton ODP20 series.
 - b. Enclosure: Galvanized, heavy duty for mounting to a 4 inch or 4-1 1/16 inch square box.
 - c. Control up to five sensors.
 - d. Power Rating
 - 1) 1560 watts incandescent at 120 volts.
 - 2) 2400 watts fluorescent at 120 volts.
 - 3) 4800 watts fluorescent at 277 volts.
- 2. Auxiliary Relays for Additional Load
 - a. Leviton ODA00 series.

2.7 FLOOR MOUNTED SERVICE FITTINGS

- A. Flush Floor Fittings (On Grade)
 - 1. Duplex Receptacle
 - a. 20A, 125V, 2P3W, NEMA 5-20R: "5362", Hubbell.
 - b. Brass cover with flaps: "S-3925", Hubbell.
 - c. 4-inch square, fully adjustable box with round ring: "B-2529", Hubbell.
 - 2. Data Outlet
 - a. Brass cover with 1-inch and 2-1/8-inch plugs: "S-2725", Hubbell.
 - b. 4-inch round, fully adjustable box with round ring: "B-2529", Hubbell.

2.8 COVER PLATES

- A. Provide one piece cover plates for all group mounted devices.
- B. Provide nylon thermoplastic of the same manufacturer and color as the device.
- C. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers.
- D. Exposed Box Cover Plate: Stamped steel handy box covers.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install receptacles and switches only in electrical boxes which are clean and free from excess building materials, debris, etc.
- B. Install wall switches with OFF position down.
- C. Where switches and other devices are mounted at one location, provide single coverplate to cover all devices.
- D. Align the tops of all group mounted devices. Install plumb and aligned in the plane of the wall.
- E. Derate ganged dimmers as instructed by manufacturer; do not use common neutral.
- F. Install convenience receptacles in vertical position with grounding pole on bottom unless otherwise noted.
- G. Provide ground fault circuit interrupting type devices in all locations requiring weatherproof devices.
- H. Do not use feed through feature for ground fault interrupting devices.

Install GFI device at each location. GFI circuit breaker will not be acceptable.

- I. Install plates on all devices and blank outlets in finished areas. Use jumbo size plates for outlets installed in masonry walls.
- J. Install galvanized steel plates on outlets in unfinished areas.
- K. Install galvanized steel plates on outlet boxes and junction boxes above accessible ceilings.
- L. Mounting Heights:
 - 1. Refer to drawing cover sheet or contact A/E.
 - 2. Convenience Receptacles Above Counter or Backsplash: 6 inches above counter or backsplash in horizontal position.
 - 3. Receptacles for Water Coolers: Mount directly behind water cooler to eliminate visibility of cord and attachment plug. Coordinate elevation with the cooler to be installed prior to installation of box.
 - 4. Install devices in mill work as shown in details and elevations or as directed by A/E.
- M. Network Occupant Sensors
 - 1. Coordinate the sensors and the control units for compatibility. Provide auxiliary relays as necessary.
 - 2. Verify the sensor coverage of the approved manufacturer and provide the necessary sensors, control units and auxiliary relays required to adequately cover and control the indicated area. Where corridors are covered, install ceiling mounted back-to-back sensors.

End of Section

SECTION 26 28 12-ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Molded-case and insulated-case circuit breakers in individual enclosures.

1.2 RELATED SECTIONS

- A. Section 26 05 63 – Identification of Electrical Systems.
- B. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables

1.3 REFERENCES

- A. NECA – Standard of Installation.
- B. NEMA AB 1 – Molded Case Circuit Breakers and Molded Case Switches.
- C. NETA ATS – Electrical Power Distribution Equipment and Systems.

1.4 SUBMITTALS

- A. Product Data: Submit catalog sheets showing ratings, trip units, time current curves, dimensions, and enclosure details.
- B. Project Record Documents: Record actual locations and continuous current ratings of enclosed circuit breakers.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 EXTRA MATERIALS

- A. Supply three of each size and type of current limiter.

PART 2 – PRODUCTS

2.1 MOLDED CASE CIRCUIT BREAKER

- A. Manufacturers:

1. General Electric.
 2. Square D.
 3. Siemens.
- B. Product Description: Enclosed, molded–case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where so applied.
- C. Field–Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have mechanism for adjusting long time, continuous current, short or long time pickup current setting for automatic operation. Range of Adjustment: seconds, amperes.
- D. Field–Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.
- E. Current Limiting Circuit Breaker: Circuit breaker indicated as current–limiting have automatically–resetting current limiting elements in each pole. Let–through Current and Energy: Less than permitted for same size Class RK–5 fuse.
- F. Solid–State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; [ground fault trip with [integral ground fault sensing] [zero sequence type ground fault sensor]; instantaneous trip; and adjustable short time trip.
- G. Current Limiter: Designed for application with molded case circuit breaker.
1. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
 2. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.
- H. Accessories: As scheduled on drawings. Conform to NEMA AB 1.
1. Shunt Trip Device.
 2. Undervoltage Trip Device.
 3. Auxiliary Switch.
 4. Alarm Switch: 120 volts.
 5. Electrical Operator.
 6. Handle Lock: Provisions for padlocking.
 7. Insulated Grounding Lug: In each enclosure.

- I. Enclosure: NEMA AB 1, as required to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel aluminum.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.
- J. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Provide solid neutral assembly and equipment ground bar.

2.2 INSULATED CASE CIRCUIT BREAKER

- A. Manufacturers: Square D, General Electric or Siemens.
- B. Product Description: Enclosed, insulated-case circuit breaker conforming to NEMA AB 1, suitable for use as service entrance equipment where so applied.
- C. Service Conditions:
 - 1. Temperature: 0 degrees F.
 - 2. Altitude: 150 feet above sea level.
- D. Trip Unit: Electronic sensing, timing, and tripping circuits for adjustable current settings; [ground fault trip with [integral ground fault sensing] [zero sequence type ground fault sensor]]; instantaneous trip; and adjustable short time trip.
- E. Accessories: As noted Conform to NEMA AB 1.
 - 1. Shunt Trip Device: 120 volts, AC.
 - 2. Undervoltage Trip Device: 120 volts, AC.
 - 3. Auxiliary Switch: 120 volts, AC.
 - 4. Alarm Switch: 120 volts, AC.
 - 5. Electrical Operator: 120 volts, AC.
 - 6. Handle Lock: Provisions for padlocking.
 - 7. Insulated Grounding Lug: In each enclosure.
- F. Enclosure: NEMA AB 1, as required to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel aluminum , unless noted otherwise.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.

3. Industrial Locations: Type 4X.

- G. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Provide solid neutral assembly and equipment ground bar.

PART 3 – EXECUTION

3.1 EXISTING WORK

- A. Disconnect and remove abandoned enclosed circuit breakers.
- B. Ensure access to existing enclosed circuit breakers and other installations which remain active and which require access. Modify installation or provide access panel as appropriate.
- C. Clean and repair existing enclosed circuit breakers which remain or are to be reinstalled.

3.2 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install enclosed circuit breakers plumb.
- C. Height: 5 feet to operating handle.
- D. Locate and install engraved plastic nameplates

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1.

3.4 ADJUSTING

- A. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.
- B. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

END OF SECTION 26 28 12

SECTION 26 28 13 – FUSES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Fuses and spare fuse cabinet.

1.2 REFERENCES

- A. NEMA FU 1 – Low Voltage Cartridge Fuses.

1.3 DESIGN REQUIREMENTS

- A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for components such as wire, cable, bus structures, and other equipment. Design system to ensure that component damage is within acceptable levels during a fault.
- B. Select fuses to coordinate with time–current characteristics of other overcurrent protective elements, such as other fuses, circuit breakers, and protective relays. Design system to ensure that device closest to fault operates.

1.4 FUSE PERFORMANCE REQUIREMENTS

- A. Switches Larger than 600 amperes: Class L (time delay).
- B. Switches smaller than 600 amperes Class RK1 (time delay).
- C. Motor Load Branch Circuits: Class RK1 (time delay).

1.5 SUBMITTALS

- A. Product Data: Submit data sheets showing electrical characteristics, including time–current curves.
- B. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 MAINTENANCE MATERIALS

- A. Provide two fuse pullers.

1.8 EXTRA MATERIALS

- A. Supply three spare fuses of each Class, size, and rating installed.

PART 2 – PRODUCTS

2.1 FUSES

- A. Manufacturers: Bussman, Gould Shawmut.
- B. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- C. Voltage: Rating suitable for circuit phase-to-phase voltage.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install fuse with label oriented such that manufacturer, type, and size are easily read.
- B. Install spare fuse cabinet where indicated.

END OF SECTION 26 28 13

SECTION 26 56 29 – SITE LIGHTING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install light fixtures associated with site, including:
 - 1. Exterior luminaires and accessories.
 - 2. Lamps.
 - 3. Ballasts.
 - 4. Poles.
 - 5. Pole bases.

1.2 RELATED SECTIONS

- A. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

1.3 SUBMITTALS

- A. Include product data for fixtures, including photometric data, reflectance, lens, lamps, ballasts, poles and lighting controls.
- B. Furnish samples upon request.
- C. Provide operation and maintenance manual.

1.4 QUALITY ASSURANCE

- A. Manufacturers of individual lighting fixtures shall be as scheduled on Drawings; manufacturers scheduled represent quality and design features required. Products of other manufacturers will be considered upon submittal of proper data.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Lamps:
 - 1. General Electric.
 - 2. Sylvania.
- B. Ballasts:
 - 1. Advance.
 - 2. Universal.
 - 3. Valmont.

2.2 LAMPS

- A. All lamps shall be pulse start metal halide.
 - 1. All bollard lamps shall be 100W medium base, coated, metal halide.
 - 2. All lamps shall be suitable for vertical base-up operation except lamps under 175W which must be suitable for universal burn position (i.e.: UBP = all base orientations accepted).
 - 3. All lamps at or above 175W shall be mogul base.
 - 4. CRI shall be 65 or higher, color temperature shall be 3900K or higher.
 - 5. Lamp wattages shall be standardized according to the following mounting heights based on lamp center above the work plane. For variations on this standard refer to PART 4; (F).
 - a. Up to 4' = 100W MH
 - b. Over 4' and up to 15' = 100W or 175W MH
 - c. Over 15' and up to 24' = 175W or 400W MH
 - d. Over 24' = 400W MH

2.3 Ballasts

- A. All HID ballasts shall have a ballast factor of 1.0 +/- 3%.

- B. All ballasts shall be energy efficient.
- C. All ballast components mounted above 15' shall be completely removable without tools as a quick-disconnect unit for easy maintenance.
- D. Each ballast shall be supplied with fusing in accordance with specific ballast manufacturer's recommendation and shall be located at the pole base.

2.4 Luminaires

- A. All fixtures at or above 175W shall be operated with lamp in the vertical base up position only.
- B. All fixtures shall meet "Cut-Off" or "Full Cut-Off" classification as defined by the IESNA.
- C. Luminaire construction must allow lamp to be replaced without tools unless mounted below 15'.
- D. Luminaires mounted below 15' must utilize tamper-proof stainless steel fasteners for access into fixture.
- E. All fixtures shall have a minimum UL ambient temperature rating of 40 degrees Celsius.
- F. Luminaire housings must be constructed of a non-corrosive material and/or cast low-copper aluminum. No sheet metal housings will be accepted.
- G. All fixture housings shall have polyester powder coat finish.
- H. All exterior hardware must be stainless steel.
- I. Enclosed luminaire optics must be gasketed or filtered. Open luminaire optics must use glass reflectors and/or refractors. No open metal reflectors will be accepted.
- J. In-ground or sub-grade fixtures are not to be used except in specialty lighting applications approved by the Houston Community College System's Facilities Department.

- K. These requirements shall apply to all luminaires including wall-mounted fixtures.

2.5 Poles

- A. All poles shall be rated for 90 mph sustained wind loading with all luminaires, mounting arms and accessories mounted with a 1.3 gust factor or 117mph wind gust. Deflection at 30 feet above grade less than 5 inches from vertical with 90 mph wind velocity and luminaires, brackets and related equipment mounted.
- B. All pole shafts shall be straight square aluminum with polyester powder coat finish. Color selection must be approved by the Houston Community College System's Facilities Department.
- C. All pole shafts shall have a track feature over the entire length of the pole on at least two sides that will allow easy field attachment, relocation and removal of luminaires, arms and accessories using a simple security Allen wrench. Strap mounting of accessories is not acceptable. Accessories may include but are not limited to: security cameras, emergency call systems, banners arms, and signage.
- D. Track feature is not required on parking lot poles that are deemed unlikely to have accessories in the future provided the anchor base, bolt sizes and configuration will allow replacement with a track pole for future fit-up capability.
- E. All poles with track feature shall be constructed of 6061-T6 extruded aluminum alloy.
- F. All poles shall have a hand-hole with a cover secured by stainless steel tamper-proof fasteners for access into the pole near the pole base.
- G. Provide structural pole calculations of reactions at the full wind gust rating with all luminaires, mounting arms and accessories attached.
- H. Metal Poles: Steel lighting pole with anchor base. Provide permanent paint as scheduled, electrostatic powder epoxy finish, 3 to 5 mils thick. Straight or tapered round steel as scheduled. Provide color to match color of light fixtures.

- I. Hand Hole: Drilled hand access hole at manufacturer's standard location. Provide matching casketed cover plate. Provide additional hand holes or selected poles as indicated.
- J. Anchor Bolts: As recommended by pole manufacturer. Provide template, flat washers, lock washers, and hex nuts for each pole. Provide bolt cover. Cover shall extend below anchor base to conceal leveling nuts.
- K. Each pole to have internal grounding lug and be grounded.

2.6 Internally Illuminated Bollards

- A. Bollards are intended to be used in open public areas such as building entrance approaches and outdoor gathering areas as well as for additional lighting as needed for pedestrian access.
- B. All bollards shall be louvered and meet "Cut-Off" classification as defined by the IESNA.
- C. All bollards must be of heavy-duty vandal resistant construction with welded reinforced top and bottom plates and include stainless steel interior fasteners and stainless steel tamper-proof exterior fasteners.
- D. All bollards shall have a minimum UL ambient temperature rating of 40 degrees Celsius.
- E. Bollard shaft must be constructed of round extruded copper free aluminum (< 0.2%) or low copper aluminum (0.4%) with a minimum of 0.125" wall thickness.
- F. All bollard shafts and housings shall have polyester powder coat finish. Color selection must be approved by the Houston Community College System's Facilities Department.
- G. All exterior hardware must be stainless steel.
- H. Bollard optics must be glass and gasketed. No plastic optics will be accepted.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Concrete Pole Bases: Size and construct as indicated on the pole base detail. Project anchor bolts 4" above base for Type A & B poles and 2 inches for type C & L poles. Install poles on bases plumb; provide double nuts for adjustment, coordinate orientation with lighting designer. Grout around pole base after aligning pole. Groute under base plate of Type A & B poles with 1/2" weep hole. Do not grout Type C & L poles bases and Install base cover.
- B. Use belt slings to raise and set pre-finished poles. Support and protect pole during lifting and setting operations to prevent damage to finish on poles.
- C. Provide Styrofoam wedge at midpoint to prevent wire flapping inside pole and provide conductor stress relief at top of pole.
- D. Install properly sized in line fuses in fuse holders accessible from pole handhole for all circuits in each pole.
- E. Install lamps in luminaires.
- F. All unused access holes in poles shall be filed plugged by installer.

3.2 FIELD QUALITY CONTROL

- A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Repair luminaire and pole finish at completion of work to "as new" condition. If pole finish is marred or damaged and cannot be restored to "as new" condition, replace pole.
- C. Aim luminaire as directed. Provide services of mechanic and bucket truck for nighttime adjustment before completion.
- D. Demonstrate & certify proper operation of all luminaires and controls.

3.3 DESIGN/DRAWING REQUIREMENTS

- A. All exterior areas shall be illuminated to meet or exceed the following values. Use the Illuminating Engineering Society IESNA G-1-03 Guideline for Security Lighting as a general reference.

LOCATION	AVERAGE HORIZONTAL ILLUMINATION	AVERAGE TO MINIMUM RATIO	COEFFICIENT OF VARIANCE
Pedestrian Walkways	10 lux (1 fc)	4:1	0.75
Covered Entryways	100 lux (10 fc)	4:1	0.50
Open Areas - Occupied	20 lux (2 fc)	4:1	0.50
Open Areas - Normally Unoccupied	2.5 lux (0.25 fc)	-	1.00
Parking Lots - Operating Hours	30 lux (3 fc)	4:1	0.50
Parking Lots - Non-operating Hours	5 lux (0.5 fc)*	-	1.00
Streets	10 lux (1 fc)	8:1	1.00

* Value is increased from that of referenced IESNA Guideline.

- B. All average illumination levels at ground level shall not be lower than the values indicated above and shall take into account a Light Loss Factor or LLF calculated as follows:
1. $LLF = LLD \times LDD \times BF$
 2. Lamp Lumen Depreciation or LLD shall be published mean lumens divided by initial lumens of the lamp used.
 3. Luminaire Dirt Depreciation or LDD shall be 0.90 for enclosed fixtures or 0.95 for open glass optics
 4. Ballast Factor or BF shall be in accordance with the ballast manufacturer's published rating.

- C. Coefficient of Variance is equal to the average deviation divided by the average illumination and shall not exceed the values indicated above.
- D. All engineering calculations of lighting analysis and light level study shall be provided.
 - 1. Illumination study shall be computer generated point-to-point calculations with a grid not less than 20' x 20'.
 - 2. Light obstructions and shadowing from buildings and structures must be considered in all lighting calculations.
- E. Design and location of exterior lighting shall always be coordinated with tree and landscaping locations.
- F. Unoccupied open area lighting shall extend 30' beyond all site boundaries unless restricted by light trespass laws or ordinances.
- G. Provide engineered pole and foundation details with registered engineer's seal.

3.4 DESIGN PROVISIONS

- A. All exterior campus lighting shall be controlled with a Master Lighting Control Cabinet (MLCC) as referenced in the latest Exterior Lighting Control Standard Criteria with interface to existing automated system as identified by Houston Community College System's Facilities Department.
- B. Parking lot lighting shall incorporate multiple circuits so that some of the lights can be turned off during non-operating hours to save energy and lamp life and still meet security requirements in accordance with Houston Community College System's policy.
- C. Utilization of government provided or subsidized lights and poles on public streets whenever and wherever available.
- D. Fixture mounting heights shall be limited to the following maximum mounting height based on bottom of optics above ground level:
 - 1. 32' maximum height for all parking lot, roadways and boulevards.

2. 16' maximum height for all pedestrian areas, walkways and areas not normally accessible by bucket truck.
 3. 17'- 6" maximum height for all open landscape areas.
 4. 4' maximum height for bollards with lamp center not less than 3' above finish paving or grade line as appropriate.
- E. All fixtures mounted above 16' shall be 480VAC if available. Fixtures mounted below 16' shall be multi-tap for 120V or 277V operation.
- F. The Houston Community College System's Facilities Department and its lighting consultant must approve any variances to this design standard.
- G. Design must meet all applicable Texas State, County and local laws, codes or ordinances in effect at time of construction. BE ADVISED AND NOTICED: Designs within Fort Bend County (and incorporated cities having adopted criteria therein) and also, very specifically within Sienna Plantation, shall require special provisions in response to lighting fixture selection guidelines and lighting level guidelines. Designer must contact appropriate offices at time of work to insure a copy of the current information issue.

END OF SECTION 26 56 29

SECTION 31 11 00 – CLEARING AND GRUBBING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for Site clearing which may consist of:
1. Protection of trees indicated to be preserved.
 2. Protection of above-ground and below-ground existing improvements indicated to be preserved.
 3. Clearing, grubbing, removal and disposal of trees, stumps, brush, roots, vegetation, logs and rubbish.
 4. Removal and disposal of above-ground and below-ground materials and existing improvements, including building demolition if any, as indicated.
 5. Stripping and stockpiling of topsoil.
 6. Stripping and stockpiling natural leaf mulch.

1.2 SUBMITTALS

- A. In accordance with Section 013100 – Project Administration of these Specifications, the following shall be submitted:
1. A detailed sequence of demolition and removal work to the Engineer for review prior to start of Work.

1.3 JOB CONDITIONS

- A. Conduct demolition operations and removal of debris in accordance with governing regulations and Section 02 41 17 – Demolition of these Specifications.
- B. Ensure minimum interference with adjacent occupied or used facilities.
- C. Exercise care to protect adjacent building, structures, and persons.

- D. Above-ground and below-ground existing improvements, indicated to remain, shall be protected from damage prior to and during construction operations.
- E Tree Protection
 - 1. Trees to be preserved shall be protected by barricades to avoid any confusion and damage prior to site clearing operations.
 - 2. Contractor shall install barricades 3 ft. beyond drip line of trees to be protected. Construction equipment or storage activities shall not be permitted within the fenced area.
- F. Protection of Existing Utilities and Adjacent Work
 - 1. Prior to earthwork operations, existing utilities, facilities and permanent objects to remain shall be located and adequately protected. When working near public and private utility company lines, Contractor shall contact the local utility coordinating committee or the utility company involved to locate their lines.
 - 2. If unknown and uncharted utilities are encountered during excavation, promptly notify Owner and the governing utility company when determinable and wait for instructions.
 - 3. If it is determined by Owner that such utility line has been abandoned, properly cap line at a depth approved by Owner or remove line as directed.
 - 5. If such unknown utilities are encountered and work is continued without contacting the Owner for instructions, and the encountered utilities are damaged by continuation of the work, Contractor shall repair, at this own expense, such damage to the satisfaction of the Owner and the Utility Company. The Contractor shall be responsible for all costs to repair the damage.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 CLEARING

- A. Trees to be removed, stumps, brush, roots and vegetation shall be removed to a depth of not less than 2 feet below original or finish ground level, whichever is lower.

- B. Miscellaneous vegetation, logs and rubbish shall be removed in their entirety, within the limits of improvements.
- D. Topsoil shall be stripped to underlying subsoil. Topsoil shall be defined as friable organic clay loam surface soil, reasonably free of clay lumps, stones, weeds, roots and other objectionable material. Topsoil shall be safely stockpiled on the Site. Stockpiles shall be constructed to freely drain surface water.
- E. Depressions caused by clearing, grubbing and stripping operations shall be filled with approved backfill material, unless further excavation is required by the construction operations. Backfill shall be placed in accordance with Section 312300 - Excavation, Grading, and Fill of these Specifications.

3.2 REMOVAL OF IMPROVEMENTS

- A. Above-ground and below-ground existing improvements shall be removed in their entirety, except for utilities which shall be removed only to the extent indicated. Where utilities are indicated to be removed in part, the ends of the remaining utilities shall be permanently plugged with Class 3000 concrete.

3.3 DISPOSAL OF MATERIALS

- A. Materials not scheduled to be salvaged shall become the property of the Contractor and shall be removed from the Site and legally disposed of. Burning or burying cleared, grubbed and demolition waste materials on the Site shall not be permitted.
- B. Remove items, without damaging, scheduled to be salvaged as directed by the engineer and placed in designated storage area.

END OF SECTION 31 11 00

SECTION 31 13 16 –SELECTIVE TREE TRIMMING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This Section specifies the requirements for protecting and trimming trees indicated to be preserved.

1.02 QUALITY ASSURANCE

- A. Reference Standard Applicable to this Section
 - 1. ASTM: American Society for Testing and Materials
 - a. D2665: Specification for Polyvinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
 - B. AWPB: American Wood Preservers Bureau
 - 1. LP-22: Standard for Softwood Lumber, Timber and Plywood Pressure Treated with Water-borne Preservatives for Ground Contact Use.
- C. All tree trimming and work involving tree roots required to protect trees shall be performed by or under the supervision of a certified arborist or certified urban forester.

1.03 JOB CONDITIONS

- A. Contractor shall not allow any vehicular traffic, construction equipment parking of vehicles or stockpiling of excavated material or construction materials within tree protection barricade. Prevent following types of damage:
 - 1. Compaction of root zone by foot or vehicular traffic, or material storage.
 - 2. Trunk damage from equipment operations, material storage, or from nailing or bolting.
 - 3. Trunk and branch damage caused by ropes or guy wires.
 - 4. Root poisoning from spilled solvents, gasoline, paint and other noxious materials.
 - 5. Branch damage due to improper pruning or trimming.
 - 6. Damage from lack of water due to:
 - a. Cutting or altering natural water migration patterns near root zone.
 - b. Failure to provide adequate watering.
 - 7. Damage from alteration of soil ph factor caused by depositing lime, concrete, plaster, or other base materials near roots.
 - 8. Cutting of roots larger than 1 1/2" in diameter.
- B. Water trees indicated to be preserved to maintain their healthy growth during the course of construction operations.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Chelated Iron – Sequestrian 138 as manufactured by Ciba-Geigy, P.O. Box 18300, Greensboro, N.C. or approved equal.
- B. Durzban granules – as specified in General Planting Section 329000.
- C. Durzban Wettable Solution – as manufactured by Dow Chemical, 9008 Building, Midland, Michigan, or approved equal.
- D. Asphalt paint: Emulsified asphalt or other adhesive, elastic, antiseptic coating formulated for horticultural use on cut or injured plant tissue, free from kerosene and coal creosote.
- E. Deep Root Fertilizer – Commercial liquid fertilizer with a ratio of 3:1:1 (N:P:K). Nitrogen shall be slow release.
- F. Natural Leaf Mulch – Partially decomposed leaf mulch consisting of organic material such as leaves, pine straw, pine cones, etc., gathered from project site or other "forest floor." Natural Leaf Mulch shall not contain twig or branches or newly ground material but may contain up to 50% commercial well-rotted bark mulch as specified in Section 02900 General Planting of these Specifications.
- G. Topsoil: Friable organic sandy clay loam free of clay, rock or gravel larger than 1 inch in any dimension, debris, waste, vegetation and other deleterious matter.
- H. Drainage Fill:
 - 1. Selected stone or gravel, graded to pass a 3 inch sieve and retained on a 1 inch sieve.
- I. Physical Barriers
 - 1. Wood Components: No. 2 Pine, pressure treated to prevent decay for 1 year in accordance with the requirements of AWPB Standard LP-22.
 - 2. Fence Material: 6 inch x 6 inch wire mesh with No. 6 steel wire, hot-dip galvanized.
 - 3. Banding: Stainless steel or varnish coated carbon steel, ¾ inch wide x 26 gauge.
- J. PVC Pipe ASTM D2665, 4 inch O.D nominal.
- K. All necessary tree replacements shall be approved by Owner's Representative.

PART 3 – EXECUTION

3.01 GENERAL

- A. Consult with Owner's Representative; remove agreed-on roots and branches which interfere with construction. Coat roots over 1 1/2 inches in diameter that are cut during construction, with asphalt paint. Employ a certified arborist or certified urban forester to remove and treat cuts.

- B. Protect tree root systems from damage due to noxious materials in solution caused by run-off or spillage during mixing and placement of construction materials, or drainage from stored materials.

3.02 PHYSICAL BARRIERS

- A. Each tree or group of trees to be preserved shall be provided with a physical barrier consisting of an encircling fence.
- B. The barrier shall consist of 4 foot minimum height fencing material fully supported by 4 inch x 4 inch wooden posts embedded in the ground a minimum of 2 foot and spaced at a maximum of 8 foot between posts so as to maintain the 3 foot from the drip line of the protected tree(s). The fencing shall be continuous between posts, shall be pulled up taut prior to fastening posts, and shall be firmly attached to the posts with fencing staples.
- C. The barrier shall be placed in a continuous circular alignment around a tree or group of trees designated to be preserved. The barrier shall be located to protect roots, trunks and foliage and generally shall be 3 foot outside the drip line of a tree or group of trees being protected. The location of a barrier may be inside the above-stated limit in a situation where requirements of the Work require operations inside the limit, with the approval of the Landscape Architect prior to placing the barrier.
- D. Storage of materials or other articles will not be allowed inside a barrier. Entryways into a protected area shall not be provided in order to discourage traffic of any type.
- E. Damage to tree barriers occurring during the progress of the Work shall be immediately repaired at no additional cost to the Owner. Workmen shall be clearly instructed to exercise caution in performance of work near trees being preserved.

3.03 PRUNING

- A. Remove branches and/or foliage as necessary so that no foliage is below eye-level on trees over 12 foot in height. For trees under 12 foot height, remove branches and/or foliage on bottom half of trees. Remove any foliage and/or branches that restrict visibility to vehicular traffic. Thin foliage on smaller trees as necessary to allow for visibility to ensure pedestrian safety.
- B. Remove dead or damaged branches over 2 inches in diameter at branch collar. Remove stubs back to main trunk. All cuts should be back to a lateral or main trunk and removed at branch collar (drop-crotch technique).
- C. Prune for overall shape only as necessary to balance form of tree due to pruning of dead or damaged branches, under direction of Certified Urban Forester or certified arborist.
- D. Cut branches with sharp pruning instruments, adjusted properly to insure proper cuts. "Anvil" type pruners or loppers will not be acceptable pruning equipment.
- E. Remove all vines from trunk and from branches and limbs. Remove poison ivy vines, with proper precaution, when defoliated.

- F. Where canopy of tree extends over areas to be paved, extent of pruning shall be based upon proximity of pavement to the trunk, extent of pavement and construction, size, condition and species of trees.
- G. Trees having branches which extend below eye-level at their outermost limit shall have such branches pruned to a height equal to the height of all vehicles requiring access below or around such trees.
- H. Prune branches to balance loss to root system caused by damage or cutting.
- I. Prune branches to maintain the basic branching form of the tree. Prune entire tree for a balanced form.
- J. Immediately after grading deep-root, fertilize existing trees and mulch with minimum 2 inch layer of natural leaf mulch over entire bed area of existing trees as shown on plans. Add commercial bark mulch as specified in Section 02900 - General Planting to achieve minimum 2 inch layer of cover. Contractor shall work expediently to minimize time period that "forest floor" is bare.

3.04 FERTILIZING

- A. Deep root fertilize all existing trees 4 inch caliper and greater (measured 12 inches above grade) after site grading and prior to any adjacent lime stabilization and concrete installation.
- B. Fertilize entire root system within the drip line of tree.
- C. Fertilizer shall be a liquid commercial fertilizer with a ratio of 3:1:1 (N:P:K). Nitrogen shall be slow-release. Apply at a rate of 3 pounds nitrogen/1,000 square feet. Concurrently, apply iron (Sequestrian 138) at manufacturer's recommended rate for chlorotic pines.
- D. Mixture shall be injected with approximately 150 psi pressure into the top 12 inches of soil.
- E. Application shall equal 3 pounds nitrogen per 1,000 square feet with a one-year period. If grading occurs after May 1, apply one-half the recommended rate at completion of grading and apply remaining half of fertilizer after November 1.

3.05 CHEMICAL TREATMENT

- A. Borers and Pine Bark Beetle
- B. Ninety (90) days after start of construction (that disturbs trees) spray trees that are to remain as follows: Spray Oaks for Bores. Spray trunks and branches over 2 inches diameter to run-off with Durzban 50 wettable insecticide at the manufacturers recommended rate for Pine Bark Beetle.
- C. Should it rain within six hours after application, trees shall be re-sprayed at Contractor's expense.
- D. Repeat spray of Oaks upon completion of construction.

3.06 EXCAVATION AROUND TREES

- A. Excavate within the drip line of trees only where indicated. Where trenching for utilities is required within drip line, tunnel under or around roots by hand digging.

Do not cut main lateral roots or tap roots. Smaller roots under 1 inch in diameter which interfere with the installation of new work may be cut.

- B. Where excavating for new construction is required within the drip line of trees, hand excavate to minimize damage to root system. Provide sheeting at excavations if required. Use narrow spading forks and comb soil to expose roots. Cut roots over 1 inch in diameter with sharp pruning instruments. Do not chop roots.
- C. Relocate roots in backfill areas wherever possible. If large main lateral roots are encountered, expose beyond excavating limits as required to bend and relocate without breaking. If roots are immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3 inches back from new construction.
- D. Do not allow exposed roots to dry out before permanent backfill is placed. Provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain exposed roots in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.
- E. Prune branches to balance loss to root system caused by damage or cutting.

3.07 GRADING AND FILLING AROUND TREES

- A. Maintain existing grade within the drip line of trees, unless otherwise indicated.
- B. Where existing grade is above new finish grade shown around trees, carefully hand excavate within the drip line to new finish grade. Cut roots exposed by excavation and provide permanent protection as recommended by the tree surgeon.
- C. Where existing grade is 6 inches or less below new finish grade, use a fill material. Place top soil in single layer and do not compact. Hand grade to required elevation.
- D. Where existing grade is more than 6 inches below new finish grade, provide 4 inch PVC pipe, 6 feet o.c. around tree perimeter, at drip line of tree for aeration of root system.

3.08 REPAIR AND REPLACEMENT OF TREES

- A. Repair trees damaged by construction operations as soon as possible to prevent progressive deterioration. Repair work shall be subject to approval by Owner's Representative
- B. Remove and replace dead or damaged trees which are determined by the tree surgeon to be incapable of restoration to normal growth status. Provide new trees of same size and species as those removed at no cost to Owner.
- C. The replacement of dead or damaged trees shall be performed in full compliance with the requirements specified in Section 02900- General Planting of these Specifications at no cost to Owner.

3.09 MAINTENANCE OF REPLACED TREES

- A. Contractor shall maintain trees during planting operations and for a period of 12 months after completion of planting in full compliance with the requirements specified in Section 32 01 90 Operation and Maintenance of Planting.
- B. Water trees to full depth a minimum of once a week, or as required to maintain a healthy vigorous growth.
- C. Prune, cultivate, and weed as required for healthy growth. Restore planting saucers. Tighten and repair stake and guy supports, and reset trees to proper grades or vertical position as required. Spray as required to keep trees free of insects and disease.

END OF SECTION

SECTION 31 23 00 – EXCAVATION, GRADING AND FILL

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Protection of trees.
- B. Field engineering for site layout.
- C. Testing laboratory services.
- D. Fill material for pavement sub base.
- E. Concrete reinforcing.
- F. Cast-In-Place concrete.
- G. Informational reference to site survey and to subsurface conditions.

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. ASTM D 698, Test for Moisture–Density Relations of Soils (Standard Proctor).
 - 2. ASTM D 2922, Test for Density of Soil in Place by Nuclear Method.
 - 3. ASTM D 2487, Classification of Soils for Engineering Purposes.

1.3 SUBMITTALS

- A. Samples:
 - 1. Submit 10 pound sample quantity of fill materials.
 - 2. Submit 20 pound sample quantity of topsoil material.
 - 3. Pack tightly in containers to prevent contamination.

1.4 GRADES

- A. Carefully compare new grade requirements with existing conditions.
- B. Provide necessary earth, grading and shaping work.
- C. Extra payment will not be authorized for overage or shortage of material.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Sub base Material: Unwashed pit run or crushed gravel, crushed stone, or crushed slag, naturally or artificially graded with maximum aggregate size of 1–1/2 inches, as acceptable to testing laboratory.
- B. Backfill and Fill Material: Soil materials free of debris, waste, frozen matter, vegetable and other deleterious matter, as acceptable to testing laboratory.
- C. Select Fill: Imported lean clay with a narrow Plasticity Index (PI) range of 10 to 15.
- D. Lime Treated Structural Fill: On-site clay mixture, free of silt, loam, friable or soluble materials and organic matter; treated in 6 inch lifts with 36 pounds per square yard of hydrated lime.
- E. Backfill:
 - 1. Free from rocks larger than 3 inches in size, alkali, salt, petroleum products, debris, waste, roots, vegetable and other deleterious matter.
 - 2. Excess non-vegetated excavated soils available from site may be used if conforming to specified requirements.
- F. Lime: Material conforming to TxDOT Item 264, "Hydrated Lime and Lime Slurry".
- G. Soil Filter Fabric: Mirafi "1405" is specified; DuPont "Typar" is acceptable, or approved equal.

PART 3 EXECUTION

3.1 OBSTRUCTIONS

- A. Remove obstructions within lines of improvements.
- B. Refer obstructions of questionable nature to Engineer.
- C. Remove abandoned foundations down to 12 inches below finished grade, or the finished elevation of pavements and walks unless indicated otherwise on the drawings.
- D. Remove foundations of light standards completely.

3.2 STRIPPING

- A. Strip entire area to receive pavement and slabs on grade to a minimum depth of six inches to remove soil containing vegetated material.
- B. Remove vegetated material from site as waste.
- C. Remove topsoil; spread on areas already graded and prepared for topsoil, or deposit in storage piles convenient to areas subsequently to receive topsoil.
- D. Scarify existing asphalt surfacing and flexible base course material and remove from site.
- E. Remove existing site improvements in areas scheduled to receive lawns, buildings, and pavements.
- F. Stripped material becomes property of Contractor; remove from Project site immediately and dispose of properly.
- G. Maintain site surface drainage during construction.

3.3 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate using ladder-type trenching machine or backhoe unless indicated otherwise.
- B. Cut trench sides vertical from trench bottom to one foot above top of pipe; slope back on stable slope above that point.
- C. Extend trench width minimum 6 inches and maximum 18 inches each side of pipe.

- D. Excavate trench to a minimum depth of 6 inches below bottom elevation of proposed pipelines.
- E. Leave no more than 500 feet of trench open at one time.
- F. Where augured hole is indicated, provide opening no larger than one inch greater than outside diameter of pipe bell.

3.4 DEWATERING

- A. Keep excavations dry; maintain dewatered condition for depth of one foot below excavation bottom.
- B. Operate suitable pumps necessary to keep excavations continuously free of water.
- C. Discharge drainage waterlines into approved sewers only with appropriate approvals; use of sanitary sewer is prohibited.
- D. Direct surface drainage away from excavated areas.
- E. Control grading adjacent to excavations to prevent water running into excavated areas.

3.5 PERIMETER BACKFILL

- A. Backfill exterior side of perimeter of structure with lime-treated on-site clay materials, carrying such fill up to indicated sub grades.
- B. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.
- C. Commence backfilling after underground work has been inspected, tested, forms removed, and excavation cleaned of trash and debris.
- D. Place and compact backfill to minimize settlement and avoid damage to work in place.
- E. Place backfill simultaneously on both sides of freestanding structures; prevent wedging action against structure.
- F. Place materials in successive horizontal layers of not more than 8 inches (4 inches for handheld tamping equipment) and uniformly compacted to 92% of maximum density as confirmed by testing laboratory.

3.6 UTILITY TRENCH BACKFILL

- A. Pipe bedding and backfill requirements for storm sewers shall be as specified in Section 334100, Storm Sewage Systems of these specifications.
- B. Backfill trench as soon as possible after pipe has been laid, jointed, and inspected; complete backfilling at end of each day.
- C. Within Pipe Zone: Place backfill material and hand tamp in 6 inch layers to one foot above top of pipe.
- D. Use of bulldozer or similar tracked equipment is unacceptable for compaction.

3.7 PREPARATION OF SUBGRADE FOR PAVING, WALKS AND EXTERIOR SLABS

- A. Cut and fill areas as required.
- B. Proof roll sub grade with heavy roller. Cut out any soft area that cannot be compacted by surface rolling and replace with compacted select fill.
- C. Provide select fill at areas where required to elevate sub grade. Lime Stabilization: Stabilize to depth of 8 inches with lime slurry in accordance with TxDOT Item 260. Subgrade beneath sidewalks shall not be lime stabilized.
- D. Compact to not less than 85% to 92% of maximum density in accordance with ASTM D698 as confirmed by testing laboratory; with moisture content for compacted material within +/- 2% of optimum moisture.
- E. Maintain site surface drainage during construction.

3.8 ROUGH GRADING

- A. Shape sub grade to allow for maximum amount of natural settlement and compaction.
- B. Remove debris, roots, branches, stones, in excess of 2 inches in size.
- C. Remove subsoil which has been contaminated with petroleum products.
- D. Excavate areas, to sub grade elevation, which are to receive paving and sidewalks.
- E. Bring sub grade to required levels, profiles and contours, making gradual changes in grade; blend slopes into level areas.

- F. Slope grade away from building minimum 2 inches in 10 feet unless indicated otherwise.
- G. Cultivate sub grade to a depth of 3 inches where topsoil is to be placed; repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub grade.
- H. Maintain site surface drainage during construction.

3.9 SURPLUS MATERIALS

- A. Remove surplus subsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

3.10 CLEAN-UP

- A. Remove temporary structures, rubbish, and waste materials from work site daily.

END OF SECTION 31 23 00

SECTION 31 32 13 .16 – CEMENT STABILIZED SAND

PART 1 – GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

- A. Submittal procedures.
- B. Storm and sanitary sewerage systems.
- C. Water distribution system.

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. ASTM – American Society for Testing and Materials.

PART 2 – PRODUCTS

2.1 SAND

- A. Unwashed and free of all foreign matter, meeting the following requirement for gradation:

TYPE SQUARE SIEVE	PERCENT RETAINED
1-1/4-inch	0-10
1/2-inch	10-20
3/8-inch	15-30
No. 4	30-65
No. 40	50-75

Material passing the No. 40 sieve:
Plasticity Index less than 10.
Liquid Limit less than 35.

2.2 CEMENT

- A. C150 ASTM, Type 1.

2.3 WATER:

- A. Potable.

PART 3 – EXECUTION

3.1 MIXING:

- A. Use minimum 2 sacks of cement per cubic yard of mixture.
- B. Use amount of water necessary to obtain optimum moisture content for mechanical tamping.
- C. Mix cement, sand, and water in mechanical type mixer.
- D. Performance requirement of mixture shall achieve an unconfined compressive strength of 100 P.S.I. in 48 hours at 95% compaction.

3.2 DELIVERY:

- A. Deliver mixed material to job site in trucks of uniform capacity.
- B. Stamp time of loading on tickets. Material placed more than 6 hours after loading, or material which has obtained an initial set, will be unacceptable as cement stabilized sand.

END OF SECTION 31 32 13 .16

SECTION 31 32 13 .19 – SOIL STABILIZATION: LIME

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing lime stabilization of subgrade using the slurry placement method. Dry placement method is not allowed on this project.
- B. Where lime stabilization is required within close proximity of the trees to be saved the Landscape Architect shall be consulted prior to the beginning of the lime stabilization in that area.

1.2 QUALITY ASSURANCE

- A. Reference Standards Applicable to this Section
 - 1. AASHTO: American Association of State Highway and Transportation Officials
 - a. T 219: Methods of Testing Lime for Chemical Constituents and Particle Sizes.
 - 2. ASTM: American Society for Testing and Materials
 - a. D 698: Test Methods for Moisture–Density Relations of Soils and Soil Aggregate Mixtures Using 5.5-lb. Rammer and 12-in. Drop.
 - b. D 4318: Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 3. TxDOT: Texas Department of Transportation
 - a. Standard Specifications for Construction of Highways, Streets and Bridges -- latest edition.
 - 1) Item 264 – LIME AND LIME SLURRY

1.3 SUBMITTALS

- A. The following shall be submitted:
 - 1. Certificates stating that the lime complies with the requirements of the TxDOT Standard Specifications, Item 264 – Lime and Lime Slurry.
 - 2. Certified weight tickets with each delivery of bulk lime to the Site.
 - 3. A complete list of the equipment proposed for prosecution of the Work for approval. Listing shall include the manufacturer's description and characteristics of each piece of equipment.

1.4 PRODUCT DELIVERY AND HANDLING

- A. Lime shall be Type B, Commercial Lime Slurry.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Lime shall neither be mixed nor placed when the ambient temperature is below 40 F and is falling.
- B. Lime may be mixed and placed when the ambient temperature is above 35 F and rising.
- C. Mixing and placing hydrated lime in windy conditions is prohibited.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Commercial Lime Slurry

Shall be Type B, in accordance with TxDOT Standard Specifications Item 264 – LIME AND LIME SLURRY having a minimum "Dry Solids Content" of 35 percent by weight of slurry.

- B. Water

Water shall be potable, from municipal supplies approved by the State or City Health Department.

PART 3 – EXECUTION

3.1 PREPARATION

- A. The material indicated for lime stabilization shall be scarified to the proposed bottom of the lime treatment and removed or wind-rowed to expose the secondary grade.
- B. Any wet or unstable material in the exposed secondary grade, as determined in accordance with ASTM D 4318, shall be scarified, lime shall be added, and the area of the unstable material shall be compacted to a uniform stability with the balance of the secondary grade.
- C. After the secondary grade has been uniformly compacted, the excavated material shall be returned to the area indicated for lime treatment. The material shall remain in a pulverized condition until lime slurry has been placed and mixed.

3.2 CONSTRUCTION

A. General

1. Lime shall be applied only to that area where the first mixing operations can be completed during the working day.

B. Slurry Placing

1. The lime shall be mixed with water in trucks with approved distributors and applied as a thin water suspension or slurry.
2. Lime slurry distribution shall be attained by making successive passes over a measured section of the area until the proper lime and optimum moisture content has been secured.
3. The distributor truck shall be provided with an agitator to keep lime and water uniformly mixed.

C. Mixing

1. First Mixing

After being thoroughly mixed and brought to the proper moisture content, soil and lime shall be left to cure 1 to 4 days as directed by the Engineer. During the curing period, the material shall be kept moist as directed by the Engineer.

2. Final Mixing

After the required curing time, the material shall be uniformly mixed by approved methods.

3. All clods and lumps shall be reduced by pulverization methods so that when all nonslaking aggregates retained on the No. 4 sieve are removed, the remainder of the material shall meet the following requirements when tested dry by laboratory sieves:

Minimum Passing 1-3/4 in. sieve 100 percent
Minimum Passing 3/4 in. sieve 85 percent

4. Material shall be aerated or sprinkled as necessary to provide the optimum moisture before compacting.

D. Compaction

1. Compaction shall begin immediately after final mixing.
2. Compaction shall start at the bottom and continue until the entire depth of the mixture is uniformly compacted to the specified density.
3. Where the total compacted thickness is to be greater than 8 in., material shall be spread and compacted in two or more approximately equal layers. The first layer of the treated material shall be compacted so that the material will not be mixed with the underlying material.
4. Compaction shall be accomplished by using approved tamping rollers, except that final passes shall be done only with heavy pneumatic rollers.
5. All irregularities, depressions and weak spots disclosed by passes of heavy pneumatic rollers shall be corrected by replacing with satisfactory material and re-compacting as specified.
6. The lime-stabilized area shall be sprinkled and compacted to 98 percent of the maximum dry density in accordance with ASTM D 698 (Standard Proctor), Method A.
7. Tests shall be made by the independent testing laboratory to verify that compaction requirements have been met. A minimum of one (1) test per 300 square yards shall be made.

E. Finishing and Curing

1. After the final layer of the lime-stabilized subgrade has been compacted, the subgrade shall be brought to the required lines and grades in accordance with the Drawings. The completed section shall then be finished with a pneumatic-tired roller which is sufficiently light to prevent hair cracking of the surface.
2. The completed section shall be moist cured for a minimum of 7 calendar days before further courses are added or any traffic is permitted on the stabilized surface.

END OF SECTION 31 32 13 .19

SECTION 32 01 90 – OPERATION AND MAINTENANCE OF PLANTING

Part 1 –GENERAL

1.1 DESCRIPTION

- A. This section specifies the minimum requirements for caring for and achieving an established landscape and maintaining existing landscape remaining on the site, including:
1. Mowing, edging and trimming of turf areas.
 2. Pruning of trees.
 3. Weed, cultivation and cleaning of tree dish.
 4. Application of fertilizers, insecticides and herbicides.
 5. Maintenance of irrigation system.
 6. General site clean-up, removal of trash and by-products of maintenance in landscape areas and streets.

1.2 INTENT OF ESTABLISHING LANDSCAPE

- A. The intent of this section is upon planting work final acceptance. The Contractor shall provide the Owner with an established landscape. During the one year establishment period the Contractor shall care for and provide a project site that is attractive in appearance and shall keep plant materials and lawns in a healthy and vigorous condition using accepted horticultural standards.

1.3 CONTRACTORS PERFORMANCE

- A. The Contractor shall perform all work required to fulfill the intent of this section. The workmen shall be neat in appearance, perform their work in a professional manner, keep noise to a minimum, and stage their work from a location on the site out of the way of the mainstream of the users. The Contractor shall provide all employees with the same uniform clearly identifying the company. In general, the Contractor's presence on the site shall be as inconspicuous as possible.
- B. Contractor shall be responsible for establishing the landscape for a period of one year from the date of Planting Work Substantial Completion of the Project as determined by Section 32 90 00 Planting.

1.4 NEGLECT AND VANDALISM

- A. Turf or plants that are damaged or killed due to Contractor's operations, negligence, or chemicals shall be replaced.
- B. Structures that are damaged due to the Contractor's operations shall be replaced.
- C. Damage to or thefts of landscaping installations not caused or allowed by the Contractor shall be corrected at the Owner's expense upon receipt of the Owner's written authorization to proceed.

1.5 SUBMITTALS

- A. In accordance with Section 01 31 00 -Project Administration of these specifications, the following shall be submitted:
 - 1. Manufacturer's data including product specifications, application instructions and precautions if any are necessary.
 - 2. Chemical manufacturer's written application instructions.

Part 2 -PRODUCTS

2.1 SOIL PRODUCTS

- A. Mulch: As specified in Section 32 90 00 - Planting of these specifications.
- B. Prepared soil: As specified in Section 32 90 00 - Planting of these specifications.

2.2 CHEMICALS

- A. Pre-emergence Weed Control, Herbicide, Insecticides, Fire Ant Control: As per Section 32 90 00 for Trees, Shrubs and Groundcover. Refer to 32 92 13 for these materials for lawn / hydro-mulch areas.
- B. Tree, Groundcover and Shrub Fertilizer: MicroLife 6-2-4 Plant Fertilizer or approved equal. Apply in accordance with manufacturer's written instructions.
- C. Fungicide (NOT for Lawn/ hydro-mulched areas):
 - 1. Systemic Fungicide with Benomyl by Greenlight Products, San Antonio, Texas 78217.
 - 2. General Purpose Fungicide with manganese and zinc by Greenlight Products.
- D. Sod Fertilizer: Not Required.

2.3 STAKES AND GUYS

- A. Tree Stakes: As specified in Section 32 90 00 – Planting of these specifications.

2.4 MACHINERY

- A. Machinery requirements listed under this Section are not intended to be restrictions of specific manufacturers or models unless so stated. Specific mention of manufacturers is intended as a guide to illustrate the final product of maintenance operations desired.
- B. Lawn Mowers: Rotary or reel in good working order, finely tuned to protect the turf from excessive exhaust fumes. Blades shall be sharp.
- C. Turf Edger: Rigid or flexible blade producing a fine clean edge where turf meets walkways, pavements, curbs, headers or buildings.
- D. Fertilizer Spreaders: Cyclone. No visible overlapping of applications will be permitted.
- E. Deep Root Feeder: Ross by Ross Daniels, Incorporated, Des Moines, Iowa 50265.
- F. Pruning Tools: Maintain in good working order and with sharp cutting edges. Disinfect pruning tools after using them to remove diseased limbs.

Part 3 –EXECUTION

3.1 TREES

- A. Check in-ground tree stakes; adjust only as needed.
- B. Remove suckers from trees in accordance with the Schedule of Article 3.11.
- C. Edge, weed, fertilize (do not fertilize lawn areas), mulch, and aerate tree saucers in accordance with the Schedule of Article 3.11. Keep mulch 12 inches away from tree trunks.
- D. Prune and shape trees in accordance with the Schedule of Article 3.11. Prune out dead wood as directed by HCCS.
- E. Control trees insects in accordance with the Schedule of Article 3.11.
- F. Control disease in accordance with the Schedule of Article 3.11 by spraying, either pruning or removing or both, disease damaged plant material.

G. Deep water trees in accordance with the Schedule of Article 3.11 with Ross deep root feeder using water only.

3.2 TREE SAUCERS

A. Weed tree saucers in accordance with the Schedule of Article 3.11. Maintain tree saucers at existing size of circumference in a neat circle. Mulch depth shall be two inches. Apply mulch in accordance with the Schedule of Article 3.11. Keep mulch 12 inches away from base of trunk. Do NOT mulch against the tree trunk.

3.3 SHRUB AND GROUND COVER MAINTENANCE

A. Mowing: Mowers are to be set to accommodate a 1.5 inch mowing height. The first mowing shall not be attempted until the hydro-mulched areas are firmly rooted and securely in place. Not more than 30 percent of the grass leaf shall be removed by the initial or subsequent mowing. Care shall be taken to assure cutting blades are maintained in a sharp condition. Do not scalp the lawn or cut more than one half the existing top growth in one mowing. Remove or catch the clippings. Do not allow clippings to remain on lawn surface more than four hours.

B. Watering: The general contractor shall monitor the irrigation system to ensure adequate water is being applied to the site. Watering should begin immediately after installation. The amount of water required will vary depending upon season, weather, temperature, wind, slope and turf grass variety. The general contractor shall designate the party responsible to ensure adequate water supply and application. Watering shall be provided as follows:

1. First Week: The contractor shall provide all labor and arrange for all watering necessary for rooting of the hydro-mulched areas. Soil on sod pads shall be kept moist at all times. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of at least 4 inches (100 mm). Watering should be done during the heat of the day to prevent wilting.
2. Second and Subsequent Weeks: The contractor shall water the hydro-mulched areas as required to maintain adequate moisture in the upper 4 inches (100 mm) of soil, necessary for the promotion of deep root growth.

C. Fertilizing for Trees, Shrubs and Ground cover areas: Fertilize in accordance with

the Schedule of Article 3.11, at manufacturer's recommended rate with products noted above and as follows:

Spring: aerate, apply Microlife 6-2-4 Biological Fertilizer and Eco-Min Rock Mineralizer on the same day.

Summer: apply Microlife 6-2-4 Biological Fertilizer and Granular Humate Soil Conditioner on the same day.

Fall: apply Microlife 6-2-4 Biological Fertilizer and Microgro Granular Inoculant on the same day.

- D. Insects: Control insects with applications of insecticides at the manufacturer's recommended rate.
- E. Diseases: Where they first appear, spray for diseases with a commercial organic, in accordance with the manufacturer's recommendations.

3.5 CONTROL OF WEEDS

- A. Weed Control: Do NOT use chemicals for weed control. Broadleaf weeds such as malva, dandelion and plantain can be controlled with applications of selective and recommended organic herbicides. Only use chemical weed control for vegetation growing through pavements, expansion joints, and pavement joints. Do NOT overspray on vegetation and lawn areas.
- B. Spray only foliage of grass to be eradicated, as this spray will kill any plant that it contacts. Areas to be sprayed shall be approved by the Owner's Representative. Application rate shall be as recommended by the manufacturer.
- C. Apply organic pre-emergent weed killer in accordance with manufacturer's recommendation and in accordance with the Schedule of Article 3.11.

3.6 OVERALL SITE WATERING

- A. Contractor shall conserve water usage. Irrigation system shall be viewed as a supplement to Houston's natural rainfall and not vise-a-versa. The Owner's objective is to condition the plant material to survive on limited water. The Contractor shall water turf, the largest user of water, on a regular basis for the first month or two until roots and stems have developed. Once established, Contractor shall reduce watering of turf thus allowing the turf to acclimatize to Houston's natural rainfall.
- B. Contractor shall monitor the irrigation to insure that the system operates efficiently reducing water waste. Contractor shall repair all leaks at time of

discovery and within 24 hours of notification by the Owner's Representative if discovered by the Owner or Owner's Representative. Contractor shall maintain the irrigation system as indicated in Specification Section 32 80 00.

- C. If discovered by Owner or Owner's Representative, Owner reserves the right to shut down system until repairs are made and Contractor will be held accountable for damage to plant materials. Contractor shall adjust pressure to eliminate water fragmentation, "fogging," at heads. Contractor shall monitor operation time to reduce water runoff.
- D. Contractor will coordinate watering times with Owner Representative's assistance.

3.7 USE OF HERBICIDES, INSECTICIDES, STERILANTS, POISON AND ANIMAL TRAPS

- A. Products, like weed oil, leaving an undesirable residue or odor shall not be used.
- B. Owner shall be notified prior to application of any herbicides, insecticides, sterilants, poison and / or animal traps. Advise Owner of any danger associated with the use of these products.
- C. Only After Owner approval, apply insecticides in accordance with the Schedule of Article 3.11. The insect control program shall include slugs and snails and advance preventive spraying for twig borers. The Contractor shall be responsible for the choosing of chemicals and insecticides he uses and shall be accountable for any misuse of same.

3.8 GENERAL CLEAN UP

- A. Contractor shall dispose of the waste materials or refuse from his operations except where agreement is reached with Owner.
- B. Plant growth shall be prevented in cracks in walks and paved areas, expansion joints, and curb joints.
- C. Leaves, pine needles, papers, grass clippings, or other debris shall be removed in accordance with the Schedule of Article 3.11 as noted under Litter Pickup.
- D. Litter pickup shall include all debris and litter occurring within the limits of right-of-way. Litter pickup and trash can content removal shall be in accordance with Schedule of Article 3.11, under Litter Pickup.
- E. Mulch beds shall be cleaned of all debris and litter. Mulch that has been scattered outside of mulch bed or has been washed outside of mulch bed by rain

shall be removed so that the areas around mulch beds are always clean and neat.

- F. Cleanup shall include removal of all trash from on-site containers. Contractor shall supply trash can liners.

3.9 SCHEDULE

- A. The Contractor shall provide the Owner with a written schedule on the first day of each month detailing all work to be performed for that month. Contractor shall copy the Architect for record purposes.
- B. All work under this Section shall be performed in accordance with the attached Schedule of Article 3.11.

3.10 GUARANTY AND REPLACEMENT

- A. Guaranty: Plants shall be guaranteed for a period of one year from the date of written acceptance and shall be alive and in satisfactory growth at the end of the guaranty period. Plants damaged or killed as a result of hail, wind, lightning, fire, freeze, theft, vandalism, construction operation or occupancy of building are not covered by the guaranty. Where Contractor sees any such damage, he shall list item and location and report to the Owner.
- B. Replacement: At any time during the establishment period, any dead plant shall be replaced within 2 weeks of Owner's Representative request. At the end of the one year establishment period, any plant that is dead; or 50% or more of the main branch structure dead; or not in satisfactory growth as determined by the Owner's Representative shall be removed from the site and shall be replaced as soon as normal conditions for planting permit. Plants which die at no fault to the Contractor shall be replaced at a price and size agreed on by the Owner and Contractor prior to the replacement.

3.11 SCHEDULE

- A. As shown on following table.

3.11 SCHEDULE

OPERATION	FREQUENCY												TOTAL
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	
Prune Trees	1	1									1		3
Pre-Emergent Herbicide			1			1			1			1	4
Tree Deep Fertilization		1							1				2
Turf / Soil Amendments			1						1				2
Turf Mowing	1	1	1	2	2	2	2	2	2	1	1	1	18
Weed Tree Dishes	2	2	4	4	4	4	4	4	4	4	2	2	40
Mulch Trees and beds/Aerate Lawn	1			1					1				3
Sucker Removal				1	1	1	1	1					5
Insect Control			1		1		1		1		1		5
Litter Pickup	2	2	4	4	4	4	4	4	4	4	2	2	40
Disease Control			1		1		1		1		1		5
Edging	2	2	4	4	4	4	4	4	4	4	2	2	40
Tree Deep Watering							1		1				2
Irrigation System Maintenance	1	1	1	1	1	1	1	1	1	1	1	1	12

END OF SECTION

SECTION 32 12 13.13 – TACK COAT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Tack coat for asphaltic concrete paving.

1.2 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REFERENCES

- A. ASTM D 244 – Standard Test Methods for Emulsified Asphalts.

1.4 SUBMITTALS

- A. Submittals shall conform to requirements of Section 013100 – Project Administration.
- B. Submit product data for proposed tack coat.
- C. Submit report of recent calibration of distributor.

PART 2 – PRODUCTS

2.1 CUTBACK ASPHALT

- A. Provide moisture-free homogeneous material which will not foam when heated to 347 degrees F and which meets following requirements:
 - 1. Asphalt material for tack coat: RC-250 and meet following:

PROPERTIES	TYPE - GRADE	
	MIN.	MAX.
Water, Percent	---	0.2
Flash Point, T.O.C., °F	80	---
Kinematic Viscosity at 140°F, cst	250	400

2. Distillate: Expressed as percent by volume of total distillate to 680 F:

TEMPERATURE	TYPE - GRADE	
	MIN.	MAX.
to 437°F	40	75
to 500°F	65	90
to 600°F	85	---
Residue from 680°F Distillation, Volume, Percent	70	---

3. Tests on Distillation Residue:

PROPERTIES	TYPE - GRADE	
	MIN.	MAX.
Penetration at 77°F, 100g, 5 sec.	100	150
Ductility at 77°F, 5 cm/min. cms	100	---
Solubility in Trichloroethylene, %	99	---
Spot Test	All Negative	

2.2 EMULSION

- A. Provide homogeneous material which shall show no separation of asphalt after mixing and shall meet the viscosity requirements at any time within 30 days after delivery.

Emulsion material for tack coat: SS-1 and meet following:

PROPERTIES	TYPE - GRADE	
	MIN.	MAX.
Furol Viscosity at 77°F, sec.	30	100
Residue by Distillation, %	60	---
Oil Portion of Distillate, %	---	2
Sieve Test, %	---	0.1
Miscibility (Standard Test)	Passing	Passing
Cement Mixing, %	---	2.0
Storage Stability, 1 Day, %	---	1
Test on Residue:		
Penetration at 77°F, 100g, 5 sec.	120	160
Solubility in Trichloroethylene, %	97.5	---
Ductility at 77°F, 5 cm/min., cms	100	---

2. For emulsions used for tack coats during the period of April 16 through September 15, volatile organic compound solvents (VOC) shall not exceed 12 percent by weight when tested in accordance with ASTM D 244.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify compacted base is ready to support imposed loads.
- B. Verify lines and grades are correct.

3.2 PREPARATION

- A. Thoroughly clean base course or concrete surface of loose material by brooming prior to application of tack coat.

3.3 APPLICATION

- A. Apply tack coat uniformly by use of approved distributor at rate not to exceed 0.05

gallons per square yard of surface.

- B. Paint contact surfaces of curbs and structures, and joints with thin uniform coat of tack coat.
- C. Cutback Asphalt:
 - 1. Do not use cutback asphalt during the period of April 16 to September 15.
 - 2. Do not place tack coat when air temperature is below 50 degrees F and falling. Materials may be placed when air temperature taken in shade and away from artificial heat is above 40 degrees F and rising.
 - 3. Temperature of tack coat shall be between 125 degrees F and 180 degrees F when applied.
 - 4. Do not heat tack coat above 200 degrees F at any time.

3.4 PROTECTION

- A. Prevent traffic or placement of subsequent courses over freshly applied tack coat until authorized by Engineer.

END OF SECTION 32 12 13.13

SECTION 32 12 13 .19 PRIME COAT

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Prime coat for asphaltic concrete paving

1.2 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 SUBMITTALS

- A. Submittals shall conform to requirements of Section 013100 – Project Administration.
- B. Submit product data for proposed prime coat.
- C. Submit report of recent calibration of distributor.

PART 2 – PRODUCTS

2.1 CUTBACK ASPHALT

- A. Provide moisture-free homogeneous material which will not foam when heated to 347 degrees F and which meets following requirements:
- B. Asphalt material for prime coat shall be MC-30 or MC-70 and shall meet following requirements:

PROPERTIES	TYPE – GRADE			
	MC-30		MC-70	
	MIN.	MAX.	MIN.	MAX.
Water, Percent	---	0.2	---	0.2
Flash Point, T.O.C., °F	100	---	100	---

Kinematic Viscosity at 140°F, cst	30	60	70	140
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- Distillate shall be as follows, expressed as percent by volume of total distillate to 680 degrees F:

TEMPERATURE	TYPE-GRADE			
	MC-30		MC-70	
	MIN.	MAX.	MIN.	MAX.
to 437°F	---	25	---	20
to 500°F	40	70	20	60
to 600°F	75	93	65	90
Residue from 680°F Distillation, Volume, Percent	50	---	55	---

- Tests on Distillation Residue:

TEST	TYPE-GRADE			
	MC-30		MC-70	
	MIN.	MAX.	MIN.	MAX.
Penetration at 77°F, 100g, 5 sec.	120	250	120	250
Ductility at 77°F, 5 cm/min. cms	100*	---	100*	---
Solubility in Trichloroethylene, %	99	---	99	---
Spot Test	All Negative			

100

* If penetration of residue is more than 200 and ductility at 77 degrees F is less than 100 cm, material will be acceptable if its ductility at 60 degrees F is more than 100.

2.2 EMULSIFIED PETROLEUM RESIN

- EPR-1 Prime: Slow curing emulsion of petroleum resin and asphalt cement conforming to the following requirements:

PROPERTIES	MIN.	MAX.
Fural Viscosity at 77°F, Sec	14	40
Residue by Evaporation, % by Weight	60	-
Sieve Test, %	-	0.1
Particle Charge Test	Positive	
Tests on the Distillation Residue:		
Flash Point, COC (F)	400	-
Kinematic Viscosity @ 140 F (cst)	190	350

- B. For use, EPR-1 may be diluted with water up to a maximum three parts water to one part EPR-1 in order to achieve desired concentration of residual resin/asphalt to facilitate application.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify base is ready to support imposed loads.
- B. Verify lines and grades are correct.

3.2 PREPARATION

- A. Thoroughly clean base course surface of loose material by brooming prior to application of tack coat.
- B. Prepare sufficient base in advance of paving for efficient operations.

3.3 APPLICATION, BASIC

- A. Apply prime coat with approved type of self-propelled pressure distributor. Distribute prime coat evenly and smoothly under pressure necessary for proper distribution.

- B. Keep storage tanks, piping, retorts, booster tanks, and distributors used in handling asphaltic materials clean and in good operating condition. Conduct operations so that asphaltic material does not become contaminated.
- C. If yield of asphaltic material appears to be in error, recalibrate distributor prior to continuing work.
- D. Maintain the surface until Work is accepted by Owner.

3.4 APPLICATION, CUTBACK ASPHALT

- A. Do not use cutback asphalt during the period of April 16 through September 15.
- B. Do not place prime coat when air temperature is below 60 degrees F and falling. Materials may be placed when air temperature taken in shade and away from artificial heat is above 50 degrees F and rising.
- C. Distribute at rate of 0.25 to 0.35 gallons per square yard.
- D. Equipment shall accurately determining temperature of asphaltic material in heating equipment and in distributor, for determining rate of application, and for obtaining uniformity at junction of two distributor loads. Maintain in accurate working order, including recording thermometer at storage heating unit at all times.
- E. Temperature of application shall be based on temperature–viscosity relationship that will permit application of asphalt with viscosity of 100 to 125 centistokes. Maintain asphalt within 15 degrees F of temperature required to meet viscosity. Selected temperature shall be within following range.

<u>Prime Coat Type</u>	<u>Minimum (EF)</u>	<u>Maximum (EF)</u>
MC-30	70	150
MC-70	125	175

- F. Do not allow temperature of MC-30 to exceed 175 degrees F at any time.
- G. Do not allow temperature of MC-70 to exceed 200 degrees F at any time.

3.5 APPLICATION, EMULSIFIED PETROLEUM RESIN

- A. Do not place prime coat when air temperature is below 36 degrees F and falling.
- B. Distribute at rate of 0.15 to 0.25 gallons per square yard.

3.6 PROTECTION

- A. Prevent traffic or placement of subsequent courses over freshly applied prime coat until authorized by Engineer.

END OF SECTION 32 12 13 .19

SECTION 32 12 16 – ASPHALTIC CONCRETE PAVEMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Surface courses of compacted mixture of coarse and fine aggregates and asphaltic material.

1.2 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REFERENCES

- A. ASTM C 33 – Standard Specification for Concrete Aggregates.
- B. ASTM C 131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- C. ASTM C 136 – Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- D. TxDOT Tex-126-E – Molding, Testing, and Evaluation of Bituminous Black Base Material.
- E. TxDOT Tex-106-E – Method of Calculating the Plasticity Index of Soils.
- F. TxDOT Tex-203-F – Sand Equivalent Test.
- G. TxDOT Tex-204-F – Design of Bituminous Mixtures.
- H. TxDOT Tex-207-F – Determination of Density of Compacted Bituminous Mixtures.
- I. TxDOT Tex-208-F – Test for Stabilometer Value of Bituminous Mixtures.
- J. TxDOT Tex-217-F – Determination of Deleterious Material and Decantation Test for Coarse Aggregates.
- K. TxDOT Tex-227-F – Theoretical Maximum Specific Gravity of Bituminous Mixtures.

1.4 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01 33 00- Submittal Procedures.
- B. Submit certificates that asphaltic materials and aggregates meet requirements of Article 2.1, Materials, of this Section.
- C. Submit proposed design mix and test data for each type and strength of surface course in Work.
- D. Submit manufacturer's description and characteristics of mixing plant for approval.
- E. Submit manufacturer's description and characteristics of spreading and finishing machine for approval.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate: Gravel or crushed stone, or combination thereof, that is retained on No. 10 sieve, uniform in quality throughout and free from dirt, organic or other injurious matter occurring either free or as coating on aggregate. Aggregate shall conform to ASTM C 33 except for gradation. Furnish rock or gravel with Los Angeles abrasion loss not to exceed 40 percent by weight when tested in accordance with ASTM C 131.
- B. Fine Aggregate: Sand or stone screenings or combination of both passing No. 10 sieve. Aggregate shall conform to ASTM C 33 except for gradation. Use sand composed of sound, durable stone particles free from loams or other injurious foreign matter. Furnish screenings of same or similar material as specified for coarse aggregate. Plasticity index of that part of fine aggregate passing No. 40 sieve shall be not more than 6 when tested by Tex-106-E. Sand equivalent shall have a minimum value of 45 when tested by Tex-203-F.
- C. Composite Aggregate: Conform to following limits when graded in accordance with ASTM C 136.

GRADATION OF COMPOSITE AGGREGATE	
Sieve Size	Percent Passing
1/2"	100
3/8"	85 to 100
#4	50 to 70
#10	32 to 42
#40	11 to 26
#80	4 to 14
#200	1 to 6*
* 2 to 8 when Test Method Tex-200-F, Part II (Washed Sieve Analysis) is used.	

- D. Asphaltic Material: Moisture-free homogeneous material which will not foam when heated to 347 degrees F, meeting following requirements:

VISCOSITY GRADE				
TEST	AC-10		AC-20	
	Min.	Max.	Min.	Max.
Viscosity, 140E F stokes	1000	± 200	2000	± 400
Viscosity, 275E F stokes	1.9	-	2.5	-
Penetration, 77E F, 100 g, 5 sec.	85	-	55	-
Flash Point, C.O.C., F.	450	-	450	-
Solubility in trichloroethylene, percent	99.0	-	99.0	-
Tests on residues from thin film oven tests:				
Viscosity, 140E F stokes	-	3000	-	6000
Ductility, 77E F, 5 cms per min., cms	70	-	50	-
Spot tests	Negative for all grades			

1. Material shall not be cracked.

2. Engineer will designate grade of asphalt to use after design tests have been made. Use only one grade of asphalt after grade is determined by test design for project.

2.2 EQUIPMENT

- A. Mixing Plant: Weight-batching or drum mix plant with capacity for producing continuously mixtures meeting specifications. Plant shall have satisfactory conveyors, power units, aggregate handling equipment, hot aggregate screens and bins, and dust collectors. Provide equipment to supply materials adequately in accordance with rated capacity of plant and produce finished material within specified tolerances. Following equipment is essential:
 1. Cold aggregate bins and proportioning device.
 2. Dryer.
 3. Screens.
 4. Aggregate weight box and batching scales.
 5. Mixer.
 6. Asphalt storage and heating devices.
 7. Asphalt measuring devices.
 8. Truck scales.
- B. Bins: Separate aggregate into minimum of four bins to produce consistently uniform grading and asphalt content in completed mix.

2.3 MIXES

- A. Employ a certified testing laboratory to prepare design mixes. Test in accordance with Tex-126-E or Tex-204-F and Tex-208-F.
- B. Density and Stability Requirements:

Percent Density		Percent	HVEEM Stability Percent
<u>Min.</u>	<u>Max.</u>	<u>Optimum</u>	<u>Not Less Than</u>
94.5	97.5	96	35

- C. Proportions for Asphaltic Material: Provide 4 to 8 percent of mixture by weight. Aggregate by weight shall not contain more than 1.0 percent by weight of fine dust, clay-like particles, or silt when tested in accordance with Tex-217-F, Part II.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify compacted base course is ready to support imposed loads.
- B. Verify lines and grades are correct.

3.2 PREPARATION

- A. Prime Coat: If indicated on the Drawings, apply a prime coat conforming to requirements of Section 32 12 13.19 – Prime Coat. Do not apply a tack coat until primed base has cured to satisfaction of Engineer.
- B. Tack Coat: Conform to requirements of Section 32 12 13.13 – Tack Coat. Where the mixture will adhere to the surface on which it is to be placed without use of a tack coat, tack coat may be eliminated if approved by Engineer.
- C. Prepare subgrade in advance of asphaltic concrete paving operation.

3.3 PLACEMENT

- A. Do not place asphaltic mixture when air temperature is below 50 degrees F and falling. Mixture may be placed when air temperature taken in shade and away from artificial heat is above 40 degrees F and rising.
- B. Haul prepared and heated asphaltic concrete mixture to the project in tight vehicles previously cleaned of foreign material. Mixture shall be at temperature between 250 degrees F and 325 degrees F when laid.
- C. Spread material into place with approved mechanical spreading and finishing machine of screening or tamping type. Use track-mounted finish machine to place base course directly on earth subgrade.
- D. Surface Course Material: Surface course 2 inches or less in thickness may be spread in one lift. Spread lifts in such manner that, when compacted, finished course will be smooth, of uniform density, and will be to section, line and grade as shown. Place construction joints on surface courses to coincide with lane lines or as directed by Engineer.
- E. Place courses as nearly continuously as possible. Pass roller over unprotected ends of freshly laid mixture only when mixture has cooled. When work is resumed, cut back laid material to produce slightly beveled edge for full thickness of course. Remove old material which has been cut away and lay new mix against fresh cut.
- F. When new asphalt is laid against existing or old asphalt, existing or old asphalt shall be saw cut full depth to provide straight smooth joint.

- G. In restricted areas where use of paver is impractical, spread and finish asphalt by mechanical compactor. Use wood or steel forms, rigidly supported to assure correct grade and cross section. Carefully place materials to avoid segregation of mix. Do not broadcast material. Remove any lumps that do not break down readily. Place asphalt courses in same sequence as if placed by machine.

3.4 COMPACTION

- A. Begin rolling while pavement is still hot and as soon as it will bear roller without undue displacement or hair cracking. Keep wheels properly moistened with water to prevent adhesion of surface mixture. Do not use excessive water.
- B. Compress surface thoroughly and uniformly, first with power-driven, 3-wheel, or tandem rollers weighing from 8 to 10 tons. Obtain subsequent compression by starting at side and rolling longitudinally toward center of pavement, overlapping on successive trips by at least one-half width of rear wheels. Make alternate trips slightly different in length. Continue rolling until no further compression can be obtained and rolling marks are eliminated. Complete rolling before mixture temperature drops below 175 degrees F.
- C. Use tandem roller for final rolling. Double coverage with approved pneumatic roller on asphaltic concrete surface is acceptable after flat wheel and tandem rolling has been completed.
- D. Along walls, curbs, headers and similar structures, and in locations not accessible to rollers, compact mixture thoroughly with lightly oiled tamps.
- E. Compact binder course and surface course to density not less than 93 percent of the maximum possible density of voidless mixture composed of same materials in like proportions.

3.5 TOLERANCES

- A. Furnish templates for checking surface in finished sections. Maximum deflection of templates, when supported at center, shall not exceed 1/8 inch.
- B. Completed surface, when tested with 10-foot straightedge laid parallel to center line of pavement, shall show no deviation in excess of 1/8 inch in 10 feet. Correct any surface not meeting this requirement.

3.6 FIELD QUALITY CONTROL

- A. Testing will be performed under provisions of applicable Division 01 Sections.
- B. Minimum of one core will be taken at random locations per 1000 feet per lane of roadway or 500 square yards of base to determine in-place depth and density.

- C. In-place density will be determined in accordance with Tex-207-F and Tex-227-F from cores or sections. Other methods of determining in-place density, which correlate satisfactorily with results obtained from roadway specimens, may be used when approved by Engineer.
- D. Contractor may, at his own expense, request three additional cores in vicinity of cores indicating nonconforming in-place depths. In-place depth at these locations shall be average depth of four cores.
- E. Fill cores and density test sections with new compacted asphaltic concrete.

3.7 NONCONFORMING PAVEMENT

- A. Recompact pavement sections not meeting specified densities or replace them with new asphaltic concrete material. Replace with new material sections of surface course pavement not meeting surface test requirements or having unacceptable surface texture. Patch asphalt pavement sections in accordance with procedures established by Asphalt Institute.
- B. Remove and replace areas of asphalt found deficient in thickness by more than 10 percent. Use new asphaltic base of thickness shown on Drawings.
- C. Replace nonconforming pavement sections.

3.8 UNIT PRICE ADJUSTMENT

- A. Unit price adjustments shall be made for in-place depth determined by cores as follows:
 - 1. Adjusted Unit Price shall be ratio of average thickness as determined by cores to thickness bid upon, times unit price bid.
 - 2. Adjustment shall apply to lower limit of 90 percent and upper limit of 105 percent of unit price.
 - 3. Average depth below 90 percent may be rejected by Engineer.

3.9 PROTECTION

- A. Do not open pavement to traffic until 12 hours after completion of rolling, or as shown on Drawings.
- B. Maintain asphaltic concrete pavement in good condition until completion of Work.
- C. Repair defects immediately by replacing asphaltic concrete pavement to full depth.

END OF SECTION 32 12 16

SECTION 32 13 13 – PORTLAND CEMENT CONCRETE PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing, placing, curing and protecting Portland cement concrete paving, with or without reinforcement as indicated, constructed on a prepared subgrade.

1.2 QUALITY ASSURANCE

A. Reference Standards Applicable to this Section

1. ACI: American Concrete Institute
 - a. 301: Specifications for Structural Concrete for Buildings.
 - b. 316R: Recommendations for Construction of Concrete Pavements and Concrete Bases.
2. ASTM: American Society for Testing and Materials
 - a. A 615: Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (with Supplement + S1).
 - b. C 150: Specification for Portland Cement Type I or Type II.
 - c. C 309: Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - d. C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - e. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
 - f. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient bituminous Types).

- g. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - h. D 3405: Specification for Joint Sealants, Hot-Poured, for Portland Cement Concrete Pavement.
3. TxDOT: Texas Department of Transportation.
- a. Standard Specifications for Construction of Highways, Streets, and Bridges -- Latest Edition.
 - 1) Item 360, CONCRETE PAVEMENT.

B. Formwork Tolerances

Formwork tolerances shall be as specified in ACI 316 R, Chapter 5.

C. Finishing Tolerance

The top surface of pavement shall have a Class B tolerance as specified in ACI 316 R, Chapter 12.5 and ACI 301, Chapter 11.9.

- D. The Portland Cement Paving Contractor/Subcontractor shall provide HCCS with evidence of his/her ability to perform the specified work. This evidence shall be in the form of at least five (5) successfully completed Portland Cement paving projects for either the HCCS, Harris County, City of Houston or any combination of the three.

This list of projects shall be submitted to HCCS prior to any paving operations beginning so that HCCS will be able to inspect the quality of workmanship at the site and approve the Contractor/Subcontractor.

1.3 SUBMITTALS

- A. In accordance with Section 013100 - Project Administration of these Specifications, the following shall be submitted:
- 1. Reinforcement Materials
 - a. As required in Section 032100 - Concrete Reinforcement of these Specifications.
 - 2. Concrete Materials

- a. As required in Sections 321373.19 – Cast-in-Place Concrete of these Specifications.

3. Joint Materials

- a. As required in Section 321319 – Concrete Pavement Joints.

1.4 EXTENDED WARRANTY

- A. Manufacturer of joint sealant shall provide at least a 1 year written warranty against material degradation or failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. This warranty shall not limit HCCS's rights or remedies as may otherwise be afforded under law or statute.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Forms

Metal forms, as indicated in ACI 316 R, Chapter 5.

- B. Welded Steel Wire Fabric

Plain wire fabric, as specified in Section 032100 – Concrete Reinforcement of these Specifications.

- C. Reinforcing Steel Bars

As specified in Section 032100 – Concrete Reinforcement of these Specifications.

- D. Dowel Bars

Smooth, ASTM A 615 + S1, Grade 60, new billet steel, coated with a water-resistant lubricant immediately prior to placement of concrete in which unbonded ends of bars are to be embedded.

- E. Dowel Bar Sleeves

Sleeves, PVC or plastic, slightly larger than dowel bars, closed end, a minimum of 6 in. long, with 1-1/2 in. long compressible insert.

- F. Concrete

Class 3000, as specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.

G. Membrane Forming Curing Compound

ASTM C 309, Type 2, unless otherwise directed.

H. Joint Materials

1. Preformed Expansion Joint Filler: ASTM D 1751, ASTM D 1752, and D 1565.
2. Joint Sealing Material: See Section 321319, Concrete Pavement Joints of these Specifications.

I. Form Coating

Commercial formulation form-coating compounds that will neither bond with, stain, nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces. Contractor shall submit sample for approval prior to use.

J. Precast Concrete Wheel Stops

Accurately formed and finished, of size and shape as indicated, reinforced and anchored as required. Fabricate wheel stops on Site or substitute approved precast units of like design and dimensions.

K. Epoxy Bonding Grout

ASTM C 881, Type I.

PART 3 – EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Prepared subgrade shall be proof-rolled to check for unstable areas and need for additional compaction. Do not begin paving work until such deficiencies have been corrected and subgrade is ready to receive paving.
- B. Loose material shall be removed from the compacted subgrade immediately prior to placing concrete and subgrade shall be uniformly dampened.

3.2 SETTING FORMS

- A. Forms shall be set in accordance with the recommendations of ACI 316 R, Chapter 5, and as specified herein.
- B. Forms shall be set in sufficient quantity to allow continuous progress of concrete placement, and to ensure that forms shall remain in place not less than 24 hours.
- C. Forms shall be cleaned after each use and coated with an approved form release agent prior to each use.

3.3 INSTALLATION OF JOINTS, REINFORCEMENT, AND SEALANT

- A. Joints and reinforcement shall be installed in accordance with the recommendations of ACI 316 R, Chapter 6.
- B. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

3.4 PLACING AND FINISHING CONCRETE

- A. Concrete shall be placed and finished in accordance with the recommendations of ACI 316 R, Chapters 10 and 12.5.

3.5 CURING AND PROTECTING CONCRETE

- A. Concrete shall be cured in accordance with the recommendations of ACI 316 R, Chapter 11, using the membrane curing method and materials.
- B. Protection as recommended in ACI 316 R, Chapter 11 shall be provided until written acceptance by HCCS.

3.6 INSTALLATION OF CONCRETE WHEEL STOPS

- A. Install concrete wheel stops where indicated and in accordance with manufacturer's installation instructions as required. Where dowels are to be embedded into concrete, embed with epoxy bonding grout.

3.7 FIELD QUALITY CONTROL

- A. Coring

After the pavement is placed and before final acceptance the Engineer may elect to determine pavement thickness by cores cut from the pavement or direct measurement of the edge thickness. Acceptable pavement thickness

shall be deficient by no more than two tenths of an inch. Core holes shall be promptly repaired with concrete conforming to the requirements specified herein by the Contractor at no cost to HCCS.

B. Deficient Pavement Price Adjustments

Where the average thickness of pavement is deficient in thickness by more than 0.2 inch, but not more than 0.75 inch, payment will be made at an adjusted price as specified in the following table.

Concrete Pavement Deficiency

Deficiency in Thickness Determined by Cores Inches	Proportional Part of Contract Price Allowed
0.00 to 0.20	100 percent
Over 0.20 to 0.30	80 percent
Over 0.30 to 0.40	72 percent
Over 0.40 to 0.50	68 percent
Over 0.50 to 0.75	57 percent

Any area of pavement found deficient in thickness by more than 0.75 of an inch but not more than one inch or 1/8 of the plan thickness, whichever is greater, shall be evaluated by the Engineer. If, in the judgment of the Engineer, the area of such deficiency should not be removed and replaced, there will be no payment for the area retained. If, in the judgment of the Engineer, the area of such deficiency warrants removal, the area shall be removed and replaced, at the Contractor's entire expense, with concrete of the thickness shown on the plans. Deficient pavement shall be removed for the full area of the slab between joints, or between pre-established limits.

END OF SECTION 32 13 13

SECTION 32 13 19 – CONCRETE PAVEMENT JOINTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Joints for concrete paving; concrete sidewalks; concrete driveways, curbs, and curb and gutters.
- B. Saw-cutting existing concrete or asphalt pavements for new joints.

1.2 MEASUREMENT AND PAYMENT

- A. Stipulated Price (Lump Sum). If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

1.3 REFERENCES

- A. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- B. ASTM D 994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- C. ASTM D 1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- D. ASTM D 3405 – Standard Specification for Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements.

1.4 SUBMITTALS

- A. Submit product data and samples in accordance with requirements of Section 013100 – Project Administration.
- B. Submit product data for joint sealing compound and proposed sealing equipment for approval.
- C. Submit samples of dowel cup, metal supports, and deformed metal strip for approval.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Board Expansion Joint Material: Filler board of selected stock. Use wood of density and type as follows:
 - 1. Clear, all-heart cypress weighing no more than 40 pounds per cubic foot, after being oven dried to constant weight.
 - 2. Clear, all-heart redwood weighing no more than 30 pounds per cubic foot, after being oven dried to constant weight.
- B. Preformed Expansion Joint Material: Bituminous fiber and bituminous mastic composition material conforming to ASTM D 994 and ASTM D 1751.
- C. Joint Sealing Compound: Hot-poured rubber-asphalt compound conforming to ASTM D 3405.
- D. Load Transmission Devices:
 - 1. Smooth, steel dowel bars conforming to ASTM A 615, Grade 60. When indicated on Drawings, encase one end of dowel bar in approved cap having inside diameter 1/16 inch greater than diameter of dowel bar.
 - 2. Deformed steel tie bars conforming to ASTM A 615, Grade 60.
- E. Metal Supports for Reinforcing Steel and Joint Assembly: Employ metal supports of approved shape and size that will secure reinforcing steel and joint assembly in correct position during placing and finishing of concrete. Space supports as directed by Engineer.

PART 3 – EXECUTION

3.1 PLACEMENT

- A. When new work is adjacent to existing concrete, place joints at same location as existing joints in adjacent pavement.
- B. If the limit of removal of existing concrete or asphaltic pavement does not fall on existing joint, saw cut existing pavement minimum of 2 inches deep to provide straight, smooth joint surface without chipping, spalling or cracks.

3.2 CONSTRUCTION JOINTS

- A. Place transverse construction joint wherever concrete placement must be stopped for more than 30 minutes. Place longitudinal construction joints at interior edges of pavement lanes using No. 6 deformed tie bars, 30 inches long and spaced 18 inches on centers.

3.3 EXPANSION JOINTS

- A. Place 3/4-inch expansion joints at radius points of curb returns for cross street intersections, or as located in adjacent pavement but no further than 80 feet apart. Use no boards shorter than 6 feet. When pavement is 24 feet or narrower, use not more than 2 lengths of board. Secure pieces to form straight joint. Shape board filler accurately to cross section of concrete slab. Use load transmission devices of type and size shown on Drawings unless otherwise specified or shown as "No Load Transfer Device." Seal with joint sealing compound.

3.4 CONTRACTION JOINTS

- A. Place contraction joints at same locations as in adjacent pavement or at spaces indicated on Drawings. Place smoothed, painted and oiled dowels accurately and normal to joint. Seal groove with joint sealing compound.

3.5 LONGITUDINAL WEAKENED PLANE JOINTS

- A. Place longitudinal weakened plane joints at spaces indicated on Drawings. Seal groove with joint sealing compound.

3.6 SAWED JOINTS

- A. Use sawed joints as an alternate to contraction and weakened plane joints. Circular cutter shall be capable of cutting straight line groove minimum of 1/2 inch wide. Depth shall be one quarter of pavement thickness plus 1/2 inch. Commence sawing as soon as concrete has hardened sufficiently to permit cutting without chipping, spalling or tearing and prior to initiation of cracks. Once sawing has commenced, it shall be continued until completed. Make saw cut with one pass. Complete sawing within 24 hours of concrete placement. Saw joints at required spacing consecutively in sequence of concrete placement.
- B. Concrete Saw: Provide sawing equipment adequate in power to complete sawing to required dimensions and within required time. Provide at least one standby saw in good working order. Maintain an ample supply of saw blades at work site at all times during sawing operations. Sawing equipment shall be on job at all times during concrete placement.

3.7 JOINTS FOR CURB, CURB AND GUTTER

- A. Place 3/4-inch preformed expansion joints through curb and gutters at locations of expansion and contraction joints in pavement; at end of radius returns at street intersections and driveways; and at curb inlets. Maximum spacing shall be 120-foot centers.

3.8 JOINTS FOR CONCRETE SIDEWALKS

- A. Provide 3/4-inch expansion joints conforming to ASTM A 1751 along and across sidewalk at back of curbs, at intersections with driveways, steps, and walls; and across walk at intervals not to exceed 36 feet. Provide expansion joint material conforming to ASTM D 994 for small radius curves and around fire hydrants and utility poles. Extend the expansion joint material full depth of the slab.

3.9 JOINTS FOR CONCRETE DRIVEWAYS

- A. Provide 3/4-inch expansion joints conforming to ASTM D 1751 across driveway in line with street face of sidewalks, at existing concrete driveways, and along intersections with sidewalks and other structures. Extend expansion joint material full depth of slab.

3.10 JOINT SEALING

- A. Seal joints only when surface and joints are dry, ambient temperature is above 50 degrees F and less than 85 degrees F, and weather is not foggy or rainy.
- B. Joint sealing equipment shall be in like new working condition throughout the joint sealing operation, and be approved by Engineer. Use concrete grooving machine or power-operated wire brush and other equipment such as plow, brooms, brushes, blowers or hydro or abrasive cleaning as required to produce satisfactory joints.
- C. Clean joints of loose scale, dirt, dust and curing compound. The term joint includes wide joint spaces, expansion joints, dummy groove joints or cracks, either preformed or natural. Remove loose material from concrete surfaces adjacent to joints.
- D. Fill joints neatly with joint sealer to depth shown. Pour sufficient joint sealer into joints so that, upon completion, surface of sealer within joint will be 1/4 inch above level of adjacent surface or at elevation as directed.

3.11 PROTECTION

- A. Maintain joints in good condition until completion of Work.
- B. Replace damaged joints material with new material as required by this Section.

END OF SECTION 32 13 19

SECTION 32 13 73.19 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for designing, furnishing, erecting and removing formwork; constructing and sealing expansion and contraction joints and waterstops; and furnishing, placing, curing, protecting and finishing cast-in-place concrete.

1.2 QUALITY ASSURANCE

A. Reference Standards Applicable to this Section

1. AASHTO: American Association of State Highway and Transportation Officials
 - a. M 182: Specification for Burlap Cloth made from Jute or Kenaf.
2. ACI: American Concrete Institute
 - a. 301: Specifications for Structural Concrete for Buildings.
 - b. 303 R: Guide to Cast-in-Place Architectural Concrete Practice.
 - c. 304: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
 - d. 305 R: Hot Weather Concreting.
 - e. 306 R: Cold Weather Concreting.
 - f. 309: Standard Practice for Consolidation of Concrete.
 - g. 347: Recommended Practice for Concrete Formwork.
 - h. 224R: Control of Cracking in Concrete Structures
3. ASTM: American Society for Testing and Materials
 - a. C 150: Specification for Portland Cement.

- b. C 171: Specification for Sheet Materials for Curing Concrete.
- c. C 157: Length Change of Hardened Hydraulic Cement Mortar and Concrete.
- d. C 309: Specification for Liquid Membrane – Forming Compounds for Curing Concrete.
- e. C 494: Specification for Chemical Admixtures for Concrete.

With the following exceptions:

- 1) Paragraph 17.1.4, last sentence, the value 0.010 shall be replaced by 0.000.
 - 2) In Table 1, Physical Requirements, Length Change, Percent of Control; 135 shall be replaced by 100 Increase over Control; 0.010 shall be replaced by 0.000.
- f. C 881: Specification for Epoxy–Resin Base Bonding Systems for Concrete.
 - g. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open–Cell Foam).
 - h. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non–extruding and Resilient Bituminous Types).
 - i. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - j. D 3405: Specification for Joint Sealants, Hot–Poured, for Concrete and Asphalt Pavements.
 - k. D 3407: Standard Methods of Testing Joint Sealants, Hot–Poured, for Concrete and Asphalt Pavements.
4. CRD: U.S. Army Corps of Engineers Handbook for Concrete and Cement
- a. C 513: Rubber Waterstops.
 - b. C 572: Polyvinyl chloride Waterstops.

5. FS: Federal Specifications and Standards
 - a. K-P-146: Tarpaulins, Cotton Duck, Fwwmr.
 - b. L-P-512: Plastic Sheet (Sheeting), Polyethylene.
 - c. HH-I-521: Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).
 - d. LLL-B-810: Building Board, (Hardboard) Hard Pressed, Vegetable Fiber.
 - e. PS-1: Plywood Product Standard.
6. TxDOT: Texas Department of Transportation, Standard Specifications for Construction of Highways, Streets, and Bridges -- Latest Edition, Item 420, Specification for Concrete Structures, Article 420.11 Placing Concrete – General, paragraph (2) Transporting Time only.

B. Formwork Tolerances

Formwork tolerances shall be as specified in ACI 301, Chapter 4 and as required herein for specified finishing tolerances.

C. Sample Installation

ARCHITECT TO FILL-IN TYPE OF ARCHITECTURAL FINISH.

D. Finishing Tolerances

1. Finishing tolerances shall be as specified in ACI 301, Chapter 11.
2. Locations
 - a. Exposed aggregate concrete columns.
 - b. Top concrete surface of platforms, landings, pedestrian ramps, floors and sidewalks: Class B.
 - c. Base courses: Class C.
 - d. All other surfaces: Class B.
3. Maximum allowable deviations from dimensions, elevations, slopes and positions, as indicated:

- a. Footings:
 - (1) Width, Depth and Length: Plus 2 in., minus 1/2 in.
 - (2) Misplacement or eccentricity: 2 in.
 - (3) Elevations of top: Plus or minus 1/4 in.
- b. Top of base courses to receive nonslip finish: Adjust to provide finish surface tolerance.
- c. Top of other base courses: Plus 0, minus 1/2 in. from finish profile elevation at every point and if slope is indicated, plus or minus 1/4 in. in 10 ft.
- d. Top elevations of slabs not otherwise specified: Plus or minus 1/2 in. at each point and if slope is indicated, plus or minus 1/8 in. in 10 ft.
- e. Top elevation of columns, piers, walls and arrises: As necessary to join other surfaces and not more than plus or minus 1/4 in.
- f. Plumb of columns, piers, walls and joints not exposed to view in public areas of finished structure: 1/4 in. in 10 ft., not exceeding 1 in. total.
- g. Plumb of columns, piers, walls, vertical joints and grooves and other prominent vertical lines exposed to view in public areas of finished structure: Plus or minus 1/4 in. in 20 ft., not exceeding 1/2 in. total.
- h. Level and grade of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines: Plus or minus 1/4 in. in 20 ft., not exceeding 1/2 in. in entire line.
- i. Level and grade of slab soffits, ceilings, beam soffits and arrises measured before removal of supporting shores: Plus or minus 1/4 in. in any 10 ft. length; 3/8 in. in any 20 ft. length; not exceeding 3/4 in. for entire surface.
- j. Cross sectional dimension of columns, beams and slabs: Plus or minus 1/4 in., except increase thickness of slabs on grade as necessary to achieve specified top elevation.
- k. Thickness of walls: Plus 1/2 in., minus 1/4 in.

- l. Position of linear building lines not otherwise specified and distance from related columns, walls and partitions: Plus or minus 1/2 in. at all points, not exceeding 1/2 in. in any 20 ft. length.
- m. Rise of steps: All risers in a flight identical within plus or minus 1/16 in. and plus or minus 1/8 in. in total rise of flight.
- n. Tread of steps: All treads in a flight identical within plus or minus 1/8 in. and plus or minus 1/4 in. in total flight.
- o. Size and location of sleeves, floor openings and wall openings: Plus or minus 1/4 in.
- p. Misplacement of anchor bolts with respect to work point: Plus or minus 1/16 in. and all bolts in a group to be parallel within plus or minus 1/8 in. per ft.

E. Extended Warranty

Manufacturer of joint sealant shall provide at least a 1 year written warranty against material degradation and failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. Warranty shall be endorsed by the Contractor. This warranty shall not limit HCCS's rights or remedies as may otherwise be afforded under law or statute.

F. Architecturally Treated Columns

The Contractor shall place the concrete in the column forms to the full height of the column in a single pour and shall not make a partial pour from one truck load of concrete and finish the pour from a second truck load of concrete.

1.3 SUBMITTALS

- A. In accordance with Section 013300 Submittals of these Specifications, the following shall be submitted:
 - 1. Shop Drawings showing details of form types, methods of form construction and erection, falsework, design computations, locations of form joints, form ties and construction joints, scheduled date and rate of placing, mix designations, and related details as necessary to indicate the scope of the work of this Section.
 - 2. The Contractor shall report start of placement and finish times, finish slumps and location in the finished work of each batch of concrete placed in the Work.

1.4 JOB SITE CONDITIONS

- A. At least 24 hours prior to actual placement, the Contractor shall notify HCCS of the intention to place concrete.
- B. Whenever possible, concrete shall be placed during normal working hours. When schedules require concrete placement at times other than the normal working hours, the Contractor shall notify HCCS at least 48 hours in advance of placement.
- C. Concrete shall not be placed in or adjacent to any structure where piles are to be driven until all piles in the structure have been driven.
- D. Concrete shall not be placed until the depth, character and water conditions of the foundations, the adequacy of forms and falsework, the absence of debris in the forms, the condition of the joints and the conditions of spacing and location of reinforcement and embedded items have been approved by HCCS.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Portland Cement Concrete

As specified in Section 321313 – Portland Cement Concrete of these Specifications.

B. Admixture

ASTM C 494.

C. Concrete Reinforcement

As specified in Section 032100 – Concrete Reinforcement of these Specifications.

D. Membrane Forming Curing Compound

ASTM C 309, Type II, Class B, shall not emit photochemically reactive solvents into the air. The curing compound shall be a true water base and in full compliance with Volatile Organic Compounds (VOC) content limits, as required by Air Pollution Control, Regulations on Architectural Coatings. (Less than 350 G/l).

E. Waterproof Curing Sheet

ASTM C 171, waterproof paper or polyethylene film.

F. Burlap Sheet

AASHTO M 182, Class 3 or 4.

G. Tarpaulins

FS K-P-146.

H. Blanket Insulation

FS HH-I-521.

I. Joint Materials

1. Preformed Expansion Joint Filler: Non-extruding and resilient Bituminous type: ASTM D 1751, Flexible Cellular Materials: ASTM D1565 and Sponge Rubber and Cork Type: ASTM D 1752.

J. Waterstops

Rubber type, Corps of Engineers Specification CRD C 513, either natural or synthetic or extruded Polyvinyl chloride, Corps of Engineers Specification CRD C 572.

K. Vapor Barrier

Polyethylene sheet, 0.01 in. thick, FS L-P-512, Type I, Class H, Grade 5.

L. Abrasive Aggregate

Aluminum oxide or silicon carbide; well graded in size from particles retained on the No. 30 sieve to those passing the No. 8 sieve.

M. Epoxy Mortar/Grout

Approved product mixed and applied in accordance with the manufacturer's instructions, meeting ASTM C 881.

N. Formwork

1. Plywood: B-B Plyform, Class I or Class II Exterior, conforming to the requirements of U.S. National Bureau of Standards Product Standard PS-1.
2. Hardboard: Tempered, smooth-one-side, conforming to FS LLL-B810.
3. Steel Forms and Fiberglass – Reinforced Plastic Forms: As required to form concrete surfaces to the specified tolerances and finishes, free of irregularity, concrete stain and seam markings.
4. Fiber Tubular Forms: Spirally constructed of laminated plies of fiber, with wall thickness as recommended by the manufacturer to meet load requirements of the various uses and sizes.
5. Column Forms: Column forms shall be such that when stripped from hardened concrete shall leave no evidence of seams or any other markings.
6. Form Ties: Approved form clamps and factory-fabricated snap-off metal type ties designed to minimize form deflection and preclude concrete spalling upon tie removal; fabricated so that the set-back in the concrete is such that the portion of the tie remaining after snap-off and removal of the exterior portions is at least 2 in. back from the concrete surface. Spreader cones on tie wires shall not exceed 7/8 in. in diameter.
7. Bond Breaker: Nonstaining, free of mineral oils and other nondrying ingredients and leaving no bond-inhibiting residues on the face of the concrete, compatible with specified water-repellant coatings, paint systems or other indicated surface treatments.
8. Chamfer Strips: Triangular fillets milled from clear, straight-grain wood, surfaced each side or extruded vinyl type.

O. Coarse Aggregates

1. **ARCHITECT TO FILL-IN ANY SPECIAL COARSE AGGREGATE REQUIREMENTS AND THEIR LOCATION.**
2. All other coarse aggregates shall conform to Section 321313 – Portland Cement Concrete Paving of these Specifications.

P. Fine Aggregates

1. **ARCHITECT TO FILL-IN ANY SPECIAL FINE AGGREGATE REQUIREMENTS AND THEIR LOCATION.**
2. All other fine aggregates shall conform to Section 321313 – Portland Cement Concrete Paving of these Specifications.

Q. Coloring Admixture

ARCHITECT TO FILL-IN COLORING ADMIXTURE REQUIREMENTS.

R. Surface Finish of Space Frame Support Columns: Provide exposed surface finishes as follows:

1. **ARCHITECT TO SPECIFY FINISH.**

PART 3 – EXECUTION

3.1 FORMWORK

A. General

1. Formwork shall be designed and constructed in accordance with the applicable requirements of ACI 301 and ACI 347 and as specified herein.
2. Earth cuts shall not be used as forms for vertical surfaces except where specifically indicated.
3. Forms shall conform to the lines and dimensions shown on the Contract Drawings and shall be sufficiently tight to prevent mortar leakage.
4. Formwork shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall conform to the tolerances of Article 1.02 of this Section.
5. Temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary, to facilitate cleaning and observation immediately before concrete is deposited.
6. Forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and form clamps extending through and fastened

to the wales. Forms shall be anchored and braced to produce proper alignment and structural safety.

7. Exposed edges and corners of concrete shall be chamfered a minimum 3/4 in., unless otherwise indicated.

B. Form Coatings

Forms shall be cleaned before each use and coated with an approved bond breaker in accordance with the manufacturer's instructions before concrete or reinforcing steel is placed.

C. Embedded Items

1. Inserts, anchors, sleeves, and other items shall be securely installed in the formwork as shown on the Drawings, using a template to locate the embedded item accurately. Embedded items shall be securely fastened, but not fastened to reinforcing steel, unless otherwise indicated.
2. Exposed curb angle surfaces, tread strips and similar surfaces shall be protected during placing of concrete.
3. Ends of conduits, piping and sleeves embedded in concrete shall be closed with approved easily removable caps or plugs.

D. Edge Forms and Screeds

Edge forms and screeds shall be set to produce the indicated elevations and contours, and shall be secured to prevent displacement during placing and consolidation of the concrete.

E. Form Removal

1. When repair of surface defects or finishing is required, side forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.
2. Formwork used to support the weight of the concrete shall remain in place until the following specified minimum flexural strengths have been reached:
 - a. Class 3000: Minimum 7 day beam strength 500 psi.
 - b. Class 4000: Minimum 7 day beam strength 650 psi.
 - c. Class 5000: Minimum 7 day beam strength 850 psi.

3.2 PREPARATION

- A. Hardened concrete and foreign materials shall be removed from the inner surfaces of the forms and conveying equipment.
- B. Underground pipes, conduits and ducts in the pour area shall be completely installed and approved before placing concrete.
- C. Each subgrade surface shall be sprinkled sufficiently to prevent absorption of water from freshly placed concrete.

3.3 CONVEYING

- A. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods that will prevent segregation, undue drying, temperature rise or loss of ingredients and so as to retain required quality of concrete.
- B. Conveying equipment shall be of approved size and design to maintain a continuous flow of concrete at the discharge end. Conveying equipment with aluminum parts that could come in contact with concrete during conveying shall not be used.
- C. Belt conveyors shall be horizontal or at a slope which will cause neither segregation nor loss of ingredients. An approved arrangement shall be used at the discharge end to prevent segregation. Long runs shall be discharged into a hopper. Concrete shall not be allowed to adhere to the return belt.
- D. Chutes shall be metal or metal-lined and shall have a slope not exceeding one vertical to two horizontal and not less than one vertical to three horizontal. Chutes more than 20 ft. long and chutes not meeting slope requirements may be used if the chutes discharge into an approved hopper before distribution.
- E. Pumping and pneumatic conveying equipment shall be of a suitable kind with adequate pumping capacity. Equipment shall be cleaned at the end of each operation. Pneumatic placement shall be controlled so that segregation does not occur in the discharged concrete. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.

3.4 PLACEMENT

- A. General
 - 1. Concrete shall be placed in accordance with the applicable requirements of ACI 304 and as specified herein.

2. Concrete shall be deposited into forms so as not to cause segregation. Vibrators shall not be used for shifting the mass of fresh concrete. The free drop of any concrete shall not exceed 5 ft. Column concrete shall be placed by adjustable length pipes not less than 6 in. in diameter.
3. Layers of concrete shall not be tapered off in wedge shaped slopes but shall be built with squared ends and level tops. Concrete shall be deposited continuously or in layers of such thickness that concrete will not be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section.
4. Concrete shall be placed at such a rate that the concrete being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited.
5. Temporary spreaders in forms shall be removed when placed concrete has reached an elevation which renders spreaders unnecessary.
6. Slab top surfaces shall be aligned to screed contours by strike-off, or if the nature of the finished surface so requires, by approved vibrating screeds or roller pipe screeds.

B. Consolidation

1. Concrete shall be consolidated in accordance with the applicable requirements of ACI 309 and as specified herein.
2. Consolidation of concrete shall be done until voids are filled and free mortar appears on the surface.
3. Vibrators shall have a minimum frequency of 8,000 vibrations per minute and sufficient amplitude to effectively consolidate concrete.
4. Vibrators shall be used to consolidate the incoming concrete within 15 minutes after depositing in forms. In all cases, at least one spare vibrator shall be available at the site of any structure during concrete placement. Vibrators shall not be used to transport concrete within forms.
5. Location, manner and duration of vibration shall secure maximum consolidation of concrete without causing segregation of mortar and coarse aggregate without causing water or cement paste to flush to the surface. The thickness of the layers shall not be greater than can be

satisfactorily consolidated by vibrators. Vibrators shall vertically penetrate a few inches into the previous layer at regular intervals.

6. Vibrators shall not remain in an area long enough to create a cavity. Vibrators shall be plunged into concrete rapidly, so as not to spatter forms or create depressions in the lift and shall be withdrawn slowly.

3.5 HOT WEATHER PLACEMENT

- A. Placement of concrete in hot weather shall comply with the applicable requirements of ACI 305R and as specified herein.
- B. When the temperature at the Site rises above 70 F, a water-reducing, set-retarding admixture shall be added to all concrete mixes. Such admixture shall be required in all cased drilled shafts regardless of temperature. The rate of dosage and method of introduction shall be in accordance with the manufacturer's recommendations.
- C. The maximum temperature of the cement when introduced to the batch shall be 170 F.
- D. Concrete temperature prior to placement shall not exceed 85 F.
 1. When the temperature at the Site rises above 85 F, 50 percent of the mix water shall be replaced pound for pound with crushed, shaved or chipped ice made from potable water placed directly into the mixer in order to reduce the concrete temperature to an acceptable level.
 2. When the temperature at the Site rises above 90 F, 75 or more percent of the mix water shall be replaced pound for pound with crushed, shaved or chipped ice made from potable water placed directly into the mixer in order to reduce the concrete temperature to an acceptable level.

E. Concrete shall be placed in accordance with requirements of Item 420, ARTICLE 420.11 of the TxDOT Standard Specifications as follows:

1. The maximum time interval between the addition of cement to the batch, and the placing of concrete in the forms shall not exceed the following:

AIR OR CONCRETE TEMPERATURE (Whichever is Higher)	MAXIMUM TIME (Addition of Water or Cement to Placing in Forms)
Non-Agitated Concrete	
Over 80 F	15 Minutes
35 F to 79 F	30 Minutes
Agitated Concrete	
90 F or Above	45 Minutes
75 F to 89 F	60 Minutes
35 F to 74 F	90 Minutes

2. The use of an approved retarding agent in the concrete will permit the extension of each of the above temperature-time maximums by 30 minutes for bridge decks, top slabs of direct traffic culverts and cased drilled shafts, and one hour for all other concrete except that the maximum time shall not exceed 30 minutes for non-agitated concrete.

F. If required, concrete placement may be restricted to early morning or late afternoon or evening.

3.6 COLD WEATHER PLACEMENT

A. Placement of concrete in cold weather shall be performed in accordance with the requirements of ACI 306R. The temperature of the concrete itself at the time of placement shall be not less than 50 F nor more than 85 F.

3.7 FINISHING

A. Formed Surfaces

1. Rough Form Finish, F1

- a. Formed concrete surfaces that will be concealed by finish work shall have an as-cast rough form finish.
- b. Rough form finish shall be in accordance with ACI 301, Chapter 10.

2. Smooth Form Finish, F2

- a. As-cast smooth form finish shall be provided to formed concrete surfaces that will be exposed to view or that are to be covered with a coating material applied directly to the concrete or a covering material bonded to the concrete such as waterproofing, damp-proofing, painting or other similar system.
 - b. Smooth form finish shall be in accordance with ACI 301, Chapter 10.
3. Grout Cleaned Finish, F3
- a. Grout cleaned finish shall be provided to scheduled concrete surfaces which have been cast with a smooth form finish.
 - b. Grout cleaned finish shall be in accordance with ACI 301, Chapter 10.
4. Brush Blast Finish, F4
- a. Brush blast finish shall be provided to scheduled concrete surfaces which have been cast with a smooth form finish.
 - b. Brush blast finish shall be in accordance with ACI 303R, Chapter 9.
5. Bushhammer Finish, F5
- a. Apply bushhammer finish to concrete surface of round columns where shown on drawings. Minimum depth shall be 1/2 inch and maximum depth shall be 3/4 inch.
 - b. Surface continuity: Perform bushhammer finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish on each surface or area of work.
 - c. Surface cut: Maintain depth of cut and general aggregate exposure to match Architect's approved field constructed mock-up. Use power hammerheads for large, flat surfaces and hand hammers for small area, at corners and edges, and for restricted locations where power tools cannot reach. Use multi-point hammers.
 - d. Acid cleaning: After bushhammering to required finish, apply weak acid wash to clean the exposed aggregate surfaces to match Architect's approved field constructed mock-up. Thoroughly neutralize and flush acid from finished surfaces.

B. Unformed Surfaces

1. Scratched Finish, F6

Scratched finish shall be in accordance with ACI 301, Chapter 11.

2. Floated Finish, F7

Floated finish shall be in accordance with ACI 301, Chapter 11.

3. Troweled Finish, F8

Troweled finish shall be in accordance with ACI 301, Chapter 11.

4. Broom or Belt Finish, F9

Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with engineer and HCCS before application.

5. Dry Shake, Nonslip Finish, F10

Dry shake, nonslip finish shall be in accordance with ACI 301, Chapter 11.

3.8 CURING AND PROTECTION

A. General

1. Concrete curing procedures shall begin immediately after placement. Concrete shall be protected from premature drying, excessive temperature change, mechanical injury and moisture loss for a minimum of 4 curing days. A curing day is defined as a calendar day when the temperature taken in the shade away from artificial heat is above 50 F for at least 19 hours (or colder days if satisfactory provisions are made to maintain the temperature of all surfaces of the concrete at 40 F or above for the entire 24 hours).

2. Curing procedures shall comply with the requirements of ACI 301 and as specified herein.

B. Curing Methods

1. Moisture-Cover Curing

The concrete surfaces to be cured shall be covered with specified moisture-retaining cover material placed in the widest practical width with sides and ends lapped at least 3 inches and sealed by waterproofing tape or adhesive. All holes and tears that develop during the curing period shall be repaired immediately.

2. Liquid Membrane Curing

a. The specified membrane curing compound shall be applied to damp concrete surfaces as soon as possible after final finishing operations are complete, but no later than 2 hours after finishing. Curing compound shall be applied uniformly over the concrete surfaces by means of approved spray equipment in accordance with the manufacturer's instructions. Should the coat be damaged from any cause during the curing period, damaged portions shall be repaired and recoated immediately with additional compound.

b. Membrane curing compound shall not be used on surfaces that are to receive paint, tile or other application requiring a positive bond, unless it can be satisfactorily demonstrated that the membrane compound is compatible with the material requiring the positive bonding.

C. Curing Formed Surfaces

1. Formed concrete surfaces shall be cured by moist curing, with the forms in place, wherever possible.

2. If the forms are removed before the end of the curing period, curing shall continue as on unformed surfaces.

D. Curing Unformed Surfaces

1. Unformed concrete surfaces such as slabs or other flat surfaces shall be initially cured by moist curing wherever possible.

2. Unless otherwise indicated, unformed surfaces shall be finally cured by any of the methods specified above.

E. Protection from Mechanical Injury

1. During the curing period, concrete surfaces shall be protected from damage and mechanical disturbances, such as load stresses, heavy shock and excessive vibration.
2. Finished concrete surfaces shall be protected from potential damage due to construction equipment, materials, methods, application of curing procedures, rain, flowing water and other hazards.

3.9 CONSTRUCTION JOINTS

- A. Construction joints and keys shall be provided as indicated on the Drawings. Joints not otherwise indicated shall be located so as not to impair strength and appearance of the structure. Such construction joints shall be located as follows:
1. At the top of a footing or at the top of a slab on ground.
 2. In slabs on ground, so as to divide the slab into areas not in excess of 1200 sq. ft., unless otherwise approved.
- B. Longitudinal keys at least 1-1/2 inches deep shall be provided at joints in walls and between walls and slabs or footings, unless otherwise indicated. Other construction joints shall be made without keys, except where keys are indicated. Keyways shall be formed to dimensions indicated on the Drawings.
- C. When indicated or permitted, bond surface shall be obtained by use of an approved chemical retarder which delays but does not prevent setting of the surface mortar. Retarded mortar shall be removed within 24 hours after placing to produce a clean exposed coarse aggregate bonding surface.
- D. After the pour has been completed to the construction joint, and before placement of fresh concrete, reinforcing steel and the surfaces of horizontal and vertical construction joints shall be cleaned of surface laitance, curing compound and other materials foreign to the concrete to expose clean coarse aggregate of at least 3/8 inch size. Hardened concrete surfaces shall be cleaned by abrasive blast methods, to expose coarse aggregate, after the curing period or immediately before placing concrete at the joint. Surfaces of concrete which has been in place not more than 8 hours may be cleaned with air and water jets, if surface laitance is removed and clean coarse aggregate is exposed. Surfaces of horizontal construction joints, where expansion joint filler or bond breaking compound is to be placed as indicated, shall be cleaned of dirt, sawdust and other loose materials. Surfaces on which concrete is to be placed shall be moistened with water immediately before

placing concrete. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

- E. When it is necessary to make a construction joint because of an emergency, additional reinforcing steel shall be placed across the joint as directed by the Engineer. Notify HCCS in writing of such action.
- F. When new concrete is to be joined to existing concrete by means of reinforcing steel dowels, grouted in holes drilled in the existing concrete, the holes shall be drilled to the required depth, blown out, wetted and filled with ASTM C 881 non-metallic, non-shrink grout, then the clean dowels shall be inserted and left undisturbed until the grout cures hard in accordance with manufacturer's instructions.

3.10 EXPANSION, CONTRACTION, CONSTRUCTION AND CONTROL JOINTS

- A. Reinforcement or other fixed metal items shall not be run continuous through joints, unless otherwise indicated.
- B. Open joints shall be constructed at the locations indicated, using a wood strip, metal plate or other approved material to be subsequently removed or the joints may be sawcut.
- C. Expansion joints in the pavement areas shall be spaced as shown on the drawings or as required for alternate methods of construction.
- D. All joints shall conform to HCCS Standard Drawing CES-1003-1A, CIVIL STANDARD JOINTED REINFORCED CONCRETE PAVEMENT.

3.11 WATERSTOPS

- A. The configuration and location of waterstops in construction joints and expansion joints shall be as indicated on the Drawings.
- B. Each piece of waterstop shall be of maximum practical length to minimize the number of end joints.

3.12 INSTALLING JOINT MATERIALS

- A. Joint materials and sealants shall be installed so as not to invalidate the manufacturer's warranty, and in strict accordance with his procedures and instructions.

3.13 PROTECTION FROM AND REMOVAL OF STAINS

- A. Concrete shall be protected from staining from steel members and other substances during the course of the Work. Dirt shall not be allowed to accumulate on horizontal surfaces. All surfaces shall be kept clean and free of standing water.
- B. If staining occurs, stain shall be removed and the concrete shall be restored to its original color and finish.

3.14 REPAIR OF SURFACE DEFECTS

A. General

- 1. Surface defects shall be repaired immediately after form removal as recommended by ACI standard practices.
- 2. Concrete repair work shall result in a monolithic concrete surface of uniform color and texture and shall be free of irregularities and discontinuities.
- 3. HCCS shall be informed upon completion of patching and repairs so as to witness the resultant surfaces and work quality.
- 4. All repairs of surface defects shall be at no additional cost to HCCS.

B. Patching Defective Areas

- 1. Defective areas shall be repaired with an approved epoxy-based mortar, where directed.
- 2. Honeycomb, rock pockets, voids over 1/4 inch in any dimension shall be cut down to solid concrete but, in no case, to a depth of less than 1 inch. Edges of cuts shall be made perpendicular to the concrete surface. Before placing the cement mortar, the area to be patched shall be thoroughly cleaned, dampened with water and brush-coated with neat cement grout.
- 3. For exposed-to-view surfaces, white Portland cement shall be blended with standard Portland cement so that, when dry, the patching mortar will match the color of the surrounding concrete. Areas shall be tested at inconspicuous locations to verify mixture and color match before proceeding with the patching.

4. Holes extending through concrete shall be filled using a plunger-type gun or other suitable device from the least exposed face, using a flush stop held at the exposed face to ensure complete filling.

C. Repair of Formed Surfaces

1. Exposed-to-view formed concrete surfaces that contain defects which affect the finish appearance shall be repaired, where possible. If defects cannot be repaired, defective concrete shall be removed and replaced. Surface defects shall include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, other projections on the surface, stains and discolorations that cannot be removed by cleaning.
2. Concealed formed concrete surfaces that contain defects which adversely affect concrete durability shall be repaired, where possible. If defects cannot be repaired, defective concrete shall be removed and replaced. Surface defects shall include cracks in excess of 0.01 inch wide, cracks of any width and other surface deficiencies which penetrate to the reinforcement or completely through non-reinforced sections, honeycomb, rock pockets and spalls, except minor breakage at the corner.

D. Repair of Unformed Surfaces

1. Unformed surfaces shall be tested for smoothness and surface plane tolerances as specified for each surface and finish. Low and high areas shall be corrected as specified.
2. Unformed surfaces sloped to drain shall be tested for trueness of slope, in addition to smoothness, using a template having the required slope. High and low areas shall be corrected as specified.
3. Finished unformed surfaces which contain defects which adversely affect concrete durability shall be repaired. Surface defects, as such, shall include crazing, cracks in excess of 0.01 inch wide or which penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets and other objectionable conditions.
4. High areas in unformed surfaces shall be corrected by grinding, after the concrete has cured sufficiently so that repairs can be made without damage to adjacent areas.

5. Low areas in unformed surfaces shall be corrected, during or immediately after completion of surface finishing operations, by cutting out the low area and placing fresh concrete.
6. Defective areas, except random cracks and single holes not exceeding 1 inch in diameter, shall be repaired by cutting out the defect and placing fresh concrete. Concrete surface in contact with patching concrete shall be dampened and brushed with a neat cement grout coating or a concrete bonding agent. Patching concrete shall be placed before grout takes its initial set. The patching mixture shall be made of the same materials as the original adjacent concrete and shall be cured in the same manner.
7. Isolated random cracks and single holes not exceeding 1 inch in diameter shall be repaired by the dry pack method. The top of the cracks shall be grooved and the holes shall be cut out to sound concrete and cleaned of dust, dirt and loose particles. Cleaned concrete surfaces shall be dampened and brushed with a neat cement grout coating. Dry pack shall be placed before grout takes its initial set. The dry pack mixture shall consist of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water as required for handling and placing. The dry pack mixture shall be compacted in place and finished as required to match the adjacent concrete.

END OF SECTION 32 13 73 .19

SECTION 32 14 00 - UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Concrete pavers set in **sand** setting beds over reinforced concrete base.
- B. Permeable Pavers set in aggregate setting bed over stone sub-base
- C. **Edge restraints** for unit pavers.

1.2 SUBMITTALS

- A. Product Data: For materials other than water and aggregates.
- B. Samples for **unit pavers, joint materials and edge restraints**.

1.3 QUALITY ASSURANCE

- A. **Mockups: Build mockups for each form and pattern of unit paver.**
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- A. Concrete Pavers: Solid interlocking paving units complying with ASTM C 936, made from normal-weight aggregates.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - a. Pavestone

- b. Mutual Materials
- c. Or approved equal

Thickness: 2-3/8 inches.

- 2. Rectangular, Face Size and Shape: 3-7/8 inches x 7-13/16 inches .
- 3. Color: As selected by Architect from manufacturer's full range.

2.2 NOT USED

2.3 ACCESSORIES

- A. Aluminum Edge Restraints: **L-shaped, 1/8-inch thick by 2-1/4-inch- high** extruded-aluminum edging with holes to allow Ramset/Hilti 1" nail fastened to concrete sub-base @ 12" O.C.

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- 2. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. BRICKSTOP Corporation.
 - b. Curv-Rite, Inc.
 - c. Permaloc Corporation.
 - d. Sure-Loc Edging Corporation.

- B. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

- C. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.4 CONCRETE SETTING-BED MATERIALS

- A. **Concrete sub-base as indicated on paving details**

- B. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33 for fine aggregate.

- C. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing **No. 16 (1.18-mm)** sieve and no more than 10 percent passing **No. 200 (0.075-mm)** sieve.

- D. Drainage Geotextile: Nonwoven needle-punched geotextile made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following:

1. Apparent Opening Size: **No. 40 (0.425-mm)** sieve, maximum; ASTM D 4751.
2. Permittivity: 0.5 per second, minimum; ASTM D 4491.

2.5 NOT USED

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- B. Cut unit pavers with motor-driven masonry saw equipment to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
 1. Joint Pattern: **As indicated.**
- C. Tolerances: Do not exceed **1/16-inch (1.6-mm)** unit-to-unit offset from flush (lippage) nor **1/8 inch in 24 inches (3 mm in 600 mm)** and **1/4 inch in 10 feet (6 mm in 3 m)** from level, or indicated slope, for finished surface of paving.
- D. Expansion and Control Joints: Provide foam filler as backing for sealant-filled joints. Install joint filler before setting pavers.
- E. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.
- F. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

3.2 CONCRETE SETTING-BED APPLICATIONS

- A. Compact soil subgrade as indicated for concrete placement.
- B. Place drainage geotextile over concrete sub-base course, overlapping ends and edges at least **12 inches (300 mm)**.
- C. Place leveling course and screed to a thickness of **1 to 1-1/2 inches (25 to 38 mm)**, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
- D. Treat leveling course with herbicide to inhibit growth of grass and weeds.

- E. Set pavers with a minimum joint width of **1/16 inch (1.5 mm)** and a maximum of **1/8 inch (3 mm)**, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars.
- F. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a **3500- to 5000-lbf (16- to 22-kN)** compaction force at 80 to 90 Hz.
- G. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

END OF SECTION 32 16 13

SECTION 32 16 13 – CONCRETE CURBS AND CURB AND GUTTER

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing, placing, curing, and protecting Portland cement concrete curbs, and combination curbs and gutters, constructed on a prepared subgrade.

1.2 QUALITY ASSURANCE

A. Reference Standards Applicable to this Section

1. ACI: American Concrete Institute
 - a. 316R: Recommendations for Construction of Concrete Pavements and Concrete Bases.
2. ASTM: American Society for Testing and Materials
 - a. A 615: Specification for Deformed and Plain Billet–Steel Bars for Concrete Reinforcement (with Supplement + S1).
 - b. C 150: Specification for Portland Cement Type I or Type II.
 - c. C 309: Specification for Liquid Membrane – Forming Compounds for Curing Concrete.
 - d. D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Closed Cell).
 - e. D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient bituminous Types).
 - f. D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - g. D 3405: Specification for Joint Sealants, Hot–Poured, for Portland Cement Concrete Pavement.

3. FS: Federal Specifications and Standards

- a. TT-P-86: Paint, Red-Lead-Base, Ready-Mixed.

B. Finishing Tolerance

The top surface of curbs and combination curbs and gutters shall have a Class A tolerance as specified in ACI 316 R, Chapter 12.5.

1.3 SUBMITTALS

- A. In accordance with Section 013100 – Project Administration of these Specifications, the following shall be submitted:

1. Reinforcement Materials

- a. As required in Section 032100 – Concrete Reinforcement of these Specifications.

2. Concrete Materials

- a. As required in Sections 321373.19 – Cast-in-Place Concrete of these Specifications.

1.4 EXTENDED WARRANTY

- A. Manufacturer of joint sealant shall provide at least a 1-year written warranty against material degradation and failure and water and foreign matter infiltration through the joint from the time of written acceptance of the Work. This warranty shall not limit HCCS rights or remedies as may otherwise be afforded under law or statute.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Forms

Either wood or metal, of the size and shape necessary for forming the item, straight and free of warp.

B. Reinforcing Steel Bars

As specified in Section 032100 – Concrete Reinforcement of these Specifications.

C. Dowel Bars

Smooth, ASTM A 615 + S1, Grade 60, new billet steel, unbonded ends painted with red-lead-base paint, FS TT-P-86, Type I and coated with a water-resistant lubricant immediately prior to placement of concrete in which unbonded ends of bars are to be embedded.

D. Dowel Bar Expansion Caps

PVC or plastic cap, slightly larger than dowel bar, closed end, a minimum of 6 in. long, with 1-1/2 in. long compressible insert.

E. Concrete

Class 3000, as specified in Section 321373.19 - Cast-in-Place Concrete of these Specifications.

F. Membrane Forming Curing Compound

ASTM C 309, Type 2, unless otherwise directed.

G. Joint Materials

1. Preformed Expansion Joint Filler: Nonextruding and resilient bituminous type, ASTM D 1751.

2. Joint Sealing Material: See Section 321373.19 of these Specifications.

H. Form Coating

Commercial formulation form-coating compound that will not bond with, stain nor adversely affect concrete surfaces and will not impair subsequent treatment of concrete surfaces.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Prepared subgrade shall be inspected for unstable or unsuitable areas and need for additional compaction. Notify the Engineer in writing of such deficiencies. Do not begin curb construction until all such deficiencies have been corrected.

- B. Loose and foreign material shall be removed from the compacted subgrade immediately prior to placing concrete, and subgrade shall be uniformly dampened.

3.2 SETTING FORMS

- A. Forms shall be set to the line and grade indicated, and shall be securely staked to maintain set position during depositing and curing of concrete. The inside form shall be rigidly attached to the outside form.
- B. Forms shall be set in sufficient quantity to allow continuous progress of concrete placement and to ensure that forms shall remain in place not less than 24 hours.
- C. Forms shall be cleaned after each use and coated with an approved form release agent prior to each use.

3.3 INSTALLATION OF JOINTS, REINFORCEMENT, AND SEALANT

- A. Reinforcement shall be installed as indicated on the Drawings and as specified in Section 032100 – Concrete Reinforcement of these Specifications. Joints shall be installed where indicated on the Drawings and in accordance with Section 321319 – Concrete Pavement Joints of these Specifications.
- B. Sealant manufacturer's instructions and procedures shall be followed so as not to invalidate the warranty.

3.4 PLACING AND FINISHING CONCRETE

- A. Concrete shall be placed and finished as specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications, and ACI 316 R, Chapters 10 and 12.5.
- B. After concrete has been struck off and has sufficiently set, the exposed surfaces shall be worked with a wood float. The exposed edges shall be rounded using an edging tool.
- C. After form removal, the surfaces of the curb or combination curb and gutter shall be plastered with a mortar consisting of one part Portland Cement and two parts fine aggregate. Mortar shall be applied with a template constructed to the shape and dimensions of the item to be plastered. All exposed surfaces shall be brushed to a uniform smooth texture.

3.5 CURING AND PROTECTING CONCRETE

- A. Concrete shall be cured in accordance with the recommendations of ACI 316 R, Chapter 11, using the membrane curing method and materials.
- B. Protection as recommended in ACI 316 R, Chapter 11 shall be provided until written acceptance by the Engineer.

END OF SECTION 32 16 13

SECTION 32 17 23 – PAVEMENT MARKINGS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing pavement and island markings of the following types:
1. Paint.
 2. Tape.
 3. Traffic buttons.
 4. Pavement markers (Reflectorized).

1.2 QUALITY ASSURANCE

- A. Reference Standards Applicable to this Section
1. FS: Federal Specifications and Standards
 - a. TT-P-115F: Paint, Traffic, (Highway, White, and Yellow).
 - b. TT-B-1325B: Beads (Glass Spheres); Retro-Reflective.
 2. TxDOT: Texas Department of Transportation
 - a. Standard Specifications for Construction of Highways, Streets and Bridges --- Latest Edition. Item 666, REFLECTORIZED PAVEMENT MARKINGS; Item 668, PREFABRICATED PAVEMENT MARKINGS; Item 672, RAISED PAVEMENT MARKERS; Item 678, PAVEMENT SURFACE PREPARATION FOR MARKINGS.
 - b. Texas Manual on Uniform Traffic Control Devices for Streets and Highways (Texas MUTCD).

- B. All markings shall comply with the requirements of the TxDOT Standard Specifications for Construction of Highways, Streets and Bridges; the Texas Manual on Uniform Traffic Control Devices; and, the applicable regulations and standards of Harris County, Texas and the City of Houston, Texas.

1.3 SUBMITTALS

- A. In accordance with Section 013300 – Submittal Procedures of these Specifications, the following shall be submitted:
 - 1. Certificates
 - a. Certificates for each product indicating that the product complies with the requirements of the TxDOT Standard Specifications and the applicable Federal Specifications
 - 2. Manufacturer's Data
 - a. Manufacturer's installation instructions, specifications and recommendations for each pavement marking product.

1.4 JOB CONDITIONS

- A. Unless otherwise directed by the Engineer in writing, pavement markings shall be installed during the period between March 1 and September 30.
- B. Markings shall be installed only on clean and dry surfaces in accordance with TxDOT Standard Specifications relating to the type of marking being provided.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Paint

Marking paint shall comply with the requirements of FS TT-P-115F.

B. Tape

Marking tape shall be yellow or white and shall comply with the requirements of the TxDOT Standard Specifications, Item 668, RETRO-REFLECTIVE PREFABRICATED PAVEMENT MARKINGS.

C. Pavement Markers

Markers shall be reflectorized as indicated and shall comply with the requirements of the TxDOT Standard Specifications, Item 674, PAVEMENT MARKERS (Reflectorized).

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Surfaces shall be prepared and markings installed in accordance with the requirements of the applicable item in the TxDOT Standard Specifications and the Texas MUTCD.
- B. Markings shall be protected from vehicular traffic until not subject to damage by such traffic. Contractor shall be responsible for repair and replacement of markings at no additional cost to HCCS until written acceptance by the Engineer, in addition to the general warranty of the Contract.

END OF SECTION 32 17 23

SECTION 32 80 00 – IRRIGATION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SCOPE OF WORK

- A. Provide shop drawings in accordance with Section 01 31 00 Project Administration for the installation of an irrigation system at the following locations:
 - 1. Planting and lawn areas in areas indicated on the Drawings.
- B. Provide all labor, materials, tools, equipment and incidentals required to install a complete operable irrigation system as indicated on the Drawings, as specified and as necessary to complete the contract, including, but not limited to, these major items:
 - 1. Irrigation System and Related Appurtenances.
 - 2. All Connections to Water and Electrical Utilities.
 - 3. Excavation and Backfill of Pipe Trenches.
 - 4. Borings and Sleeving.
 - 5. Record Drawings and Guarantees.
 - 6. Permits and Licenses.
 - 7. Testing of Completed System.
 - 8. Clean up.
- C. Shop drawings must be sealed and signed by a Texas Registered Licensed Irrigator. Shop drawings will NOT BE REVIEWED or ACCEPTED if not sealed and signed by a Texas Registered Licensed Irrigator.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 31, Earthwork
- B. Section 32 90 00, Planting
- C. Section 32 01 90, Operation and Maintenance of Planting
- D. Division 03, Concrete.
- E. Division 26, Electrical

1.04 QUALITY ASSURANCE

- A. The irrigation plan shown on drawings is for pricing and design intent only. **A Texas Licensed Irrigator shall provide final design shop drawings for approval and use during installation. Shop drawings must be issued to Landscape Architect for review and approval prior to installation of irrigation system. Shop drawings must be sealed and signed by a Texas licensed irrigator in accordance with current TCEQ rules and regulations.** All newly installed plant material associated with this project shall receive irrigation. The irrigation system shall be designed to allow for future expansion, or to be incorporated into an adequate existing system, if present. It should be designed and equipped for ease of maintenance; therefore, grip irrigation should be avoided because of its unique maintenance requirements. Lawn areas shall be on different section from planting, and bubblers on a separate section from others. A separate water meter shall be set for the irrigation system to reduce water costs to the campus. Irrigation system shall be fully automatic, and designed in accordance with applicable codes. Provide at least one person that is a Texas licensed irrigator who shall be present at all times during execution of this portion of the work who shall be thoroughly familiar with type of materials being installed and the material manufacturers' recommended methods of installation and who shall direct work performed under this Section.
- B. Reference Standards applicable to this Section:
 - 1. ANSI: American National Standards Institute
 - a. Z55.1: Gray Finishes for Industrial Apparatus and Equipment
 - 2. ASTM: American Society for Testing and Materials
 - a. B88: Specifications for Seamless Copper Water Tube

- b. D 1785: Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - c. D 2241: Specification for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
 - d. D 2466: Specification for Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedules 40 and 80
 - e. D 2564: Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
 - f. F 690: Practice for Underground Installation of Thermoplastic Pressure Piping Irrigation Systems
 3. AWWA: American Water Works Association
 - a. C 500: Gate Valves, 3 inches through 48 inches NPS, for Water and Sewage Systems
 - b. C 506: Backflow Prevention Devices, Reduced Pressure Principle and Double Check Valve Types
 4. IAMPO: International Association of Plumbing and Mechanical Officials
 - a. UBC: Uniform Building Code
 5. NEMA: National Electrical Manufacturer's Association
 - a. 250: Enclosures for Electrical Equipment (1 000 Volts Maximum)
 6. NFPA: National Fire Protection Association
 7. NFPA 70 (NEC): National Electrical Code
 8. Uniform Plumbing Code
 9. NSF: National Sanitation Foundation
 - a. No. 14: Plastic Piping System Components and Related Materials
 10. City of Houston Plumbing Code
- C. In addition to complying with pertinent codes and regulations, comply with the latest rules of the National Electrical Code for electrical work and materials. Also furnish and install all necessary warning signs, barricades, etc., as required by the safety orders of the Division of Industrial Safety and local ordinances.
- D. The Contractor shall be responsible for full and complete coverage of all irrigated areas and shall make necessary minor adjustments at no additional cost to the Owner.

1.05 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 31 00. Shop drawings are to indicate verification of available psi and gpm for irrigation system use AND shall be in accordance with current TCEQ requirements for irrigators and irrigation shop drawings..
- B. Show manufacturer's name and catalog number for each item. Furnish complete catalog cuts and technical data and the manufacturer's recommendations as to method of installation. Quantities of materials and equipment need not be included.
- C. Field Modifications: As approved by the Landscape Architect or Owner's Representative, the Contractor shall provide and keep up to date a complete set of as-built drawings which shall be corrected daily to show changes in sprinkler locations, controller locations, piping locations and other deviations from the original design drawings.

1.06 PRODUCT HANDLING

- A. Use means necessary to protect irrigation system materials before, during and after installation and to protect the installed work and materials of other trades.
- B. In the event of any damage, immediately make repairs and replacements necessary, to the approval of the Landscape Architect or Owner's Representative and at no additional cost to the Owner.
- C. Exercise care in handling, loading, unloading and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.
- D. Repair dented or damaged pipe by cutting out the dented or damaged section and rejoining with a coupling.

1.07 EXISTING CONDITIONS

- A. Verify and be familiar with the location, size and detail of water lines provided as the source of water supply and of the electrical supply to the sprinkler system, as shown on the plans. Source of supply and point of connection of the water source shall be existing water main lines at approximate locations as shown on the Drawings, unless otherwise noted on drawings.

- B. Beginning the work of this Section without reporting unsuitable conditions to the Landscape Architect or Owner's Representative constitutes acceptance of conditions by the Contractor. Any required removal, repair or replacement of this work caused by unsuitable conditions shall be done at no additional cost to Owner.

1.08 INSPECTIONS AND ACCEPTANCE

- A. Maintain proper facilities and provide safe access for Owner's Representative to observe of the work. Where the specifications require work to be tested, it shall not be covered up until tested or approved by the Owner's Representative or Owner. The Contractor shall be solely responsible for notifying the Owner's Representative (48 hour notice minimum required) where and when such work is in readiness for testing). Should any such work be covered without such test or approval, it shall be uncovered at the Contractor's expense. Trenches shall remain open for main line pressure test except where pipe is installed with a pipe-pulling machine. Observations will be required as follows:
 - 1. Pre-Construction Meeting
 - 2. Layout of Control Equipment and Heads
 - 3. Main Line Pressure Test and Trench Depth Check
 - 4. Lateral Trench Depth Check
 - 5. Installation of heads, valves and other equipment.
 - 6. Coverage Test and Pre-final Observation
 - 7. Final Observation
 - 8. Material and workmanship shall be in accordance with local codes and ordinances of legally constituted authorities, except that where provisions of these Specifications exceed such requirements, these Specifications shall govern.
- B. Clean up work as it progresses. At frequent intervals and when directed by the Landscape Architect or Owner's Representative, remove and dispose of accumulations of rubbish and debris. At the time of completion, the site shall be cleared of tools, equipment, rubbish, etc., and shall be left in proper, clean condition ready for acceptance.

1.09 MAINTENANCE AND GUARANTEE

- A. Maintenance covered under this contract shall begin immediately after irrigation system is installed and shall be maintained for one year (360) calendar days after substantial completion of Work. If at the end of the maintenance period, the Work is not in order for Final Acceptance; maintenance period may be extended for an additional period as determined by Owner. Maintenance is to include but is not limited to:
1. Check, Adjust and Clean System: The irrigation system will be inspected on a monthly basis during the maintenance period. Making adjustments and setting the automatic controllers to establish frequency and length of watering periods, checking and making adjustments to head elevation to maintain proper coverage, checking valve functions and vacuum breakers, keeping head and lines flushed clear, and checking that all heads and visible lines are intact, secure, clean and free of any obstructions shall be a part of this maintenance task item.
- B. Contractor will closely monitor the irrigation system throughout the 360-day maintenance period. Repair and replace any equipment damaged as a result of maintenance operations at the Contractor's expense of the system after substantial completion for the maintenance but not necessarily be limited to:
1. Adjustment of sprinkler height and plumb to compensate for settling.
 2. Adjustment of head coverage arcs and nozzle types as necessary.
 3. Unstopping of plugged heads and adjustment of controller.
 4. Repair of broken lines or faulty equipment.
- C. Repair of damage caused by vandals, other contractors or weather conditions during the maintenance period shall be considered extra and shall be performed upon written approval by Owner at a material plus hourly labor cost.
- D. Supply to the Owner's maintenance staff, six (6) controller keys, (5) quick coupler keys with hose ells, (5) extra heads and nozzles of each type and valve and head adjustment equipment if applicable, at the completion of construction.
- E. The entire sprinkler system shall be guaranteed by the Contractor as to material and workmanship, including settling of back filled areas below grade for a period of one (1) year following the date of substantial completion of the work.

- F. The Contractor shall service the system at the Owner's request during the guarantee period.
- G. If, within one (1) year from the date of completion, settlement occurs and adjustments in pipes, valves and sprinkler heads, sod or paving is necessary to bring the system, sod or paving to the proper level of the permanent grades, the Contractor as part of the work under this Contract, shall make adjustments without extra cost to the Owner, including complete restoration of damaged planting, paving or other improvements of any kind.
- H. Should any operational difficulties in connection with the sprinkler system develop within the specified guarantee period, which in the opinion of the Landscape Architect or Owner's Representative may be due to inferior material or workmanship, said difficulties shall be immediately repaired at no additional cost to the Owner, including any other damage caused by such defects.
- I. Plant loss or damage due to Contractor's failure to maintain a properly functioning irrigation system during the maintenance period shall be the responsibility of the Contractor.

PART 2 – PRODUCTS

2.01 WATER METERS

- A. Meters shall be as per the local water district requirements.
- B. All stations connected to one controller shall be operated off the same meter as shown on the Drawings.
- C. Costs of meter to be paid by Contractor.

2.02 VALVES

- A. Gate Valves: Up to 3-inch size to be 125 lb. bronze construction with screw in bonnet, non-rising stem, sized to line, installed with valve sleeve to provide access to the handle. Gate valves shall have bronze hand wheel or operating nuts and shall be by Nibco or approved equal, installed as per manufacturer's recommendations.
- B. Electric Remote Control Valves shall be Rain Bird P.E.B., Hunter ICV (or pre-approved equal) as noted on the Drawings. Coordinate with Drawings.
- C. Valve Boxes: To be injection-molded of polyesters and fibrous inorganic temperature resistant components. Box shall provide adequate clearance to

operate and service valve. Valve boxes should be provided for each component separately as follows:

1. Remote Control Valves: 10" x 14" box with black lockable lids.
 2. Quick Coupler Valves: 10" dia. Box with green lockable lids.
 3. Gate Valves: 10" dia. Box with green lockable lids.
- D. Paint on lids the following identifications using paint and 1" high letters:
1. Remote Control Valves: RC
 2. Quick Coupler Valves: QV
 3. Gate Valves: GV
- E. Install valve boxes with minimum of 12" between valves and 6" from an adjacent walk structure. Boxes shall be square to adjacent edges.
- F. Quick Couplers shall be Rainbird DRC-33 Quick Coupler Valves or approved equal. Quick Coupler keys shall be 33DK with corresponding hose swivel or approved equal.

2.03 BACKFLOW PREVENTION UNITS

- A. Backflow prevention for the potable water system shall be a Pressure Vacuum Breaker Backflow Prevention Assembly, Febco #765 or equal. Backflow prevention units shall be installed in accordance with the requirements set forth by local codes. All piping into and from the assembly shall be copper.
- B. The pressure vacuum breaker shall be located in a secured area. Place inside an aluminum covered vandal resistant easy access backflow enclosure lockable box model SBBC (size as required to fit the backflow prevention assembly) as manufactured by V.I.T. Products, Inc., San Diego Ca. 1-800-729-1314. or equal. Contractor to install backflow in accordance to manufactures recommendations and provide required concrete slab for proper installation.

2.04 SPRINKLERS

- A. Refer to Equipment Schedule on Drawings.
1. All sprinklers shall perform to manufacturer's specifications concerning diameter of throw and gallonage at given pressures. Spacing of heads shall not exceed the manufacturer's maximum recommendations.

2. Heads of a particular type of function in the system shall be of the same manufacturer 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.
3. Lawn and Shrub Sprinkler Heads are to be models specified under zone listings on Drawings.
4. The sprinklers shall be Rainbird 1800 or Hunter Pro Spray (or equal) pop-up series model numbers noted on the drawings, providing adequate pop-up height depending upon the plant material being covered. Installed on flexible PVC pipe swing joint or pre-fabricated 1/2" or 3/4" swing joints as manufactured by Rainbird or Hunter.

2.05 SPRINKLER NOZZLES

- A. Refer to Equipment Schedule on Drawings. All equipment shall be as specified on drawings or approved equal.
- B. Matched precipitation nozzles either adjustable or fixed arc designed to accommodate Rain Bird 1800 Series Pop-ups (or approved equal) and Pressure Compensating screens.
- C. Bubblers for trees shall be Hunter PCN-50 on Hunter Pro Spray or Rainbird 1800 4" pop-up spray bodies or equal.
- D. Gear driven rotary spray heads, for large lawn areas, shall also be the pop-up type with bodies constructed of high impact plastic, fitted with vandal resistant screw. Suggested manufactures are Rainbird, Toro or Hunter.
- E. No risers are allowed.

2.06 PIPE

- A. All lateral pipes shall be polyvinyl chloride (PVC) Type 1, Grade 2, SDR 1220, 200 psi (Code 1220) and shall conform to current ASTM D-2241. Pipe on the pressure side of the irrigation control valves (mainline) shall be Schedule 40 PVC.
- B. Identification: All piping shall be continuously and permanently marked with manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 degree F. and National Sanitation Foundation (N.S.F.) approval.

2.07 FITTINGS AND SOLVENTS

- A. All fittings to be used on specific PVC pipe shall be Schedule 40 or 80, Type 1, unless otherwise noted on drawings, and must be of domestic manufacture. All fittings shall be of a type approved by the manufacturer of the pipe.
- B. Adapters: when connections are plastic to metal, male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base (Teflon paste, tape or equal).
- C. Solvent: Type as approved by pipe manufacturer to be compatible with PVC pipe and of proper consistency. Solvent shall be #715 Gray or Christy's Red Hot Blue glue, NSF approved as manufactured by Industrial Polychemical Service, Gardena, California or approved equal.

2.08 CONTROLS

- A. Automatic Controller: Refer to Equipment Schedule on Drawings or approved equals.
 - 1. The irrigation system controller shall use hybrid control technology and be capable of automatic, semi-automatic and manual operations. Controller shall be capable of receiving add on modules for future expansion. It shall be housed in a high-impact plastic, lockable [locking] enclosure suitable for outdoor use. The controller shall have a power input of 115 VAC and be capable of operating one 24 VAC station at 0.50 amperes (12 VA). In addition to the operating station, the controller shall be capable of running a 24 VAC Pump/ Master Valve output circuit at 0.37 amperes (9 VA). Total controller output load 1.4 amperes at 24 VAC.
 - 2. Transformer output to be 24 VAC, 1.5A (40 VAC). Station output 24VAC, 0.56A, 2 valves with maximum total output 24VAC at 1.4 amps, including master valve.

2.09 WIRING

- A. All wiring shall be per the National Electrical Code Requirements as to type and quality, approved for direct burial in ground, size to accommodate length of run and operate valves.
- B. Common Ground Wire: Solid strand #14 UF, minimum gauge, White.

- C. Control Wires: Between automatic controller and electric solenoid actuated remote control valve, to be solid strand #14 UF minimum gauge, colored other than White, solid copper, single conductor, 600 volt maximum rating or as required to service runs as shown on Drawings. Each valve shall have a single color of wire from the valve to the controller.
- D. Field splices between controller and valves are not permitted. Splices to have Pen-Tite, 3M DBY, or approved equal in valve box.

2.10 RAIN SWITCHES

- A. Furnish and install Hunter Mini Click Rain Sensor, manufactured by the Hunter Corporation, 1940 Diamond Street, San Marcus, California, 92069, telephone number 1-800-733-2823. Coordinate with the General Contractor and Landscape Architect or Owner's Representative for location prior to installation.

2.11 CONTAINER IRRIGATION FOR HAND WATERING OF CONTAINERS

- A. Furnish and install Wausau Tile Reservation System or pre-approved equal, Container Irrigation System for hand watering model no. TF4900 installed in accordance with manufacturer's instructions for new containers where indicated on the Drawings. Wausau Tile telephone number 1-800-388-8728. Provide all materials necessary for proper installation based upon manufacturer's proprietary literature from Wausau Tile, Inc. Equals must comply with minimum levels of material and detailing indicated on details to be obtained from Wausau Tile, Inc. Submit Product data and Shop Drawings to Architect for review prior to ordering and providing materials.

2.12 OTHER MATERIALS

- A. All other materials not specifically described, such as air relief valves and automatic drain valves, 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 Landscape Architect or Owner's Representative.

PART 3 – EXECUTION

3.01 SURFACE CONDITIONS

- A. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
- B. Verify that the irrigation system will be installed in strict accordance with pertinent codes and regulations, the original design, the referenced standards and the manufacturer's recommendations.

3.02 FIELD CONDITIONS

- A. Verify field conditions including property lines, rights-of-ways, tract boundaries, easements, landscape setback lines and any other legal or physical element as required for the successful completion of the project.
- B. In the event of discrepancy, immediately notify the Landscape Architect or Owner's Representative. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.
- C. Make necessary measurements in the field to insure precise fit of items in accordance with the original design as are commonly encountered underground and take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, promptly notify the Landscape Architect or Owner's Representative to verify the need for field modifications. Proceed in the same manner if rock layer or any other conditions encountered underground make changes advisable.

3.03 TRENCHING AND BACKFILLING

- A. Excavation shall be open vertical construction sufficiently wide to provide free working space around the work installed and to provide ample space for backfilling and compacting.
- B. Exercise reasonable care to avoid causing damage to any underground utilities and structures. Utility locating services shall be called upon to pinpoint the location of any underground utilities on site of the project. Damages to utilities and structures that were indicated on the Drawings or could have been verified in advance are the responsibility of the irrigation contractor and shall be repaired in a timely manner.

- C. Be responsible for the removal of unsuitable materials from the trench encountered during excavation and removal of any unnecessary backfill. All excavation shall be unclassified and shall include all materials encountered.
- D. Trenches for pipe shall be cut to required grade lines, and trench bottom shall be compacted to provide an accurate grade and uniform bearing for the full length of the line.
- E. Backfill materials shall be approved soil. Unsuitable material, including clods and rocks over 1/2 inch in size, shall be removed from the premises and disposed of legally at no cost to the Owner.
- F. Backfill material shall be free from rocks, large stones and other unsuitable substances that could damage the pipe or create unusual settling problems.
- G. Backfilling shall be done carefully and shall be in accordance with Section 02200.
- H. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe: see details on Drawings.
- I. Surplus earth remaining after backfilling shall be disposed of on the premises as directed by the Landscape Architect or Owner's Representative. Regarding after removing extra backfilling shall be completed to Landscape Architect or Owner's Representative's approval. Do not mix subsoil with topsoil or planting soil mix.

3.04 INSTALLATION OF PIPING

- A. Irrigation piping layout is schematic. Contractor can make minor adjustments to the system as required to avoid physical elements or conform to other site conditions. There should be no conflicts between irrigation system, planting and structural elements. The Contractor is responsible for maintaining coverage as indicated, for obtaining prior approval of any such adjustments from the Landscape Architect or Owner's Representative and for recording any such change.
- B. Prior to installation, indicate final location by stakes or other means of control equipment for approval by Landscape Architect or Owner's Representative if the plan is altered. Contractor shall allow for possible minor adjustment due to actual site conditions.
- C. Verify the static pressure, size of service at each point of connection and make final connections allowing for possible minor deviations from locations shown on Drawings due to site conditions or resulting from modifications to the systems

design at the time shop drawings are developed by the Contractor. Any deviation from design criteria shall be brought to the attention of the Landscape Architect or Owner's Representative at the time shop drawings are prepared and if necessary at time of installation. Continuation of work without making prior notification to the Landscape Architect or Owner's Representative shall be at Contractor's risk and expense.

- D. Sleeves shall be provided in some locations as noted on Drawings. Where sleeving is required under existing pavement, it shall be installed by boring or hydraulic driving as per Texas Highway Specifications at Contractor's expense.
- E. Carefully inspect pipe and fittings before installation removing dirt, scale, and burrs and reaming as required. Install pipe with markings up for visual inspection and verification.
- F. PVC pipe shall be installed in a manner that will provide for expansion and contraction as recommended by the pipe manufacturer, including snaking-in to prevent strain during cold weather. One additional foot per 100 feet of pipe is the minimum allowance for snaking.
- G. System Main: Installation of the system main shall be in accordance with the manufacturer's instructions and shall proceed from the point of connection of supply from the existing line.
 - 1. Before backfilling the main line with control valves in place, but before lateral pipes are connected, completely flush and test the main line and repair leaks. Flush out each section of lateral pipe before sprinkler heads are attached.
 - 2. Make necessary provisions for thoroughly bleeding the line of air and debris.
 - 3. The main shall be flushed and pressure tested for 24 hours prior to making any lateral connections.
- H. Lateral Lines: Lateral lines may be installed by standard trenching techniques. Lateral pipes and fittings shall be installed in accordance with the manufacturer's recommendations, including the snaking-in of PVC pipe to prevent excessive strain when contracting in cold weather. All lateral lines should be connected to the side of the main line and be thoroughly flushed prior to the installation of any automatic valves or sprinkler heads.

3.05 PIPE JOINING

- A. Use only the specified solvent and make joints in strict accordance with the manufacturer's recommended methods. Give solvent welds at least one-hour setup time before moving or handling and 24 hours curing time before filling with water.
- B. Threaded Joints for Plastic Pipes:
 - 1. Use Teflon tape on threaded PVC fittings except where Marlex fittings are used.
 - 2. Use strap-type friction wrench only. Do not use metal-jawed wrench.
 - 3. When connection is plastic to metal, male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon tape or equal upon approval.
- C. Threaded Joints for Galvanized Steel Pipes:
 - 1. Factory-made nipples shall be used wherever possible. Field-out threads in pipes will be permitted only where necessary.
 - 2. Use pipe joint compound to make threads only.

3.06 INSTALLATION OF CONTROLLING EQUIPMENT

- A. All control lines shall be installed in a neat orderly fashion and may be installed either in the main or lateral trenches. The lines shall be bundled together, taped every 10' and placed under the main or lateral pipes.
- B. Automatic controller(s) shall be installed in enclosures at the location(s) shown on the Drawings.
- C. The controller's final locations shall be approved by the Owner's Representative according to the locations shown on the Drawings.
- D. Provide additional wire at the terminal or furthestmost main line locations.
- E. National Electrical Code Requirements shall take precedence in furnishing and/or connecting of 110-volt electrical service to the controller.
- F. Adequate coverage (18 inch min.) of the 24-volt service wire leading from the controller shall be installed from the bottom of the controller to trenches.
- G. Electrical equipment and wiring shall comply with the National Electrical Code and be installed by those skilled licensed in the trade.

- H. Connecting and splicing of wire at the valves shall be made using Pen-Tite Connectors, Scotch-Lok or approved equal. No other splices will be allowed.
- I. Tape all control wire to the underside of all mains at 10' intervals.
- J. Thoroughly clean, balance and adjust the various components of the sprinkler system so the overall operation of the system is most efficient.

3.07 INSTALLATION OF VALVES

- A. Valves shall be installed in accordance with manufacturer's recommendations.
- B. Automatic valves shall be sized as shown on Drawings. Gate valves shall be line size.
- C. Install each control valve in a separate valve box with a minimum of 12 inches between valves and 6 inches from any walk or structure.
- D. Valve boxes are to be installed in accordance with Drawing details and manufacturer's recommendations. Paint on lids the following identification using white paint and 1 inch high letters:
 - 1. Remote Control Valves: RC
 - 2. Quick Coupler Valves: QC
 - 3. Gate Valves: GV
- E. Adjust remote control valves so that the remote sprinkler heads operate at the pressure recommended by the head manufacturer. Adjust remote control valves so a uniform distribution of water is applied by the sprinkler heads to the planting areas for each individual valve system.

3.08 INSTALLATION OF OTHER EQUIPMENT

- A. Water meter(s): Install as per requirements of the local water district and local codes. The Contractor will pay costs. Connect into existing water meter as per requirements of the local water district and local codes.
- B. Backflow Prevention Device: Install according to local codes and manufacturer's latest printed instructions. Device to be tested and certified in accordance to local codes.

3.09 TESTING AND INSPECTIONS

- A. Upon completion of the irrigation system and after sufficient time has allowed for solvent weld joints to cure, the entire system shall be tested for proper operation.
- B. Furnish necessary testing equipment and personnel.
- C. Before testing, fill the line with water for a period of at least 24 hours.
- D. Prior to installation of control valves, test live water lines for leaks.
- E. Correct leaks or deficiencies in system and retest until acceptance by the Owner's Representative or Owner.
- F. Do not allow or cause any of the work of this Section to be covered up or enclosed until it has been inspected, tested and approved by the Owner, authorized agencies or Owner's Representative.

3.10 COMPLETION AND ACCEPTANCE

- A. Notice of Completion: When the Contractor is satisfied that the system is operating properly, is balanced and adjusted, all work and clean-up is completed and all controllers and stations have been labeled individually according to Drawings, he shall issue a notice of completion to the Landscape Architect and Owners authorized representative. The notice of completion shall include the request for final inspection with date and time given.
- B. Final Inspection: Upon receipt of written notice that work is ready for final inspection by the Landscape Architect or Owners authorized representative, the Landscape Architect or Owner's Representative shall inspect the job, and a written copy of corrections shall be given to the Contractor. The Contractor should be prepared to fully explain to the maintenance personnel how the system works.
- C. Demonstrate the entire system to the Owner's Representative to show that control valves are properly balanced, heads are properly adjusted for radius and are of coverage and the installed system is workable, clean and efficient.

END OF SECTION

SECTION 32 90 00 – PLANTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Work under this section shall include the performance and completion of planting work indicated on the drawings and specified herein. It includes but is not limited to the following:
 - 1. Furnishing and placement of backfill topsoil and soil backfill mixes.
 - 2. Furnishing and placing of compost over planting bed and areas to be hydromulched.
 - 3. Soil preparation and furnishing and application of soil amendments, compost and mulch over planting areas.
 - 4. Furnishing and placement of parking area perimeter gravel and drainage rock over specified geotextile fabric.
 - 5. Furnishing plants and planting operations.
 - 6. Finish grading of planting areas and lawn areas to ensure proper drainage.
 - 7. Disposal of excavated earth and clean up in areas affected by this work.
 - 8. Protection, maintenance, establishment of turf and warranty of planting.
- B. Related Work Specified Elsewhere:
 - 1. Division 31, Earthwork
 - 2. 32 91 19, Landscape Grading
 - 3. 32 92 13, Hydro-Mulching
 - 4. 32 01 90, Operations and Maintenance of Planting
 - 5. 32 80 00, Irrigation

1.3 SUBMITTALS

- A. Submittals to the Owner's Representative:

1. Proposed work schedules within ten (10) days after the Notice to Proceed.
2. Documentation within thirty (30) days of first Payment Request that plant and turf materials have been located and ordered.
3. ***Certificates indicating authenticity of species for the Highrise Oak trees must be provided to Landscape Architect prior to ordering materials.***
4. ***Purchase Orders of plant materials must be presented at time of installation to Landscape Architect prior to installation of materials.***
5. Letter stating the intended plant material is suited for its intended purpose and is disease free and suited for planting during the season work is being performed – signed by material supplier.
6. Samples and analysis of materials: Submit a 1 qt sample of topsoil, 1 qt sample of compost, 1 qt sample of shredded mulch in a ziploc or sealable baggie with a label indicating the supplier of the material. Supplier name, address and phone number of a contact shall be clearly indicated on the label. Samples without labels will be returned without review. Suppliers of the compost shall include a copy of their most recent soil biology test results indicating the soil to be aerobic and in a viable condition. Samples must be submitted for approval prior to ordering.
7. Submit in writing the names of organic weed killers and method of application intended for use.
8. Submit sample and certified analysis of fertilizers to the Owner's representative prior to delivery.
9. For standard products, manufacturer's analysis will be acceptable with labels indicating source and composition of material. Materials may be analyzed by a licensed laboratory in accordance with the current method of the Association of the Agricultural Chemists.
10. Certificates of Inspection by the County or State Agriculture Inspector or verification by producing shipping invoices indicating the plants were grown by a licensed nursery, are to be submitted at time of inspection to the Owner's representative.
11. Submit manufacturer's label on all organic materials, for pest, disease and weed control.
12. Submit maintenance instructions for the plants installed including water requirements, fertilization schedule, and other related maintenance items.

13. Material submittals shall be made as required and noted below in section 2.3 below.

1.4 STANDARDS

- A. Botanical plant names used on the drawings conform to the most recent nomenclature authorities available including Hortus Third, Liberty Hyde Bailey Hortorium, 1977.
- B. The following documents, used as standards are to be a part of these specifications: American Joint Committee on Horticultural Nomenclature "Standardized Plant Names" and the American Associations of Nurserymen, Inc. "American Standard for Nursery Stock" (latest edition).

1.5 REVIEW AND APPROVAL OF MATERIALS

- A. Written request for required reviews of plant materials and work by Owner's representative must be received ten (10) days prior to the anticipated review. State location and quantity of plants to be reviewed or type of review requested.
- B. Review: All materials may be reviewed and approved by the Owner's representative at the source of supply as to species, size, form and quality of the above ground growth. However, such approval does not alter the Owner representative's right of review and rejection of materials upon delivery to the project site or during progress of the work for improper shipment, incorrect ball specification, or physical damage caused in handling and storage. All rejected materials shall be immediately removed from the site.
 1. The plants shall be clearly labeled as to genus, species and variety with a weatherproof label attached to not restrict growth.
 2. The Contractor shall assemble plants grouped to conform to plant list on the drawings, with separation between species of variety groups to allow reasonable access for viewing and inspection of plants.
 3. The Owner's representative reserves the right to require root ball washing of two percent (2%) of materials to inspect root girdling or root bound conditions. If 2% are unsatisfactory, the entire lot shall be rejected. Rejected plants shall be removed immediately from the site and replaced with acceptable material. No placing or planting shall be done until the Owner's representative has approved plants for quality.

- C. Approval of individual plant specimen by the Owner's representative may be construed as constituting approval of all other specimens of that plant species providing all specimens are identical in quality to the approved specimen. Approval shall not impair the right of further inspection and rejection of material during the progress of work.
- D. Plants are also subject to inspection by the Owner's representative upon delivery and during the progress of work.
- E. Owner's representative shall review the work after planting operations are complete for establishing the maintenance period covered under this contract.
- F. Owner's representative shall review the work for final acceptance.
- G. Material testing: The Contractor shall pay the cost of testing materials not meeting specifications.

1.6 PROTECTION AND HANDLING OF PLANTS

- A. Insofar as is practicable, plant materials should be planted on the day of delivery to the site. In the event that this is not possible, the Contractor shall protect that stock not planted.
 - 1. Container grown plants shall remain in their container until ready to be set in their plant pit.
 - 2. Plants shall not be bound with wire, rope or other materials in a manner which damage the bark, break branches, or destroy the shape of the plant. All plants shall be watered as necessary until planted.
- B. Guarantees: Plant materials except turf grass shall be guaranteed by the contractor to be in vigorous growing conditions from the date of final acceptance of the completed project by the Owner or from a date seven days after certification by the Owner's representative that the project is complete, whichever comes first, for a period of time as follows: One year for all shrubs and ground covers and one year for all trees.
 - 1. Materials and workmanship include a one-year guarantee excluding traditional acts of nature and lack of Owner's maintenance.
- C. Replacements: After thirty (30) days from Substantial Completion AND 10 days prior to the completion of the Maintenance Period (360 days) the site will be reviewed by Owner's Representative and any materials to be replaced under the guarantee are to be identified and Contractor shall provide replacement. Also, prior

to the end of the one-year guarantee period if a plant is found to be dead, it shall be replaced by the Contractor within one week of the date requested by the Owner's representative at no additional cost to the Owner.

1. All replacement plants shall be of the same kind, size and quality as originally specified.
 2. Replacement shall be at the Contractor's expenses except for those required because of damage by vandals, animals, fire neglect by the Owner, or other causes not attributable to the Contractor's neglect.
- D. Personnel: Planting shall be performed by experienced workmen familiar with planting procedures and under the supervision of a qualified planting foreman. The planting foreman shall be on the job site whenever planting is in progress.
- E. Transporting, handling and storing trees and plants:
1. Trees are to be transported to the site in a covered vehicle that prevents wind and temperature extremes.
 2. Plants are to be well watered prior to shipping and checked for moisture at arrival.
 3. On site plant material is to be maintained under shade and irrigated twice daily.
 4. Trees are to be protected from extreme temperatures, freezing or extreme heat until installed.
 5. Trees are to always be handled by the root ball using straps or powered equipment and not by lifting using branches or the trunk. The trunk should be wrapped during shipping and the planting process for protection.

1.7 ONE YEAR (360 calendar days) Maintenance:

- A. ***Maintenance covered under this contract shall begin immediately after each plant is planted and shall be M A I N T A I N E D for 360 calendar days AFTER Substantial Completion is determined AND plants are accepted in vigorous thriving condition.*** Contractor's work will be accepted only when it is in a fully completed, undamaged condition with all of the Architect's and Consultants' final review punch list items have been completed. Until such time the Contractor shall have full responsibility and ownership of all materials, workmanship and maintenance related to the Work.

1. Maintenance activities include watering, weeding, cultivating, mulching, adjusting of stakes, removal of dead materials, resetting plants to proper grades or upright positions, restoration of the planting saucer and any other procedure consistent with good horticultural practice.
 - a. Water all planting as necessary; quantity applied at any one time shall be sufficient to penetrate the soil to a minimum depth of six inches.
 - b. Weeding: Keep all planting areas free from weeds and undesirable grasses.
 - c. Refer to Section 32 01 90 Operation and Maintenance of Planting and Section 32 80 00 Irrigation for additional maintenance requirements.

PART 2 – MATERIALS

2.1 PLANT QUANTITIES

- A. The Contractor shall supply plant materials in the quantities necessary to complete the Work as shown on the drawings. Quantities of groundcover and turf grass, as indicated on plans and in the plant list are approximate only. These materials shall be provided in quantities sufficient to properly plant the designated areas at the spacing indicated on the drawings.
- B. Plants specified on drawings are available from, but not limited to:
 1. TreeSource, 5312 Elm St., Tel.no. 713-667-5700
 2. Newton Wholesale Nursery, 1261 Brittmore Rd., Tel.no. 713-365-9917
 3. Southern Pride Tree Farm, Inc. Tel. no. 386-935-3636
 4. Montellaro's Nursery, Tel.no. 210-655-2192
 5. Native Texas Nursery, Tel. no. 877-962-8483
 6. Treeseach Farms, Tel. no. 713-937-9811
 7. Cherry Lake Tree Farm, Tel. no. 800-429-2171
- C. GC shall provide written notice to Owner's Representative if specified materials are not available from local or national nurseries prior to start of work. If materials are available at time of Notice to Proceed being issued, but may be unavailable at time of planting, GC will be required to pay for materials in advance and store and maintain materials until the scheduled planting date.

2.2 PLANT QUALITY

A. All plants shall be sound, healthy specimens typical of their species with well-formed tops and roots and shall be free from injurious insects, insect eggs, or larvae, diseases, serious injuries to the bark, root or foliage, broken branches, or any other disfigurement.

1. All plants are to be container grown unless otherwise noted. Container grown plants shall be of a reasonable age and state of development for the size container specified. Plants shall have been growing in their container long enough to have developed a good sound root system capable of holding the entire soil mass intact after removal from the container, but not so long as to have become pot bound. All container grown nursery stock shall be healthy, vigorous, well-rooted, and established in the container in which was growing. Container grown nursery stock shall have a well established root system reaching the sides of the container to maintain a firm ball when the container is removed but shall not have excessive root growth encircling the inside of the container.

2. Minimum acceptable tree Height-Caliper relationship:

Container	Height	Spread	Caliper at 1'-0" Above Root Cap	Branch Height
15 Gal	6' - 8'	2.5'-3'	1.25" - 1.5"	3'-4'
30 Gal	8' - 10'	4'-5'	2" - 2.5"	4'-5'
45 Gal	10'-12'	5'-6'	2.5"-3"	5'+
65 Gal	12'-14'	6'-7'	3"-3.5"	5'+
95 Gal - 100 Gal	14'-16'	7'-8'	4"-4.5"	5'+

3. Plants with broken, pruned or multiple leaders shall not be acceptable.

4. Trees are to have trunks free from all cuts and scratches.

5. Container grown plants pruned so that foliage mass is not equally distributed between the upper 1/3 and the lower 2/3 of the trunk in plants less than 8 feet height are not acceptable.

6. Ground cover from flats shall have a well-developed root system and display an active growth pattern at the tip.

2.3 MATERIALS

A. Topsoil:

1. Imported topsoil shall be clean, fertile, friable, sandy loam soil capable of supporting plantings in a thriving condition. Worn out soil from rice farming that is contaminated with agricultural chemicals and salts, and full of weed seeds will NOT be accepted. Soils that contain more than 50% clay particle size 0.002, have rocks, debris or clods that will not pass a 1" screen, show signs that they were stripped from weed infested sites, or show appreciable amounts of subsoil with no organic matter shall not be delivered to the site. Topsoil shall be similar in texture and composition to the existing soil it is to be incorporated into. Submit a one-quart sample indicating source in writing on label for approval.
 2. Existing soil: On site or existing soil shall be cleaned and free of construction debris. It shall be loose, weed free and friable prior to use. Existing soil shall be tested at Contractor's expense if requested for use on site and shall be modified to provide a pH no less than 6 and no greater than 8. Provide soil test results to Landscape Architect for approval prior to proceeding with use of existing soil.
- B. Compost: Shall be well decomposed, stable, weed free organic matter. Shall consist of very organic aerobically composted humus containing manures, leaves, bark fines, rice hulls, and other valuable organic components. Materials are to be fully composted under sustained temperatures to 165 degrees F, have high nutrient value, free of weeds, weed seeds, and insect pests. It shall contain no substances toxic to plants and shall be reasonably free (<1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors, shall not resemble the raw material from which it was derived, shall be a color that matches a 70% cocoa dark chocolate candy bar - the color is an indication of aerobic content in the compost and helps to avoid compost that has been burned and brought into an anaerobic state.
1. For acid loving plants, provide only compost that has not received the addition of liming agents or ash by-products.
 2. Compost containing available nutrients for plant materials and lawn areas must be provided; the use of unstable or immature compost will not be approved.
 3. Compost shall have pH within a range of 5.5 - 8.5. Care shall be given when using compost possessing a basic pH >7 near acid loving plants. A pH adjustment of the finished soil/compost mix may be necessary.

4. Compost is available from (but not limited to) Nature's Way Resources, telephone number 1-936-321-6990. Submit sample with written label indicating source and confirming composition.
- C. Commercial Fertilizer: All commercial fertilizer shall be organic and conform to all state fertilizer laws and shall be delivered in original, unopened containers, each bearing the manufacturer's guaranteed analysis, and shall be uniform in composition, dry, and free flowing. Any fertilizer that becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted. Use the following fertilizers in the different areas noted below:
1. Trees, Shrub and Ground Cover Areas: MicroLife 6-2-4 or pre-approved equal applied in accordance with manufacturer instructions.
 2. Plant stimulant: Water all plants in well with Super Seaweed Biostimulate and thoroughly drench root mass.
 3. Soil Mix for all Plants: Nature's Way Resources blended compost/top soil/washed sand mix or pre-approved equal. Nature's Way telephone number is 1-936-321-6990.
 4. Microlife Ultimate 8-4-6 and Super Seaweed are available from but not limited to San Jacinto Environmental Supplies, telephone number 713-957-0909
 5. NO FERTILIZER FOR HYDROMULCH AREAS.
- D. Herbicides: Organic Granular pre-emergent herbicide used shall be safe to lawns, trees, shrubs, and ground covers. When an Organic Post-emergent herbicide is provided, it must be applied in a manner that will not damage other plant materials that are not weeds. Contractor will be responsible for replacing any damaged plant materials resulting from lack of care during applications of post-emergent herbicides at no additional cost to Owner.
- E. Organic Insecticides and Pesticides: To be applied on an as needed basis only and are not a part of regularly scheduled maintenance tasks. When insecticides or pesticides are provided they must be applied in a manner that will not damage other plant materials that are not being treated. Primary form of insect and pest management should be organic controls unless determined to be ineffective or impractical. If organic controls cannot be used, chemical controls are to comply with applicable laws governing their use and are to be used with Contractor's care to read and follow all labels and instructions - ONLY IF PRE-APPROVED by Landscape Architect. Contractor will be responsible for replacing any damaged

plant materials resulting from lack of care during applications of insecticides or pesticides at no additional cost to Owner.

- F. Water: Water for all necessary operations of the contractor at the site will be furnished by the Owner. The contractor shall provide the facilities needed to make connections and convey the water to the places where it will be needed.
- G. Mulch for general planting shall be Native Double Shredded Cedar Mulch: A 2" minimum coverage depth is to be applied on all planting beds. Mulch shall not cover tree root flairs or leaves and branches of shrubs and groundcovers. Cedar oil shall be present within the shredded mulch. Submit sample with written label indicating source and confirming oils to be present. Available from (but not limited to) Living Earth Technology, telephone number 281-579-1472.
- H. Green sand: Sand rich in iron, potassium, calcium and dozens of other minor and trace elements required for healthy plants. Available from (but not limited to) Nature's Way Resources. Nature's Way telephone number is 1-936-321-6990. Submit sample with written label indicating source and confirming composition.
- I. Sharp sand: Shall consist of clean, washed sand, fine to course sizes meeting the requirements of ASTM C33. Submit sample with written label indicating source.
- J. Edging:
 - 1. At Planting Beds:
 - a. Clearline Aluminum Landscape Edging by Permaloc. Install according to manufacturer's instructions.
 - 2. At Black Star Gravel locations:
 - a. Permastrip edging by Permaloc aluminum edging. Install according to detail shown on Drawings and Manufacturer installation instructions.
 - 3. At Decomposed Granite and Tree locations:
 - a. Permastrip edging by Permaloc aluminum edging. Install according to manufacturer's instructions.
 - 4. Permaloc is available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713-957-0909
- K. Tree Staking Materials: Contractor shall use staking materials necessary to meet requirements of specifications, subject to approval. Stakes shall be below grade tree stabilizing system as provided by Tree Staple, Inc. or pre-approved equal. Tree Staples shall be installed (3) per tree and in accordance with the Installation

Specifications as provided by the manufacturer. Plant Schedule has 4 inch caliper trees specified. Model TS36-10-10 or TS42-12-12 may be required. The proper size Tree Staple shall be selected by measuring the depth of the root ball and adding 12 inches. The determined length should equal the long prong of the Tree Staple device. If necessary, round up to the next size. Tree Staple, Inc. telephone number is 1-877-TREES-49. Submit manufacturer installation instructions for approval prior to ordering.

- L. Plant Pit Backfill Mix: mix for use in backfilling plant pits shall be prepared in the following proportions by volume (Coordinate with Civil structural soil requirements prior to installation):
 - 1. For shade and ornamental trees:
 - a. 5 parts topsoil
 - b. 2 parts compost
 - c. 1 part green sand
 - d. Granular Humates Soil Amendment applied in accordance and in ration as recommended by manufacturer. Granular Humates is available from San Jacinto Environmental.
 - e. MicroLife 6-2-4 Plant Fertilizer applied in accordance and in ratio as recommended by manufacturer.
 - 2. For shrubs, ground covers and perennials:
 - a. 1 part shredded mulch
 - b. 1 part compost
 - c. 1 part topsoil
 - d. 1 part green sand
 - e. Granular Humates Soil Amendment applied in accordance and in ration as recommended by manufacturer. Granular Humates is available from San Jacinto Environmental.
 - f. MicroLife 6-2-4 Plant Fertilizer applied in accordance and in ratio as recommended by manufacturer.
- M. Drainage River Rock: Provide Rainbow River Rock Boulders in two layers to cover catch basins located within planting bed areas and to cover drainage paths where shown on the Drawings. Rainbow river rock boulders shall be 6" to 10" sizes and is

available from but not limited to Living Earth Technology Company, telephone number 281-579-1472.

- N. Geotextile Fabric for over catch basin drains located within planting beds and at Black Star Gravel areas indicated on the Drawings: Provide Polyspun XL Soil Separator below areas to receive perimeter parking gravel and drainage river rock. Install according to manufacturer instructions. Polyspun XL Soil Separator is available from but not limited to San Jacinto Environmental Supplies, telephone number 713-957-0909.
- O. Root Barrier: Provide BioBarrier root barrier or pre-approved equal, installed in accordance with manufacturer's instructions. Locate adjacent to paving where indicated on Drawings. BioBarrier is available from but not limited to San Jacinto Environmental Supplies, telephone number 713-957-0909.
- P. Decomposed Granite at tree areas:
 - 1. Materials shall be in compliance with ASTM C33, crushed stone or crushed gravel. Material shall be clean, hard, durable particles or fragments of ¼" minus fines, select brown/gray crushed granite, river rock or basalt. Fines shall be evenly mixed throughout the aggregate. Color to be California Gold, Brimstone or Architect approved equal.
 - 2. The portion retained on the No. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77 and AASHTO T-90-81, respectively.
 - 3. The crushed aggregate screening shall be free from clay lumps, vegetable matter, and deleterious material.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

- A. The Contractor shall make an examination of the site of the proposed work and completely familiarize himself with the nature and extent of the work to be encountered. No extra compensation will be allowed for any work made necessary by unusual conditions or obstacles encountered during the progress of the work which conditions or obstacles are readily apparent upon a visit to the site.
 - 1. The Contractor shall notify the Owner's representative of any discrepancies between the plans and actual site condition.

3.2 PROTECTION OF EXISTING FACILITIES AND VEGETATION

- A. The Contractor shall be held liable for the cost of repairing any damage inflicted by his operations to existing facilities (i.e., concrete curbs, sidewalks, etc.) and vegetation. The Contractor shall be responsible for the protection of foliage, trunk, branches, and roots of all existing trees and shrubs designated to remain on project site.

3.3 TIME OF PLANTING

- A. Planting operations shall be conducted under favorable weather conditions during the seasons that are normal for such work as determined by accepted practice in the locality. Contractor shall be responsible for replacing any materials damaged due to proceeding with installation of plant materials during unfavorable weather conditions at no additional cost to Owner.

3.4 SOIL PREPARATION OF PLANTING AREAS (Coordinate with demolition requirements of paved areas that are being removed prior to installation that are to receive planting and / or lawn areas):

- A. Where applicable for removed paved areas ensure that 2 ft of dirt previously below paved surfaces have been removed and area wetted down for 48 hours. Allow to dry prior to backfilling. Blend 4 inch depth of compost with topsoil to backfill removed dirt.
- B. For all areas that are currently lawn but are to be planting beds or new hydro-mulched areas, strip lawn and rake 4 inch depth of compost into remaining soil. Wet down for 48 allows and allow to dry.
- C. Place a 3" - 4" layer of soil mix with blended compost, top soil and green sand mix. Work in biological organic fertilizer into the top 2 to 8 inches of soil. Follow label directions. Perform percolation testing to ensure good drainage prior to proceeding with plant installation.
- D. Rototill all together to a depth of 8 to 12 inches below original grade until all particles are golf ball size or smaller. Remove rocks, roots, and debris. Fumigate to eliminate soil-born insects, diseases, and nematodes. Use a material with a short residual effect. Read and follow all label directions.

3.5 LAYOUT AND EXCAVATION OF PLANTING AREAS

- A. Layout plants in locations shown on drawings. Use wire stakes color-codes for each species of plant material. Stake location of each tree and major shrub and

outline of shrub and ground cover beds. Stake out on the ground locations for all trees and outline for shrub and ground cover beds prior to excavation for planting is begun.

- B. If underground obstructions are encountered notify the Landscape Architect as to whether an adjustment or change of location is possible within the design intent. In order to minimize conflict, secure and verify with the project owner exact locations of all underground utility lines and other structures.
- C. Subsoil shall not be worked when moisture content is so great that excessive compaction will occur, nor when it is so dry that clods will not break readily. Water shall be applied, if necessary, to bring soil to an optimum moisture content for tilling and planting.

3.6 EXCAVATION

- A. Do not excavate tree pits more than 24 hours in advance of planting operations.
- B. **Perform Percolation Test** to test drainage of Tree Pits, plant beds and plant pits by filling with water twice in succession **PRIOR TO INSTALLATION OF PLANT MATERIALS**. Conditions permitting the retention of water for more than 24 hours shall be brought to the attention of the Owner's representative. See Section 3.8 below.
- C. If rock, hardpan, underground construction work, tree roots or other obstruction are encountered in the excavation of plant pits and beds, alternate locations may be selected by landscape Architect. Where locations cannot be changed, the Contractor shall submit cost estimate required to remove obstructions to a dept of not less then 12" below the required pit or bed depth.
- D. Contact utility companies for locations of lines prior to start of excavation.

3.7 PLANT PITS (Coordinate with Civil structural soil requirements prior to installation):

- A. Plant pits shall be as shown on Drawings.
- B. Rough-up or score sides of the tree holes to prevent glazing or compaction of planting hole and potential obstruction of lateral root growth.
- C. Plant the tree with the root ball at least 2 inches above the soil line with the trunk flare / root flare and uppermost roots at least level with the backfill surrounding the tree and exposed.
- D. Gradually straighten the tree as the backfill is added.

- E. Slice a shovel or spade around the backfill to settle the soil and remove air pockets. Remove heavy clay pans. Do not step firmly on the backfill which may cause excessive compaction.
- F. Amend and pocket plant shrub and ground cover beds and provide any necessary drainage when soil condition so require. Connect under drains to nearest storm drain, man-hold inlet or junction box.
- G. Amend and Pocket Plant Dimensions for Shrubs and Ground covers:

Excavation for:	Width	Depth
Shrubs	entire bed	can + 10" minimum
Ground cover	entire bed	can + 8" minimum

- H. Excavate shrub and ground cover beds and provide any necessary drainage when soil condition so require.

3.8 SURFACE DRAINAGE and FRENCH DRAINS FOR PLANTING AREAS

- A. The Contractor shall bear final responsibility for proper surface drainage of planted areas. Any discrepancy in the drawings or specifications, obstructions on the site, or prior work done by another party, which Contractor feels precludes establishing proper drainage shall be brought to the attention of the Owner's representative in writing for correction or relief of said responsibility. IF CONTRACTOR FAILS TO BRING DISCREPANCIES TO THE ARCHITECT AND LANDSCAPE ARCHITECT ATTENTION AND PROCEEDS WITH PLANT INSTALLATION, CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS RELATED TO CORRECTIONS NEEDED TO PROVIDE PROPER DRAINAGE.
- B. The Contractor shall provide positive surface and or sub-surface drainage. For landscaped areas provide a 2% slope of planting beds if possible, or provide French Drain. If the inability to provide proper slope for drainage is due to a hidden condition, AND, the Contractor properly notifies the Architect and Landscape Architect in writing regarding the conflict, a Change Order may be requested in order to proceed with providing a French Drain or alternative method to provide the proper drainage. See 3.8A above.

- C. French drains: Contractor shall provide French drains consisting of a 4 inch diameter A.D.S. perforated polyethylene tubing by Advanced Drainage System, Inc. or approved equal, with sock filter, end caps and fittings as required for a complete installation.
1. French drain shall be installed where planting beds and lawn areas meet, in tree wells, planters or other areas contained by walks and/or paving, or in areas of planting that a 2% slope cannot be achieved due to site conditions. French drains shall be connected to the storm sewer system if possible.

3.9 INSTALLATION OF PIT PLANTED MATERIALS

- A. Fill plant pits with soil mix to compacted depth to received plant root ball, so top of root ball is two inches above finished grade.
- B. Scarify the walls and bottom of all plant pits immediately prior to the placement of plant and backfill mix. The Contractor shall remove all glazing caused by an auger or mechanical hole digger.
- C. Evenly distribute commercial fertilizer as specified above.
- D. It is recommended that commencement of planting operations be started only when irrigation system is completely functioning.
- E. Smooth planted areas to conform to specified grade after full settlement has occurred.
- F. Mulch circle shall meet lawn or bed grades evenly and smoothly. Do not create a watering basin unless specified on drawings.
 1. Water all plants immediately after planting.
 2. **Do not pile mulch against the trunk of the tree.** Mulch is to stay 12 inches away from trunks of trees in all locations.
 3. Apply Organic Granular pre-emergent weed control material in areas to receive shredded mulch.

3.10 INSTALLATION OF BED PLANTED MATERIALS

- A. Fill all shrub beds with plant bed mix to finished grade (compacted) plus two inches.
- B. Excavate in planting mix for individual plant and install as required. Set plants plumb and brace rigidly in position until planting soil mix has been tamped solidly around the ball and roots.

- C. Apply organic fertilizer prior to installing the plant materials.
- D. Water thoroughly, saturating root balls before installing remainder of the planting solid to top of pit, eliminating all air pockets in the process. Top of root ball shall be a maximum of two inches above finished grade.
- E. Smooth planting areas to conform to specified grade after full settlement has occurred. Contractor shall bear final responsibility for proper drainage of planted areas.
- F. Water all plants immediately after planting.
- G. Apply Organic Granular pre-emergent weed control material over entire area to receive mulch.
- H. Mulch all shrub and ground cover beds with specified mulch two inches in thickness.

3.11 STAKING OF TREES WITH CALIPER SIZES 3 1/2" and greater:

- A. Trees 3-1/2" cal. or greater shall have three stakes spaced as required by the manufacturer of the below grade tree stabilizing system manufacturer. Trees under 3" caliper shall have two stakes set opposite each other about the tree as required by the manufacturer of the below grade tree stabilizing system manufacturer (if applicable).
- B. Plumbing shall be accomplished by adjusting the ball of the tree.

3.12 PRUNING OF PLANT MATERIALS

- A. Prune containerized plants only at time of planting and according to standard horticultural practice to preserve the natural character of the plant. Prune by removing entangled branching and by removing crotches. Avoid removing branch tips wherever possible.
- B. Pruning of trees shall be limited to the minimum necessary to remove dead wood, suckers, injured twigs and branches, and to compensate for the loss of roots during the transplanting operations.

3.13 INSTALLATION OF DECOMPOSED GRANITE (DG) PAVING

- A. Base Course Installation:
 - 1. Surface Preparation: Do necessary final excavating and filling to prepare finished subgrade. Building up of subgrade under forms after they are in place will NOT be permitted. After forms are in place, test subgrade with

template, reduce high spots to grade and raise low spots to grade with materials compacted in place by tamping.

2. Forms: Install adjacent paving in lieu of forms, the full depth of decomposed granite area, and secure in place to hold firmly to and grade required. DO NOT USE STABILIZER IN AREAS OF TREE PLANTING.
3. Base Course: Construct a base course layer to a depth of 4 inches (compacted). Deposit aggregate directly on prepared subgrade or preceding layer of compacted aggregate. Keep placed materials free from segregation. Compact each layer of material with tamping roller, with pneumatic tired roller, with vibration machine, or with combination of the three. Do not haul over completed or partially completed work when subgrade is soft or there is tendency for subgrade material to work into base course material.
4. Compact each layer with aid of water. Provide sufficient moisture to prevent segregation into pockets of fine and coarse material.

B. Decomposed Granite (DG):

1. Place the DG on the on the prepared subgrade, in one layer of 3 inches thicknes and rake smooth using a steel tine rake to desired grade and cross section. DO NOT APPLY DG DEEPER THAN 3 INCHES.
2. Water to achieve full depth moisture penetration. Watering is best accomplished usnig a garden hose with spray nozzle set to a coarse spray; pressure should not disturb leveled surface. It is essentail that the full depth of water penetration by random inspection of cores. After inspection, fill core holes with material removed, smooth and hand tamp to match adjoining trail surface grade. Let watered mix stand 6 to 24 hours until surface water is no longer present; the mix should then be moist but not soggy.
3. While mix is still moist, roll with a heavy lawn roller (minimum 225 pounds and maximum 30-inch width), to achiev finish grade and initial compaction. Hand tamp edges around poles, and other objects. Uses a heavy (1 ton minimum) small rider, after having initially used the lawn roller, to obtain the desired final dense, smooth, uniform texture. DO NOT USE WACKERS OR VIBRATORY ROLLERS; the mix will not harden for weeks after vibration if used.
4. Landscape header or edging is to remain in place, secured to hold firmly to approved line and grade. After finished compacted surface has been

achieved, finish adjacent shoulders by backfilling required grade and cross sections.

5. Final thickness of completed area shall not vary more than ½ inch from grades indicated on civil drawings. Correct any variations in the thickness beyond the allowable ½” by repeating the procedures listed above.

3.14 CLEAN-UP AND INSPECTIONS

- A. Clean-up: All areas of project must be free of any debris from the planting operations. As planting operations are underway; all ropes, wires, burlaps, empty containers, rocks, clods and all other debris shall be removed daily and the project site shall be kept neat at all times.
- B. Reviews: Contractor shall notify the Landscape Architect by written request for review of planting operations. at least three days prior to the anticipated review date.

END OF SECTION

SECTION 32 91 19 – LANDSCAPE GRADING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Work Includes:

1. Machinery Restrictions.
2. Excavation, filling and backfilling of onsite material.
3. Subgrade preparations and spreading of topsoil.
4. Finished grading.
5. Prevention of excessive weed growth in lawns.

1.2 GENERAL PROVISIONS

- A. Finished grading shall be defined as placing and grading of additional soil that will be required to bring the grade to the required grades for lawns, shrub and groundcover beds.
- B. Additional fill materials shall generally be defined as topsoil as specified herein unless otherwise specified.
- C. Where practicable and as directed, the use of heavy machinery shall be kept to a minimum.

PART 2 – MATERIALS

2.1 TOPSOIL

- A. Topsoil material that will be required for finish grading operations shall conform to the requirements included within this section.
- B. General Qualifications: Topsoil shall be considered as imported material conforming to the following minimum criteria.
 1. Natural, friable, loamy soil, typical of local topsoil which produces heavy vegetative growth, free from subsoil, weeds, stiff clay, stones larger than one (1) inch, toxic substances, debris, or other substances which may be harmful to plant growth. Do not deliver in muddy condition.
 2. Acidity/Alkalinity: pH 6.0 to pH 7.5.
- C. Grading Analysis: Two (2) inch sieve, 100% minimum passing. Number 4 sieve, 90 percent minimum passing. Number 10 sieve, 80 percent minimum passing.
 1. Sand, silt, and clay content (from ASSHTO M146):
 - a. Sand 20 to 75 percent
 - b. Silt 10 to 60 percent
 - c. Clay 5 to 30 percent

2. All topsoil shall be free from all herbicides and insecticides which might adversely affect subsequent growth of turf or plantings or which might otherwise contain materials toxic to humans and pets.
- D. Non-conforming Material: The Contractor shall not be permitted to use on-site material that does not conform to the above minimum criteria for fine grade operations. At the discretion of the owner, such material can either be amended to meet the minimum requirements or shall be removed from the site and replaced with suitable material as specified herein.
- E. It shall be the Contractor's responsibility to verify that the existing topsoil conforms to these specifications. Topsoil determined to be non-conforming subsequent to the award of a contract shall not be means for extra compensation unless otherwise provided for herein.

2.2 SAND

- A. Sand shall be "Sharp Sand" to A.S.T.M. C-33. Sample shall be submitted for approval. Sand shall not be permitted for fill purposes if the depth exceeds two (2) inches to achieve the finished grade.

PART 3 – EXECUTION

3.1 WORKMANSHIP

- A. Work shall be performed by personnel trained and experienced in this work and shall be done under the direction of a superintendent on the Contractor's staff.

3.2 PREPARATION OF SUBGRADE AND SPREADING OF TOPSOIL

- A. The sub grade soil shall be loosened to a depth of four (4) inches and graded to remove all ridges and depressions so that it will be everywhere paralleled to proposed finished grade. All stones over one and one-half (1-1/2) inches in any dimensions, sticks, rubbish and other extraneous matter shall be removed during this operation. No heavy objects except rollers shall be moved over lawn areas after the sub grade soil has been prepared before topsoil is spread.
- B. After the subgrade soil has been prepared, topsoil shall be spread evenly therein to depth of two (2) inches by an approved method and the area then rolled with a 200-pound roller.
- C. On all hydromulch areas, the finished surface of the topsoil shall conform to the finished grade and shall be free from hollows or other inequalities, stones, stocks and other extraneous matter.

3.3 FINISH GRADING

- A. In areas to receive hydromulch, the Contractor shall till, disc, or otherwise scarify the soil, removing all clods, stones, and related material one (1) inch or larger. Place and spread any additional material that may be required. Roll completely.
- B. Contractor shall be responsible for minor adjustments to the finished sub grade if such treatment is required in the opinion of the Owner's Representative.

- C. The Contractor may use machinery acceptable to the Owner's Representative to complete most of the work to re-establishing finished grade.
- D. Hand-rake the surface, removing all clods and undesirable material greater than one-half (1/2) inch from ground surface. Fill all low spots and cut irregularities to the acceptance of the Owner's Representative. Roll the entire surface evenly with a 200-pound water ballast roller or other means acceptable.
- E. During the finished grading operations, all swales and additional swales that may be required to drain areas where there are existing plant materials, shall be finished. In general, all grade adjustments shall be made so there are no areas that will have standing water.
- F. To prevent excessive weed growth in the lawn areas, the Contractor should be prepared to immediately install the hydromulch upon the completed and acceptable finished grade.

END OF SECTION

SECTION 32 92 13 -HYDRO-MULCHING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. This section specifies the requirements for preparing ground and providing compost, seed, topsoil, and water necessary for hydro-mulching.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Work Specified Elsewhere:
 - 1. Division 31, Earthwork
 - 2. Section 32 90 00, Planting
 - 3. Section 32 01 90, Operation and Maintenance of Planting

1.03 SUBMITTALS

- A. Submittals to the Owner's Representative:
 - 1. Seed Certification shall be submitted from the supplier for each type of seed specified. Certification shall accompany the delivery of the seed and shall indicate that the seed is in accordance with the requirements of the Texas Seed Law.
 - 2. Erosion Control Blanket: Provide product specification and cut sheet information for approval prior to ordering material.

1.04 PRODUCT HANDLING

- A. Seed Delivery: Each variety of seed shall be delivered in separate bags or containers, labeled to indicate pure live seed, name and type of seed.

1.05 GUARANTEE

- A. A written guarantee shall be provided guaranteeing germination for a period of one year, excepting any unusual acts of nature beginning on the date of substantial completion.
- B. Contractor shall guarantee a full stand of grass, 95% cover with no bare spots in excess of 6-inch diameters.
- C. Guarantee shall provide for timely filling, leveling and repairing eroded areas, reseeding areas exhibiting lack of healthy growth and mowing as necessary to maintain a neat appearance.

PART 2 – PRODUCTS

2.01 QUANTITIES

- A. The Contractor shall supply materials in the quantities necessary to complete the Work as shown on the drawings. Quantities of hydromulch areas, as indicated on plans and in the plant list are approximate only. These materials shall be provided in quantities sufficient to properly hydromulch the designated areas indicated on the drawings.
- B. Seed specified for hydro-mulch areas indicated on drawings are available from, but not limited to:
 - 1. Native American Seed, Junction, TX, Tel. no. 800-728-4043

2.02 SEED TYPE

- A. Native Sun Turfgrass (NTSG): Provide Pure Live Seed (PLS) in a mix of 34% Blue Gramma and 66% Buffalograss. Provide at a rate of 80 pounds (PLS) per 27,000 sf.
- B. Fall Application ONLY: Provide Cereal Rye Grain at a 40lbs / acre application in addition to ALL seed mixes that will then need to be applied in the Spring.
- C. Seed types shall be harvested within 1 year prior to planting, free of Johnson grass, field bind weed, dodder seed, and free of other weed seed to the limits allowable under the Federal Seed Act and applicable seed laws. The seed types shall be extra fancy grade, treated with fungicide, and shall have a germination and purity that will produce, after allowance for Federal Seed Act tolerances, a pure live seed content of not less than 85 percent, using the formula: purity percent times (germination percent plus hard or sound seed percent). Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations.

2.03 TOPSOIL

- 1. Imported topsoil shall be clean, fertile, friable, sandy loam soil capable of supporting plantings in a thriving condition. Worn out soil from rice farming that is contaminated with agricultural chemicals and salts, and full of weed seeds will NOT be accepted. Soils that contain more than 50% clay particle size 0.002, have rocks, debris or clods that will not pass a 1" screen, show signs that they were stripped from weed infested sites, or show appreciable amounts of subsoil with no organic matter shall not be delivered to the site. Topsoil shall be similar in texture and composition to the existing soil it is to be incorporated into. Submit a one-quart sample indicating source in writing on label for approval.

2. Existing soil: On site or existing soil shall be cleaned and free of construction debris. It shall be loose, weed free and friable prior to use. Existing soil shall be tested at Contractor's expense if requested for use on site and shall be modified to provide a pH no less than 6 and no greater than 8. Provide soil test results to Landscape Architect for approval prior to proceeding with use of existing soil.

2.04 MAINTENANCE AND GUARANTEES

- A. Contractor shall water in the hydromulch and keep the installation moist at all times until the germination takes place and the grass becomes visible and shows signs of thriving; then modify and monitor the duration of watering to maintain a healthy stand of grass. Refer to Section 32 01 90 Operation and Maintenance of Planting for additional information for lawn areas.

2.05 FERTILIZER

- A. NOT REQUIRED.

2.06 ORGANIC FIRE ANT INSECTICIDE

- A. Provide Amdro organic fire ant insecticide over the entire area of hydro-mulching ONLY if fire ants are present during Preparation of areas to receive hydro-mulching.
- B. Amdro is available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713-957-0909.

2.07 ORGANIC HERBICIDE

- A. Provide Organic Post-emergent Herbicide during Preparations: Use Agralawn, Black Jack 21 or pre-approved equal. Post-emergent herbicide must be applied in a manner that will not damage other plant materials that are not weeds. Contractor will be responsible for replacing any damaged plant materials resulting from lack of care during applications of post-emergent herbicides at no additional cost to Owner.
- B. Provide Organic Pre-emergent Herbicide during Preparations: Use Corn Gluten Crumbs at rates and per instructions provided by manufacturer.
- C. Agralawn, Black Jack 21 and Corn Gluten Crumbs are available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713-957-0909

2.08 WOOD CELLULOSE FIBER MULCH

- A. CONTRACTOR SHALL COORDINATE MULCHING REQUIREMENTS WITH THE

SEED SUPPLIER TO ENSURE PROPER GERMINATION OF THE SEED MIX. Wood cellulose fiber mulch, for use with the hydraulic application of grass seed types shall consist of specially prepared wood cellulose fiber. It shall be processed in such a manner that it will not contain germination or growth inhibiting factors. It shall be dyed an appropriate color to allow visual metering of its application. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like groundcover that readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers for all applications shall refer only to air-dry weight of the fiber, a standard equivalent to 19 percent moisture. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and be marked by the manufacturer to show the dry weight content. Suppliers shall be prepared to certify that laboratory and field-testing of their products has been accomplished and that it meets all of the foregoing requirements.

2.09 MULCHING EQUIPMENT

- A. Hydraulic equipment used for the application of seed and slurry of prepared wood fiber mulch shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry containing up to forty (40) pounds of fiber for each one hundred (100) gallons of water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles that provide even distribution of the slurry on the areas to be seeded. The slurry tank shall have a minimum capacity of eight hundred (800) gallons and shall be mounted on a traveling unit which may be either self-propelled or drawn with a separate unit which will place the slurry tank and spray nozzles within sufficient proximity to the areas to be seeded so as to provide uniform distribution without waste. The Owner's Representative may authorize equipment with smaller tank capacity if the equipment has the necessary agitation system and sufficient pump capacity to spray the slurry in a uniform coat.
- B. Contractor shall ensure that the mulching equipment is clean and does not contain any seed material or materials that may contain weeds, from previous installations prior to proceeding with work for this project.

PART 3 – EXECUTION

3.01 SITE EXAMINATION

- A. The Contractor shall make an examination of the site of the proposed work and completely familiarize himself with the nature and extent of the work to be encountered. No extra compensation will be allowed for any work made necessary by unusual conditions or obstacles encountered during the progress of the work which conditions or obstacles are readily apparent upon a visit to the site. Seeding shall not start until all preparatory work has been

completed.

- B. The Contractor shall notify the Owner's representative of any discrepancies between the plans and actual site condition.

3.02 TIME OF HYDRO-MULCHING

- A. Hydro-mulch operations shall be conducted under favorable weather conditions in the early spring (after the last freeze in late February, early March) through late summer (end of September). Should the operations have to occur during the fall the Contractor will have to provide a cover crop of Cereal Rye and then apply the specified seed mixes in the Spring. Cereal Rye is NOT THE SAME AS RYE GRASS SEED.
- B. Ground temperature shall be greater than 65 degrees at time of application and for period anticipated for establishment. Do NOT install if ground temperature is below 55 degrees or anticipated to be below 65 degrees during establishment period.

3.03 SOIL PREPARATION OF AREAS TO RECEIVE HYDRO-MULCHING (COORDINATE WITH DEMOLITION REQUIREMENTS OF PAVED AREAS THAT ARE BEING REMOVED PRIOR TO INSTALLATION THAT ARE TO RECEIVE HYDRO-MULCH AREAS):

- A. Where applicable for removed paved areas ensure that 2 ft of dirt previously below paved surfaces have been removed and area wetted down for 48 hours. Allow to dry prior to backfilling. Blend 4 inch depth of compost with topsoil to backfill removed dirt.
- B. Place a 3" - 4" layer of soil mix blended with compost, topsoil and green sand. The soil must be friable and free of lumps. A pH greater than 5.5 must be confirmed prior to completing the hydro-mulch preparation. The soil pH shall be between 5.5 to 6.0 prior to installation of the hydro-mulch. Provide a written confirmation to the Landscape Architect that the soil pH has been confirmed prior to proceeding with installation. Work in Granular Humates Soil Amendment applied in accordance and in ration as recommended by manufacturer and work into the top 2 to 8 inches of soil. Follow label directions. .
- C. Rototill all together to a depth of 8 to 12 inches below original grade until all particles are golf ball size or smaller. Remove rocks, roots, and debris. Fumigate to eliminate soil-born insects, diseases, and nematodes. Use a material with a short residual effect. Read and follow all label directions. Perform earthwork and grading as required in Division 31, Earthwork.
- D. For all areas that are currently lawn but are to be hydro-mulched areas, strip lawn and rake 4 inch depth of compost into remaining soil. Wet down for 48 allows and allow to dry. Perform earthwork and grading as required in Division 31, Earthwork. Loosen, by manual or mechanical means, to a depth

of 1-½ inches. Soil shall be leveled and fine graded by hand raking. All stones are to be removed (1 inch diameter and larger in top 2 inches of soil), tree stumps, brush, roots, vegetation, rubbish and other foreign matter shall be removed from the site. No foreign matter may be buried on site.

- E. Preparation work shall be completed one month in advance of hydro-mulching operations.
- F. A 2-inch layer of topsoil shall be spread over the entire area to be hydro-mulched to form a cover of uniform thickness. The seedbed shall be watered to a depth of 4 inches at least 48 hours prior to seeding to obtain loose, friable seedbed. Apply pre-emergent herbicide, organic Corn Gluten Meal per manufacturer instructions over areas to receive hydro-mulching.

3.04 APPLICATION

- A. Seed shall be uniformly distributed over the designated area at the rate specified.
- B. Mechanical equipment shall be used. Contractor shall ensure that the hydro-mulch machines are thoroughly cleaned prior to use for this project. No previous job residue shall be present within the machinery. Notify Landscape Architect 2 business days prior to beginning hydro-mulching applications to afford time to review the machinery and site preparation.
- C. Mixing: Care shall be taken that the slurry preparation takes place on the site of the Work. Spraying shall commence immediately when the tank is full.
- D. Apply specified slurry mix in a motion to form a uniform mat at specified rate. Spray the area with a uniform. Visible coat by using the green color of the wood pulp as a guide. Keep hydro-mulch within areas designated and keep from contact with other plant materials. Contractor shall not over spray areas designated for hydro-mulch onto areas that are to receive planting bed materials. Slurry mixture, which has not been applied within four (4) hours of mixing, shall not be used and shall be removed from the site. Do not overspray on concrete. Wash-off immediately if some of the mix falls on sidewalks or other paved areas.
- E. After installation, the Contractor shall not operate any equipment over the covered areas. Immediately after application, thoroughly wash off any plant material, planting areas, or paved areas not intended to receive the slurry mix. Keep all paved and planting areas clean during operation.
- F. After a sixty (60) day waiting period from the hydro-mulch installation date, if the Owner's Representative or Landscape Architect note unplanted skips of hydro-mulched areas or damaged planting areas resulting from over spray, after hydro-mulching, the Contractor shall be required to re-seed and / or re-plant these areas at no additional cost to Owner.

3.05 WATERING

- A. After installation, hydro-mulched areas shall be watered in an amount and as often as necessary to keep areas moistened to their full depth for a period of two weeks. Water twice per day for the first seven- (7) days after application for approximately a total of thirty (30) minutes. Do not allow puddles to form or run off. If these conditions occur shut the water off. The best time to water is early morning and just before dark. If it rains, stop the watering program until the soil begins to dry out, then return to the original program. Once germination is achieved, reduce the watering to once per day 4 times per week.
- B. After initial 2 weeks of watering, seeded areas shall be watered and maintained to insure a healthy, vigorous growth throughout the installation period and the maintenance period.

3.06 MAINTENANCE

- A. Contractor shall correctly maintain the hydro-mulched work throughout the installation process.
- B. Refer to Section 32 90 00 for maintenance period information.
- C. Pick up trash on site. Retreat any areas for fire ants if necessary.

END OF SECTION

SECTION 33 41 00 – STORM SEWAGE SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing storm sewers and appurtenant structures.

1.2 QUALITY ASSURANCE

- A. Reference Standards Applicable to this Section

1. AASHTO: American Association of State Highway and Transportation Officials
 - a. M 36: Specification for Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains.
 - b. M 190: Specification for Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches.
 - c. M 252: Specification for Corrugated Polyethylene Drainage Tubing.
 - d. M 294: Specification for Corrugated Polyethylene Pipe 12 inch to 36 inch diameter.
2. ASTM: American Society for Testing and Materials
 - a. A 48: Specification for Gray Iron Castings.
 - b. A 74: Specification for Cast Iron Soil Pipe and Fittings.
 - c. C 40: Test Method for Organic Impurities in Fine Aggregate for Concrete.
 - d. C 76: Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - e. C 150: Specification for Portland Cement.

- f. C 443: Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets.
- g. C 881: Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- h. D 618: Conditioning Plastics and Electrical Insulating Materials for Testing.
- i. D 1248: Polyethylene Plastics Molding and Extrusion Material.
- j. D 1693: Environmental Stress Cracking of Ethylene Plastics.
- k. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- l. D 2239: Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- m. D 2412: Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- o. D 2447: Specifications for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
- p. D 2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- q. D 2467: Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- r. D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- s. D 2665: Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
- t. D 2729: Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- u. D 2855: Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- v. D 3035: Specifications for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
- w. D 3212: Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

- x. D 3261: Specification for Butt Heat Fusion of Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - y. D 3350: Specification for Polyethylene Plastics Pipe and Fittings Material.
 - z. F 402: Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.
 - aa. F 405: Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
 - bb. F 412: Standard Terminology Relating to Plastic Piping Systems.
 - cc. F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - dd. F 656: Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Pipes and Fittings.
 - ee. F 714: Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 - ff. F 913: Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - gg. F 667: Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.
3. Federal Specification
- a. SS-S-210A and Latest Amendments: Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.
4. City of Houston
- a. Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage and Street Paving, September 1996 or latest revision.
5. Harris County Flood Control District (HCFCD)
- a. Standard Specifications
 - b. Policy Criteria and Procedure Manual

1.3 SUBMITTALS

- A. In accordance with Section 013100 – Project Administration of these Specifications, the following shall be submitted:
 - 1. Certificates
 - a. Manufacturer's certificates and load tickets stating that materials meet specified requirements.
 - 2. Shop Drawings
 - a. Shop Drawings and details of all storm sewers and drains, including relationship to other systems and true position and details of all interfaces, connections, inlets, cleanouts, manholes, alignment and grade, changes of direction, offsets, bedding and protection, materials, manufacturer's installation and connection instructions and recommendations, and all other pertinent data.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Products for use within City of Houston right-of-way shall meet the applicable requirements.

2.2 PIPES AND FITTINGS

- A. Reinforced Concrete Pipe (RCP)
 - 1. ASTM C 76, bell-and-spigot, Class III, Wall B.
- B. Corrugated Galvanized Metal Pipe (CGMP)
 - 1. AASHTO M 36, coated and paved in accordance with AASHTO M 190, Type C coating for pipe and Type A coating for coupling bands.
- C. PVC Pipe in accordance with the following:
 - 1. ASTM D 1785.
 - 2. ASTM D 2241.
 - 3. ASTM D 2466.
 - 4. ASTM D 2467.

D. PE Pipe

1. ASTM D 2447.
2. ASTM D 3035.
3. ASTM D 3350 Type PE 3408.
4. ASTM F 714 Type PE 3408.

2.3 JOINTS

A. Gaskets for RCP in accordance with the following:

1. Federal Specification SS-S-210A.
2. ASTM C 443.

B. All joints in PVC plastic pipe shall be solvent-cemented in accordance with the following:

1. ASTM D 2564.
2. ASTM D 2672.
3. ASTM D 2855.
4. ASTM F 402.
5. ASTM F 656.

C. All joints in PE plastic pipe shall be fusion butt-welded in accordance with ASTM 3261.

2.4 DRAINAGE STRUCTURES

A. Manhole

Type as indicated on the Drawings and conforming to applicable Standards for City of Houston or HCFCD Right-of-Way, or HCCS Property. Frame and Cover ASTM A 48 Class 35 B.

B. Inlet

Type as indicated on the Drawings and conforming to applicable Standards in City of Houston or HCFCD Right-of-Way, or HCCS Property. Frame and Grate ASTM A 48 Class 35 B.

C. Reinforcing Steel

As specified in Section 032100 – Concrete Reinforcement of these Specifications.

D. Cast-in-Place Concrete (Class 3000)

As specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.

E. Mortar (Type M)

2.5 CEMENT-STABILIZED SAND BACKFILL

A. Aggregate

Use clean sand; deleterious materials in the sand shall not exceed the following limitations, by weight:

Material removed by denatation	5.0 percent
Clay lumps	0.5 percent
Other deleterious substances such as coal, shale, coated grains of soft flaky particles.	2.0 percent

Gradation Requirements:

Retained on 3/8-in. sieve	0 percent
Retained on 1/4-in. sieve	0 – 5 percent
Retained on 20-mesh sieve	15 – 50 percent
Retained on 100-mesh sieve	80 – 100 percent

Color test per ASTM C 40, color not darker than standard color.

B. Cement

ASTM C 150, Type I or II.

C. Water

Potable, from municipal supplies approved by the State or City Health Department.

D. Mixture

Use at least 1-1/2 sacks of cement per cubic yard of mixture. Use amount of water required to provide mix suitable for mechanical hand tamping and mix in approved mixer. Stamp load tickets at plant with time of loading. Material not in place within 1-1/2 hours after loading or that has obtained an initial set will be rejected and shall be removed from the Site and replaced with new acceptable mixtures at no additional cost to HCCS.

2.6 TIMBER POSTS

- A. Southern Pine or Douglas Fir, pressure-treated in accordance with American Wood Preservers' Association (AWPA) Standards.

PART 3 – EXECUTION

3.1 GENERAL

- A. All storm sewer work performed within City of Houston right-of-way shall meet the applicable requirements.

3.2 EXCAVATION

- A. All excavation shall be in accordance with Section 017330 – Trench Safety Systems of these Specifications.
- B. Perform excavation for storm sewer and storm sewer drainage structures to line and grade required as shown on the Drawings and as specified herein.
- C. If the excavation exceeds the permissible dimensions, extend the encasement or install pipe of higher strength, as directed.
- D. Prevent surface or ground water from flowing into excavation. Install, operate, and maintain dewatering system to convey water away from excavation. Notify the Engineer in writing of delays to the Work caused by water intrusion.

3.3 PIPE ENCASEMENT

- A. Place cement-stabilized sand bedding before laying pipe. Bedding shall be compacted and shaped to fully support the pipe.
- B. After the pipe is laid, place cement-stabilized sand beside and above the pipe in 4 in. lifts to the limits shown on the construction drawings. Compact individual lifts with a hand-operated, motorized tamper; exercise care to avoid damaging the pipe.

3.4 LAYING PIPE

- A. Install and joint pipe in accordance with the pipe manufacturer's instructions and as specified herein.
- B. Provide a minimum of 6 in. clearance between storm sewer and sanitary sewer.
- C. Seal open end of pipe with plug when pipe laying operation is temporarily halted. Plug shall remain in place until operation restarts.

3.5 BACKFILL

- A. On completion of construction, backfill the excavation as specified in Section 312300 - Excavation, Grading, and Fill of these Specifications and in accordance with details on the construction drawings. Backfill only when the written approval of the Engineer is obtained to do so.

3.6 CONSTRUCTION OF MANHOLES AND INLETS

A. General

- 1. Construct manholes and inlets as soon as practical after sewer lines into or through the manhole or inlet locations are completed.
- 2. Construct manholes and inlets at locations and of the type indicated. All manholes within 9 feet of existing water lines shall be watertight.

B. Manholes

- 1. Provide base of the shape and size required with a minimum thickness of 12 inches.
- 2. Place axis of manholes directly over the centerlines of the lines, unless otherwise indicated.
- 3. Shall be constructed of either precast or cast-in-place concrete.

C. Inlets

- 1. Shall be constructed of either precast or cast-in-place concrete.

3.7 CLEANUP

- A. Remove temporary structures, rubbish, waste materials, and excess excavated materials from the Site and dispose of legally.

END OF SECTION 33 41 00

