

Houston Community College

Project Manual

for

Austin Street Improvements & San Jacinto Memorial Green

at

Central College, Central Campus



Issued for Bid

November 15, 2013
HCC Project No. 14-02
LDS Project No. 724/803



5120 Woodway
Suite 8010
Houston, TX 77056

**INSIDE
FRONT COVER**

TABLE OF CONTENTS

UNIFORM GENERAL AND SUPPLEMENTARY GENERAL CONDITIONS

| | |
|--|----|
| ARTICLE 1 – DEFINITIONS | 7 |
| ARTICLE 2 – LAWS GOVERNING CONSTRUCTION | 9 |
| ARTICLE 3 – GENERAL RESPONSIBILITIES OF OWNER & CONTRACTOR | 12 |
| ARTICLE 4 – ARTICLE 4. SMALL BUSINESS (SB) SUBCONTRACTING PLAN | 18 |
| ARTICLE 5 – BONDS & INSURANCE | 18 |
| ARTICLE 6 – CONTRACT DOCUMENTS | 26 |
| ARTICLE 7 – CONSTRUCTION SAFETY | 28 |
| ARTICLE 8 – QUALITY CONTROL | 30 |
| ARTICLE 9 – PROJECT SCHEDULING REQUIREMENTS | 35 |
| ARTICLE 10 – PAYMENTS | 40 |
| ARTICLE 11 – CHANGES | 43 |
| ARTICLE 12 – PROJECT COMPLETION AND ACCEPTANCE | 50 |
| ARTICLE 13 – WARRANTY & GUARANTEE | 54 |
| ARTICLE 14 – SUSPENSION AND TERMINATION | 56 |
| ARTICLE 15 – DISPUTE RESOLUTION | 59 |
| ARTICLE 16 – MISCELLANEOUS | 60 |

SAMPLE CONTRACT 62

DIVISION 0 – PROCUREMENT & CONTRACTING REQUIREMENTS

| | |
|---|----|
| 00 73 46.1 – WAGE SCALE & PAYROLL REQUIREMENTS FOR ENGINEERING CONSTRUCTION | 68 |
| 00 73 46.2 – WAGE SCALE & PAYROLL REQUIREMENTS FOR BUILDING CONSTRUCTION | 81 |

DIVISION 1 – GENERAL REQUIREMENTS

| | |
|--|-----|
| 01 00 00 – MISCELLANEOUS REQUIREMENTS | 99 |
| 01 20 00 – PROJECT MEETINGS | 107 |
| 01 27 00 – UNIT PRICES | 109 |
| 01 31 00 – PROJECT ADMINISTRATION | 114 |
| 01 32 00 – PROJECT PLANNING AND SCHEDULING | 127 |
| 01 32 20 – PHOTOGRAPHIC DOCUMENTATION | 131 |
| 01 35 23 – PROJECT SAFETY REQUIREMENTS | 132 |
| 01 36 00 – PROJECT MANAGEMENT SOFTWARE | 140 |

| | |
|---|-----|
| 01 42 00 – REFERENCE STANDARDS | 145 |
| 01 43 00 – QUALITY ASSURANCE | 163 |
| 01 43 39 – SITE MOCK-UPS | 170 |
| 01 45 00 – QUALITY CONTROL | 171 |
| 01 45 18 – FIELD ENGINEERING | 172 |
| 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS | 173 |
| 01 50 10 – PROJECT SIGNAGE | 179 |
| 01 52 40 – CONSTRUCTION WASTE MANAGEMENT | 180 |
| 01 55 26 – TRAFFIC CONTROL AND REGULATION | 182 |
| 01 70 00 – CONTRACT CLOSE-OUT | 187 |
| 01 73 00 – EXECUTION | 191 |
| 01 73 29 – CUTTING AND PATCHING | 197 |
| 01 91 00 – GENERAL COMMISSIONING REQUIREMENTS | 201 |
| DIVISION 2 – EXISTING CONDITIONS | |
| 02 41 13 – REMOVE EXISTING PAVEMENTS AND STRUCTURES | 204 |
| 02 41 17 – DEMOLITION | 207 |
| DIVISION 3 – CONCRETE | |
| 03 21 00 – CONCRETE REINFORCEMENT | 211 |
| DIVISION 4 – MASONRY | |
| 04 20 00 – UNIT MASONRY | 213 |
| 04 70 00 – ADHERED MASONRY VENEER SYSTEM | 222 |
| DIVISION 5 – METALS | |
| 05 12 00 – STRUCTURAL STEEL | 233 |
| 05 50 00 – METAL FABRICATIONS | 240 |
| 05 52 13 – PIPE AND TUBE RAILINGS | 243 |
| DIVISION 6 – WOOD AND PLASTICS | |
| 06 10 00 – ROUGH CARPENTRY | 248 |
| 06 20 13 – EXTERIOR FINISH CARPENTRY | 253 |
| 06 65 20 – PVC DECKING | 259 |
| 06 65 32 – PVC PORCH FLOORING | 263 |

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

| | |
|---|-----|
| 07 61 00 – PREFORMED METAL ROOFING | 266 |
| 07 65 26 - SELF-ADHERING SHEET FLASHING | 272 |
| 07 92 00 – SEALANTS | 276 |

DIVISION 9 – FINISHES

| | |
|------------------------------|-----|
| 09 91 13 – EXTERIOR PAINTING | 281 |
|------------------------------|-----|

DIVISION 10 – SPECIALTIES

| | |
|----------------------|-----|
| 10 35 00 – FLAGPOLES | 285 |
|----------------------|-----|

DIVISION 12 – FURNISHINGS

| | |
|---|-----|
| 12 93 00 – REMOVABLE BOLLARDS | 288 |
| 12 93 13 – BICYCLE RACKS | 291 |
| 12 93 23.1 – TRASH AND LITTER RECEPTORS | 294 |
| 12 93 23.2 – WEATHER PROTECTED ASH URN | 298 |
| 12 93 43 – SITE SEATING AND TABLES | 302 |
| 12 93 43.13 – BENCHES | 306 |

DIVISION 26 – ELECTRICAL

| | |
|---|-----|
| 26 01 20 – OPERATION AND MAINTENANCE OF LOW-VOLTAGE ELECTRICAL DISTRIBUTION | 310 |
| 26 01 26 – MAINTENANCE & TESTING FOR ELECTRICAL SYSTEMS | 312 |
| 26 05 19 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES | 317 |
| 26 05 26 – GROUNDING AND BONDING | 322 |
| 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS | 326 |
| 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS | 328 |
| 26 05 63 – IDENTIFICATION FOR ELECTRICAL SYSTEMS | 335 |
| 26 27 26 – WIRING DEVICES | 338 |
| 26 28 13 – FUSES | 340 |
| 26 56 29 – SITE LIGHTING | 342 |

DIVISION 31 – EARTHWORK

| | |
|------------------------------------|-----|
| 31 11 00 – CLEARING AND GRUBBING | 348 |
| 31 13 16 – SELECTIVE TREE TRIMMING | 351 |
| 31 20 00 – EARTHWORK | 357 |

| | |
|--|-----|
| 31 23 00 – GRADING EXCAVATION AND FILL | 364 |
| 31 32 13.16 – CEMENT STABILIZED SAND | 370 |
| 31 32 13.19 – SOIL STABILIZATION LIME | 372 |

DIVISION 32 – EXTERIOR IMPROVEMENTS

| | |
|--|-----|
| 32 01 90 – OPERATION AND MAINTENANCE OF PLANTING | 376 |
| 32 12 13.13 – TACK COAT | 385 |
| 32 12 13.19 – PRIME COAT | 389 |
| 32 12 16 – ASPHALTIC CONCRETE PAVEMENT | 393 |
| 32 13 13 – PORTLAND CEMENT CONCRETE PAVING | 400 |
| 32 13 13.26 – CONCRETE WALKS AND RAMPS | 405 |
| 32 13 16 – DRY-SHAKE COLORED HARDENER | 410 |
| 32 13 19 – CONCRETE PAVEMENT JOINTS | 415 |
| 32 13 73.19 – CAST-IN-PLACE CONCRETE | 419 |
| 32 14 00 – UNIT PAVING | 437 |
| 32 16 13 – CONCRETE CURBS AND CURB AND GUTTER | 444 |
| 32 17 23 – PAVEMENT MARKINGS | 448 |
| 32 80 00 – IRRIGATION | 451 |
| 32 90 00 – PLANTING | 466 |
| 32 91 19 – LANDSCAPE GRADING | 483 |
| 32 92 13 – HYDRO-MULCHING | 486 |
| 32 94 43 – TREE GRATES | 492 |

DIVISION 33 – UTILITIES

Project Team:

Architect: **llewelyn-davies sahani**

Civil Engineers: **ESPA Corp**

Electrical Engineers: **E&C Engineers & Consultants**

Landscape Architect: **Environments & Co.**

Structural Engineers: **ASA Dally**

Lighting Designer: **MJS LIGHT | Studio of Richard Jeter**

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 Contingency Expenditure Authorization (CEA)** means a written document executed by Owner authorizing the expenditure of Owner's Construction Contingency to fund minor changes in the work and unforeseen conditions. Requests for expenditures for expenditures from the Owner's Construction Contingency shall be submitted as a Contingency Expenditure Proposal (CEP).
- 1.7 Contract** means the entire agreement between the Owner and the Contractor, including all of the Contract Documents.
- 1.8 Contract Date** is the date when the Contractor between the Owner and the Contractor becomes effective.
- 1.9 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, all pre-bid and/or pre-proposal addenda.

- 1.10 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 Construction Manager-at-Risk or a Design-Build firm as well as a General or Prime Contractor. The Contract Documents refer to Contractor as if singular in number.
- 1.11 Contract Sum** means the total compensation payable to the Contractor for completion of the Work in accordance with the terms of the Contract.
- 1.12 Contract Time** means the period between the Start Date identified in the Notice to Proceed and the Substantial Completion date identified in the Notice to Proceed or as subsequently amended by Change Order.
- 1.13 Date of Commencement** means the date designated in the Notice to Proceed for the Contractor to commence the Work.
- 1.14 Day** means a calendar day, unless otherwise specifically stipulated.
- 1.15 Drawings** mean that product of the Architect/Engineer which graphically depicts the Work.
- 1.16 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.
- 1.17 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.
- 1.18 Owner's Construction Contingency** means a contingency fund created by Owner as part of the Contract Sum to cover the cost of unforeseen conditions that that develop during the Construction Phase which the Contractor could not have anticipated or discovered through the exercise of reasonable care during Pre-Construction Phase.
- 1.19 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.
- 1.20 Owner's Project Allowance** means amounts designated by the Owner to use for items which require further development of the Drawings and Specifications by the Architect following establishment of the Contract Sum. Requests for expenditures from the Owner's Project Allowances must be submitted as an Allowance Expenditure Proposal (AEP).
- 1.21 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 contractual and warranty obligations.

- 1.22 Sample** 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.
- 1.23 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.
- 1.24 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.
- 1.25 Site** means the geographical area of the location of the Work.
- 1.26 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.
- 1.27 Specifications** mean 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.
- 1.28 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.
- 1.29 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.
- 1.30 Supplementary General Conditions** mean procedures and requirements that modify the Uniform General Conditions. Supplementary General Conditions, when used, have precedence over the Uniform General Conditions.
- 1.31 Unit Price Work** means Work or a portion of the Work paid for based on incremental units of measurement.
- 1.32 Unilateral Change Order (ULCO)** means a Change Order issued by the Owner without the agreement of the Contractor.
- 1.33 Work** means the administration, procurement, materials, equipment, construction and all services necessary for the Contractor, and/or its agents, to fulfill the Contractor's obligations under the Contract.

Article 2 – Laws Governing Construction

- 2.1 Environmental Regulations.** The Contractor shall conduct 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 Subcontractors 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. Nothing herein shall prevent the

Contractor or Subcontractor from seeking reimbursement for such amounts under the terms of its subcontracts or sub-subcontracts.

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. Civil Prac. & Rem. 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 must, to the fullest extent possible, 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 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.** Contractor shall 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. Contractor may 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.** Contractor shall 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, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities, 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.** Contractor shall 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 Contract 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. The Contractor shall 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. The Contractor shall 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.** The Contractor shall carry on the Work and adhere to the progress schedule during all disputes, disagreements or alternative resolution processes with the Owner. The Contractor shall 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, the Contractor shall 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, 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 The Contractor shall 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.** The Contractor shall 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, sprinklers, 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 If Owner awards 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 Owner's separate Contractors employed on the Project, including providing access to Site and Project information as requested.*

Article 4 – Article 4. Small Business (SB) Subcontracting Plan

- 4.1 General Description.** The purpose of the Small Business (SB) Development 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.
- 4.2 Compliance with Approved SB Subcontracting Plan.** Contractor, having been awarded this Contract in part by complying with the SB Development 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 Submit to Owner a compliance report, in the frequency and format required by the Owner that demonstrates Contractor's performance of the SB Subcontracting Plan.

Article 5 – Bonds & Insurance

- 5.1 Construction Bonds.** The Contractor is required to tender to Owner, prior to commencing the Work, public works performance and payment bonds, as required by Texas Government Code Chapter 2253.
- 5.1.1 A **Performance Bond** is required if the Contract Sum 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 the form of bond approved by the 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 Sum 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 Texas Government 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 Texas Government 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 Texas Government 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 Texas Property 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-X 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:

- \$100,000 each accident
- \$100,000 disease each employee
- \$500,000 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 Occurrence
\$2,000,000 Aggregate
\$2,000,000 Completed Operations
\$1,000,000 Personal Injury
\$ 500,000 Fire Damage
\$ 5,000 Medical Payments

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.

- 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

Program Manager, Project Manager, Project Architect, the Contractor, Subcontractors and, Sub-Subcontractors, which shall be named as additional insureds. 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) as follows:

\$2,000,000 for all projects estimated to cost up to \$25,000,000. \$5,000,000 for all projects estimated to cost over \$25,000,000.

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 sixty (60) 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 Texas Labor Code §401.011(44) and specific to construction Projects for public entities as required by Texas Labor 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 The Contractor will have access to a complete set of electronic PDF Drawings and Specifications on e-builder. Contractor is responsible for any costs associated with any hard copies if necessary.
- 6.1.2 **Ownership of Drawings and Specifications.** All Drawings, Specifications and copies thereof furnished by the AE are to remain AE's property. These documents are not to be used by Contractor 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 Construction Manager-at-Risk.

- 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 Construction Manager-at-Risk, 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

The Contractor shall maintain at the Site one copy of all Drawings, Specifications, addenda, approved Submittals, Contract modifications, and all Project correspondence. The Contractor shall 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. The Contractor shall provide Owner and AE access to these documents.

- 6.2.1 The Contractor shall 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. The Contractor shall make available all records prescribed herein for reference and examination by the Owner and its representatives and agents.
- 6.2.2 The Contractor shall update the "As-Constructed" Drawings and Specifications monthly prior to submission of periodic partial pay estimates. Contractor's 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, the Contractor shall 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, the Contractor shall 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, the Contractor shall provide one set of prints of professionally drafted "As-Constructed" drawings, along with an electronic copy on CD, "As-Constructed" specifications in bound volume(s) along with an

electronic copy on CD, 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 safeguards for such safety and protection.
- 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.
- 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 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 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 non-compliant 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 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 maximum of ten (10) business days' duration after receipt by the Architect/Engineer and ODR for review and approval of each submittal. If re-submittal is required, allow a maximum of an additional ten (10) business 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 if the request satisfies in 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, exterior veneer/ finishes, glazing, and any other Work requiring a mock-up as identified throughout the Contract Documents. Mockups for 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.** The Contractor shall 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. The Contractor shall 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 The Contractor shall 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.** The Contractor shall 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. The Contractor shall 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. The Contractor shall 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, including without limitation any act or omission of 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, expenditures from Owner's Construction Contingency, and expenditures from Owner's Project 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's 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 Small Business 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 Texas Government 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 business 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, five percent (5%) 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 Texas Government 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 The Project must be Substantially Complete before the Owner will 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 Construction Change Directive that will have the full force and effect of a contract modification. The issuance of a Construction Change Directive 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

representatives 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 ninety (90) 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 Subcontractor 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 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 Order 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 changes in the 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. All changes in the work are subject to audit by Owner or its representatives at any time in accordance with the Contract Documents, and sums due to the Contractor for changes in the work may be adjusted lower as a result of such audit.
- 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 actual wages paid for labor, the total actual cost paid for state and federal payroll taxes and for Worker's Compensation. Any additional insurance or bond premium costs shall only be allowed if the change results in a verifiable increase in the premiums that must be 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, all other general conditions/general requirements costs, and no separate allowance will be made therefor. Allowable percentages for overhead and profit on changes will not exceed 15 percent if the total cost of self-performed work is less than or equal to \$10,000, will not exceed 10 percent if the total cost of self-performed work is between \$10,000 and \$20,000, and will not exceed 7.5 percent if the total cost 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 CM-at-Risk 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. CM-at-Risk or Design Build firms will therefore not be permitted any markups for overhead and profit (including General Conditions or CM Construction Phase Fee), on self-performed work funded from Owner's Construction Contingency or Owner's Project Allowances.*
- 11.8.2.2 For subcontracted Work each affected Subcontractor shall figure its costs, overhead and profit, subject to the same calculation and markup limitations described for Contractor self performed work in 11.8.2.1, above. **The total amount of combined markup for overhead and profit, for the subcontractor and the Contractor shall not, in any case, exceed 15%.**
- 11.8.2.3 On changes involving both additions and deletions, markups will be allowed only on the net addition, and in accordance with the markup and calculation provisions above. The Owner does not accept and will not pay for additional contract cost identified as indirect, consequential, or as damages caused by delay.

11.9 Owner's Construction Contingency

- 11.9.1 Owner's Construction Contingency is a contingency fund created by Owner as part of the Contract Sum to cover the cost of unforeseen conditions that that develop during the Construction Phase. Expenditures from the Owner's Construction Contingency must be approved in writing by the Owner by CEA.
- 11.9.2 The Owner's Construction Contingency may not be used for Contractor rework, cost increases caused by lack of coordination or communication with the Project Architect or trade Subcontractors.
- 11.9.3 Proposals for expenditures from the Owner's Construction Contingency must be requested by a Contingency Expenditure Proposal (CEP) and the CEP must conform to the same documentation requirements as are required for Change Order Proposals in Section 11.8.1.
- 11.9.4 For changes funded from Owner's Construction Contingency, the Contractor shall not be entitled to any markup for overhead or profit, regardless of whether the work is self-performed or performed by subcontractors. For work performed by subcontractors and funded from the Owner's Construction Contingency, the subcontractors will be allowed their actual costs for materials, the total amount of actual wages paid for labor, the total actual cost paid for state and federal payroll taxes and for Worker's Compensation. To the total of the above costs, the subcontractor will be allowed to add a percentage as noted below to cover overhead and profit combined. Overhead shall be considered to include insurance, field and office supervisors and assistants, including safety and scheduling personnel, use of small tools, incidental job burdens and general Home Office expenses, all

other general conditions/general requirements costs, and no separate allowance will be made therefor. Allowable percentages for overhead and profit on changes will not exceed 15 percent if the total cost of the work is less than or equal to \$10,000, will not exceed 10 percent if the total cost of the work is between \$10,000 and \$20,000, and will not exceed 7.5 percent if the total cost of the work is over \$20,000, for any specific change priced.

- 11.9.5 The determination of whether changes in the work are funded from the Owner's Construction Contingency by a CEA or by Change Order will be at the Owner's sole discretion.
- 11.9.6 The balance of any remaining Owner's Construction Contingency funds belong to the Owner and shall be credited to the Owner at the end of the Project by deductive Change Order, including a credit for overhead and profit on the unused funds.

11.10 Owner's Project Allowances

- 11.10.1 As the Drawings and Specifications may not be finished at the time the Contract is awarded, the Contractor shall provide amounts for the Owner's Project Allowances in the Contract Sum. Allowances shall be limited to use for items which require further development of the Drawings and Specifications by the Architect that is consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include such things as changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which, if required, shall be incorporated by Contingency Expenditure Authorization (CEA) or Change Order.
- 11.10.2 Proposals for expenditures from the Owner's Project Allowances must be requested by an Allowance Expenditure Proposal (AEP) and the AEP must conform to the same documentation requirements as are required for Change Order Proposals in Section 11.8.1.
- 11.10.3 For changes funded from Owner's Project Allowances, the Contractor shall not be entitled to any markup for overhead or profit, regardless of whether the work is self-performed or performed by subcontractors. For work performed by subcontractors and funded from the Owner's Project Allowances, the subcontractors will be allowed their actual costs for materials, the total amount of actual wages paid for labor, the total actual cost paid for state and federal payroll taxes and for Worker's Compensation. To the total of the above costs, the subcontractor will be allowed to add a percentage as noted below to cover overhead and profit combined. Overhead shall be considered to include insurance, field and office supervisors and assistants, including safety and scheduling personnel, use of small tools, incidental job burdens and general Home Office expenses, all other general conditions/general requirements costs, and no separate allowance will be made therefor. Allowable percentages for overhead and profit on changes will not exceed 15 percent if the total cost of the work is less than or equal to \$10,000, will not exceed 10 percent if the total cost of the work is between \$10,000 and

\$20,000, and will not exceed 7.5 percent if the total cost of the work is over \$20,000, for any specific change priced.

- 11.10.4 The balance of any remaining Owner's Project Allowances funds belong to the Owner and shall be credited to the Owner at the end of the Project by deductive Change Order, including a credit for any corresponding overhead and profit calculated on such unused funds.

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 Contractor's 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 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 workmanlike manner, 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 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. The Contractor shall 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 Texas Government Code Chapter 2251. The Contractor shall 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.
- 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 Correction 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 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 reasonable 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 or rejected by the ODR; and/or
 - 14.3.1.5 Failure to pay Subcontractors, laborers, and material suppliers; 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 (30) 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 (30) 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 of the Contract Sum, 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 a 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 effective date of contract termination. The notice may also contain instructions necessary for the protection, storage or decommissioning of incomplete work or 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, the Site 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, overhead and profit on Work not performed, 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, overhead and profit on Work not performed 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 one hundred eighty (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 Texas Government 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 Texas Government 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 Texas Government 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 Owner'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. The Owner will administer its design and construction management through the e-Builder 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, amendments, Change Orders and other administrative activities.

16.3.1 Accessibility And Administration.

16.3.1.1 Refer to Specification Section 01 36 00 in the Owner's Construction Project Division 1 Specifications for the Project Manager Software Requirements for the Project.

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

SAMPLE CONTRACT

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 01 00 00 Miscellaneous Requirements | Exhibit 2 |
| Contract Forms And General Requirements | Exhibit 3 |
| Drawing List | Exhibit 4 |
| Addendum No.1 | Exhibit 5 |
| Addendum No. 2 | Exhibit 6 |
| Allowances | Exhibit 7 |
| General Conditions,Requirements, Insurances, Taxes & Bond Line Items | Exhibit 8 |
| Insurance Requirements | Exhibit 9 |
| Payment And Performance Bonds, Documents Bf & Bg | Exhibit 10 |
| Owner's Specifications | Exhibit 11 |
| Assurance Of SBDP Goal | Exhibit 12 |
| Policy On UTilization Of Small Business (SB) Program | Exhibit 13 |
| 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 14 |

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 Guilde, , 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

DIVISION 0 – PROCUREMENT & CONTRACTING REQUIREMENTS

00 73 46.1 – WAGE SCALE & PAYROLL REQUIREMENTS FOR ENGINEERING CONSTRUCTION

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Document 00820

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Wage Scale Requirements

- 1.01 Contractor and its Subcontractors must pay the general prevailing wage rates for building construction for each craft or type of worker or mechanic employed in the execution of any building construction or repair under the Contract in accordance with Chapter 2258 of the Texas Government Code and City of Houston, Texas Ordinance Nos. 85-2070, 2000-1114, 2001-152, 2006-91 and 2006-168, and 2009-247 all as amended from time to time. City Council has determined the prevailing wage rate in the locality in which the work is being performed, which is set forth in Exhibit "A".
- 1.02 This prevailing wage rate does not prohibit the payment of more than the rates stated.
- 1.03 In bidding, Contractor warrants and represents that it has carefully examined the classifications for each craft or type of worker needed to execute the Contract and determined that such classifications in Exhibit "A" include all necessary categories to perform the work under the Contract.
- 1.04 The wage scale for engineering construction is to be applied to all site work greater than 5 feet from an exterior wall of new building under construction or from an exterior wall of an existing building.
- 1.05 If Contractor believes that an additional classification for a particular craft or type of worker is necessary to perform work under the Contract, it must submit with its bid a request to the Contract Compliance Division of the Mayor's Office Of Business Opportunity ("OBO") to use an additional labor classification not listed in Exhibit "A" and specify the proposed new classification. OBO shall determine whether a proposed classification is already covered in Exhibit "A", and, if it is, specify which classification is appropriate. OBO's decision is conclusive. If OBO decides that a new classification is necessary, it will determine the appropriate prevailing wage rate for any resurveyed, amended, new, or additional craft or type of worker not covered by Exhibit "A". Such determination must be decided in accordance with procedures established by OBO, and in compliance with Chapter 2258 of the Texas Government Code and City of Houston, Texas Ordinance Nos. 85-2070, 2000-1114, 2001-152, 2006-91, 2006-168 and 2009-247 subject to City Council approval.
- 1.06 Contractor must not use any labor classification not covered by Exhibit "A" until such classification is established and approved for use by OBO.
- 1.07 A Contractor or Subcontractor who violates Chapter 2258 of the Texas Government Code must pay to the City, \$60 per each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates set forth in Exhibit "A".

00820-1
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

- 1.08 The City may withhold money required to be withheld under Chapter 2258 of the Texas Government Code from the final payment to Contractor or earlier payments if City Council makes a determination that there is good cause to believe that Contractor has not complied with these provisions and Chapter 2258 of the Government Code, in which case the City may withhold the money at any time subsequent to the finding by City Council.
- 1.09 Contractor and Subcontractors must keep records specifying:
- (1) the name and classification of each worker employed under the Contract; and
 - (2) the actual per diem wages paid to each worker, and the applicable hourly rate.
- The records must be open at all reasonable hours for inspection by the officers and agents of the City.
- 1.10 The hourly cost of salary for non-exempt workers for labor in excess of 40 hours per worker per week, shall be calculated at 1.5 times the worker's base pay, plus 1.0 times fringe benefits, for the applicable craft and level.

Certified Payroll Requirements

- 2.01 Employees are paid weekly and payrolls are submitted weekly using the City of Houston's electronic payroll submission module, unless the prime Contractor has been instructed to do otherwise by the Office of Business Opportunity. When no work is done after a Contractor has started work, the Contractor is required to submit weekly compliance statement with no work performed. The payrolls must reflect the exact work and classification of the workers, the exact amount that they were paid. Workers must be paid the contracted amount (prevailing wage rates.) The Contractor will be penalized \$60.00 a day for each employee who is underpaid per Texas Government Code 2258-023 for all contracts except Federally Funded Contract.
- 2.02 Payrolls submitted manually must be signed by an authorized person. Only ORIGINAL signatures are acceptable - no copied signatures. Payrolls must clearly indicate whether the worker worked inside or outside the building area.
- 2.03 Payrolls must be numbered and clearly marked: the first payroll as No. 1; etc. Payroll for the final week worked on the job should be marked "FINAL".
- 2.04 Payrolls must have "Week Ending" dates.
- 2.05 Payrolls must have employees' names, addresses, last four digits of the social security numbers, and job classifications. The job classifications must be the same as the classifications on the prevailing wage rate schedule.

00820-2
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

- 2.06 A payroll deduction authorization form must be submitted for each employee for any deductions other than Federal and FICA taxes.
- 2.07 Employees must be paid overtime (time and a half) for all hours worked over 40 hours a week on both federally and City-funded contracts.
- 2.08 The Contractor has the responsibility to comply with all Internal Revenue Service rules and regulations. Contractors who submit certified payrolls with owner operators (truckers) must submit a signed tax liability statement from each worker acknowledging the worker's responsibility for payment of Federal Income Tax and FICA.
- 2.09 Companies that have computerized payroll systems must copy the back of the certified payroll, Form WH347, and submit it with the authorized official's original signature.
- 2.10 If the Contractor wants to use the apprentice wage rates for an employee, the apprenticeship certificates must be submitted to the Office of Business Opportunity in advance of the employee working on the project and appearing on the payroll.
- 2.11 A poster of the Prevailing Wage Rate Schedule should be clearly displayed on each job site, or in case of annual service agreements, in the Contractor's office.
- 2.12 The Contractor shall submit the "Certificate from Contractor Appointing Officer or Employee to Supervise Payment of Employees" (Exhibit "B") to the Monitoring Authority listed in Document 00495 prior to final execution of the contract.
- 2.13 During the course of the work, Subcontractors shall submit the "Certificate from Subcontractor Appointing Officer or Employee to Supervise Payment of Employees" (Exhibit "C") to the Monitoring Authority listed in Document 00495.
- 2.14 Upon completion of the Project, as part of the contract-awarding department's total clearance process, the Office of Business Opportunity's Contract Compliance Section must review whether the Wage Rate and Payroll Requirements were met and report the results to the department.

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00820-3
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**CITY OF HOUSTON
 STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
 FOR ENGINEERING CONSTRUCTION**

EXHIBIT "A"

**LABOR CLASSIFICATIONS AND PREVAILING WAGE RATES
 FOR
 ENGINEERING CONSTRUCTION
 2013**

| CLASSIFICATION | RATE | CLASSIFICATION | RATE |
|--|-------------|---|-------------|
| Asphalt Distributor Operator | \$14.06 | Milling Machine Operator - Fine Grade | \$13.53 |
| Asphalt Paving Machine Operator | \$14.32 | Mixer Operator | \$10.33 |
| Asphalt Raker | \$12.36 | Motor Grader Operator- Rough | \$14.23 |
| Asphalt. Shoveler | \$11.68 | Motor Grader Operator | \$15.69 |
| Broom or Sweeper Operator | \$12.68 | Oiler | \$12.12 |
| Bulldozer Operator | \$11.81 | Painter-Structures | \$18.62 |
| Carpenter- Rough | \$12.49 | Pavement Marking Machine Operator | \$11.18 |
| Concrete Finisher- Paving | \$11.38 | Pile Driveman. | \$14.95 |
| Concrete Finisher- Structures | \$10.80 | Pipe Layer | \$12.12 |
| Concrete Paving Curbing Machine Operator | \$11.71 | Reinforcing Steel Setter - Paving | \$15.15 |
| Concrete Paving Finishing Machine Operator | \$13.07 | Reinforcing Steel Setter - Structure | \$14.39 |
| Concrete Paving Joint Sealer Operator | \$11.00 | Roller Operator, Pneumatic - Self-propelled | \$11.57 |
| Concrete Paving. Saw Operator | \$13.99 | Roller Operator, Steel Wheel, Flat Wheel/Tamping | \$11.57 |
| Concrete Paving Spreader Operator. | \$10.44 | Roller Operator, Steel Wheel, Plant Mix Pavement | \$11.92 |
| Concrete Rubber . . . | \$9.00 | Scraper Operator | \$13.47 |
| Crane Clamshell Backhoe Derrick, Dragline, Shovel Operator | \$12.71 | Servicer | \$13.97 |
| Crusher and Screening Plant Operator | \$11.29 | Sign Installer - PGM | \$8.54 |
| Electrician * 3 Journeyman 2 Apprentice | \$21.79 | Slip Form Machine Operator | \$11.07 |
| Flagger | \$10.33 | Spreader Box Operator | \$13.58 |
| Form Builder/Setter- Structures | \$12.23 | Structural Steel Worker | \$14.39 |
| Form Liner- Paving and Curb | \$12.34 | Tractor Operator - Crawler Type | \$13.68 |
| Form Setter- Paving and Curb | \$12.34 | Tractor Operator- Pneumatic | \$10.07 |
| Foundation Drill Operator - Crawler Mounted | \$17.43 | Transit Mixer Truck Driver | \$11.00 |
| Foundation Drill Operator - Truck Mounted | \$15.89 | Truck Driver, Lowboy-float | \$16.03 |
| Front Loader Operator | \$13.32 | Truck Driver, Single-Axle - Heavy | \$11.46 |
| Laborer Common | \$11.02 | Truck Driver, Single-Axle - Light | \$10.07 |
| Laborer- Utility | \$11.73 | Truck Driver, Tandem Axle Semi-Trailer | \$12.27 |
| Manhole Builder | \$9.00 | Work Zone Barricade Servicer | \$11.67 |
| Mechanic | \$16.96 | Welders - Receive rate prescribed for craft performing operation to which welding is incidental | |
| * Apprentices- must be in an approved USDOL Program and cannot exceed ratios | | | |

00820-4
 02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

**Engineering Prevailing Wages
Classification Definitions**

Asphalt Distributor Operator

Drives distributor truck, sets spray bars and operates valves and levers to control distribution of bituminous material for highway surfacing. May oil, grease or otherwise service and make adjustments to equipment as needed. Performs other related duties.

Asphalt Paving Machine Operator

Operates paving machine that spreads and levels asphaltic concrete on highway subgrade. Controls movement of machine, raises and lowers screed, regulates width of screed. May, oil, grease, service and make adjustments to equipment as needed. Performs other related duties.

Asphalt Raker

Distributes asphaltic materials evenly over road surface by raking and brushing material to correct thickness; directs Laborers when to add or take away material to fill low spots or to reduce high spots. Performs other related duties.

Asphalt Shoveler

A general term used on construction work covering many unskilled classifications requiring work of a physical nature. A laborer works with all crews doing everything from pick and shovel work to cleaning up lumber with hammer, shoveling and placing concrete, uses air tools, cleans concrete joints and fills joints with sealing compound from bucket or with hose and nozzle from a central source, applies coating of oil to inside face of forms, may help set and strip forms, unloads and transports reinforcing steel, cures newly poured concrete, helps lower pipe into ditch for pipelayers, builds fences, works with dirt crew keeping construction layout stakes out of the way of dirt moving equipment.

Broom or Sweeper Operator

Operates a self-propelled machine to sweep and clean roadway surfaces. May oil grease, service and make adjustments to equipment as needed. Performs other related duties.

Bulldozer Operator

Operates a crawler tractor with a bulldozer mounted in front of chassis to level, distribute and push earth or other material. May operate a ripper attachment to break up rock or other hard material. May use a push block on front of tractor to push load scrapers. May oil grease, or otherwise service and make minor repairs to equipment as needed. Performs other related duties.

Carpenter, Rough

Works from plans to build, assemble, fit together, align, plum, and set in place forms for molding concrete structures. Forms may be wood, steel, aluminum, fiberglass or any other type of material. Checks form while concrete is placed. May install miscellaneous materials integral to concrete structures. May set precast concrete elements. Prepares for slipforming traffic rail and median barrier. May install permanent metal deck forms. May work with power tools Performs other related duties.

Concrete Finisher, Paving

Finishes the exposed surfaces of fresh concrete paving, median barrier and every element of concrete structures to the final grade and contour structures to the final grade and contour with the use of straight edges and steel trowels. Operates bridge deck finishing machine. Finishes concrete curbs and gutters. Finishes exposed surface of concrete after forms have been removed by patching imperfections with fresh concrete, rubbing surface with abrasive stone, and directing others in removing excess or defective concrete with power tools. Performs other related duties.

Concrete Finisher, Structures

A worker semi-skilled in concrete finishing who assists Concrete finisher by performing specific or general duties of lesser skill and keeping Concrete Finisher supplied with materials, tools, and supplies; cleaning working area an equipment; and holding materials and tools. Performs other related duties.

00820-5
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Concrete Paving Curbing Machine Operator

Operates self - propelled machine(s) which may or may not travel on concrete paving forms, spreading and leveling fresh concrete to grade by use of augers and screeds. May oil, grease or otherwise service and make adjustments to equipment as necessary. Performs other related duties.

Concrete Paving Finishing Machine Operator

Operates self - propelled machine(s) which may or may not travel on concrete paving forms, spreading and leveling fresh concrete to grade by use of augers and screeds. May oil, grease or otherwise service and make adjustments to equipment as necessary. Performs other related duties.

Concrete Paving Joint Sealer Operator

Cleans and seals joints requiring a hot or cold sealing compound in concrete paving, sidewalks, driveway and approach slabs. May oil, grease or make necessary repairs adjustments to equipment as needed. Performs other related duties.

Concrete Paving Saw Operator

Operates a water-cooled power saw with either or an abrasive blade to saw expansion and contraction joints in concrete paving. May also be used to saw asphaltic pavements. May oil grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Concrete Paving Spreader Operator

Operates self - propelled machine(s) which may or may not travel on concrete paving forms, spreading and leveling fresh concrete to grade by use of augers and screeds. May oil, grease or otherwise service and make adjustments to equipment as necessary. Performs other related duties.

Concrete Rubber

Finishes the exposed surface of concrete masonry after the forms have been removed by patching holes and broken corners with fresh concrete, rubbing surface with abrasive stone to remove rough spots, and removing high spots and defective concrete with hand chisel and hammer or pneumatic chisel and powered abrasive stone. Performs other related duties.

Crane, Clamshell, Backhoe, Derrick, Dragline, Shovel Operator

A worker who operates a lattice boom type crane can hoist and move materials, raise and lower heavy weights and perform other related operations. May be crawler type or rubber tired. May include placement of rock riprap, clamshell, dragline, pipe and pile driving operations. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Crusher and Screed Plant Operator

Operates a crusher or screening plant through which rock is run to break it into crushed stone for construction or to control flow of materials not needed. May include minor repairs and may service and make necessary adjustments to equipment as needed. Performs other related duties.

Electrician *3 Journeyman 2 Apprentice

Plans and directs the layout of metal electrical conduit, installs wiring systems, switch-panels, buss bars, works on overhead distribution systems and underground distribution systems. Performs other related duties.

Flagger

A worker who directs traffic in or around a construction site. May use signs or devices to direct traffic. May help assemble, position and clean devices or equipment used to direct traffic. Must be able to effectively communicate with the public. May require certain level of training by TXDOT specifications. Performs other related duties.

Form Builder/Setter, Structures

Fits together, aligns and sets to grade metal and wooden forms for placement of concrete. Forms may be wood, steel, aluminum, fiberglass or any other type of material. Checks forms while concrete is placed. May install miscellaneous materials integral to concrete structures. May set precast concrete elements. Prepares for slipforming traffic rail and median barrier. May install permanent metal deck forms. May work with power tools. Performs other related duties.

Form Liner, Paving & Curb

Fits together, panels align and sets to grade metal and wooden forms for placement of concrete. Works with survey crew to set stringline for panels or moles. Performs other related duties.

00820-6
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Form Setter, Paving & Curb

Fits together, align and set to grade metal and wooden forms for placement of concrete paving and curbs. Works with survey crew to set stringline for paving, curb and gutter curb. Performs other related duties.

Foundation Drill Operator, Crawler Mounted

Operates a hole-drilling machine that is crawler mounted. May include geotechnical operations such as soils nails, rock nails, tiebacks, anchors and jet grouting. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Foundation Drill Operator, Truck Mounted

Operates a hole drilling machine that is mounted on the rear of a rubber tired vehicle or truck. May include soils nails, rock nails, tiebacks, anchors and jet grouting. Drive truck from location to location or may have laborer who drives truck. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Front End Loader Operator

Operates a rubber tired, skid steer or crawler type tractor with an attached scoop type bucket on front end. Machine is used to load materials from stockpiles, excavation, charging batch plants, loading and unloading trucks. May be used with attachments in lieu of the bucket. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Laborer, Common

A general term used on construction work covering many unskilled classifications requiring work of a physical nature. A laborer works with all crews doing everything from pick and shovel work to cleaning up lumber with hammer, shoveling and placing concrete, uses air tools, cleans concrete joints and fills joints with sealing compound from bucket or with hose and nozzle from a central source, applies coating of oil to inside face of forms, may help set and strip forms, unloads and transports reinforcing steel, cures newly poured concrete, helps lower pipe into ditch for pipelayers, builds fences, works with dirt crew keeping construction layout stakes out of the way of dirt moving equipment.

Laborer, Utility

Performs a variety of manual duties, usually working in a utility capacity by working on multiple projects and tasks where demands require workmen with varied experience and ability to work without close direction. Unloads and transports reinforcing steel. May occasionally place and tie reinforcing steel. Directs common laborers in pouring concrete. Erects shoring and bracing. Assists in installation of pipe. Installs, operate and maintains dewatering systems. May assist equipment operators in positioning machines, verifying grades and signaling operators. Directs truck drivers and scraper operators to dumping positions to maintain grades as directed. Uses power tools and air tools. May work as lead man in a labor crew. His performance of a wide variety of construction jobs distinguishes him from a helper assigned to a specific craft. Installs and maintains erosion control. Is more or less a general utility construction worker. May be second step in learning a skill, and may later become a helper in a specific classification. Performs other related duties.

Manhole Builder

Constructs a means of permanent access to water and sewer lines for maintenance purposes. This work consists of laying brick or concrete slab at bottom of ditch up to an approximate grade line near the surface of the ground. Brick or block is normally laid to form a nearly circular manhole. Brick or block is laid in by eyesight and is normally to a plumb line. Chipped or culled brick can be used quite often is. No effort may be made to keep mortar off the face of the brick and joints are not pointed. May apply coating of concrete to interior and exterior surface. Performs other related duties.

Mechanic

Assembles, set up, adjusts and maintains and repairs all types of construction equipment and trucks. He may perform the duties of a welder in repair of equipment. Performs other related duties.

Milling Machine Operator, Fine Grade

Operates a power-driven milling machine that planes material of the to roadbed and discharges the material into a hauling unit or a windrow. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

00820-7
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Mixer Operator

Performs a variety of manual duties, usually working in a utility capacity by working on multiple projects and tasks where demands require workmen with varied experience and ability to work without close direction. Unloads and transports reinforcing steel. May occasionally place and tie reinforcing steel. Directs common laborers in pouring concrete. Erects shoring and bracing. Assists in installation of pipe. Installs, operate and maintains dewatering systems. May assist equipment operators in positioning machines, verifying grades and signaling operators. Directs truck drivers and scraper operators to dumping positions to maintain grades as directed. Uses power tools and air tools. May work as lead man in a labor crew. His performance of a wide variety of construction jobs distinguishes him from a helper assigned to a specific craft. Installs and maintains erosion control. Is more or less a general utility construction worker. May be second step in learning a skill, and may later become a helper in a specific classification. Performs other related duties.

Motor Grader Operator, Rough

Operates a motor grader. Equipment is used to grade excavation and embankment and to lay asphalt, base and other materials. May blade haul roads and do other general motor grader work, but does not perform finish grade work to close specification tolerances. This operator may be a learner in the first phase of learning the skills of motor grader work. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Motor Grader Operator

Operates a motor grader. Equipment is used to grade excavation and embankment and to lay asphalt, base and other materials. May blade haul roads and do other general motor grader work, but does not perform finish grade work to close specification tolerances. This operator may be a learner in the first phase of learning the skills of motor grader work. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Oiler

A learner or semi-skilled worker who under the direction of the watch engineer May oil and grease or otherwise service all engines and necessary equipment as needed. He may clean and paint engine room as needed. Performs other related duties.

Painter, Structures

Paints and stains structural steel and concrete surfaces of bridges, retaining walls, or other structures. Directs cleaning and abrasive blasting of surfaces prior to painting or staining. Performs other related duties.

Pavement Marking Machine Operator

Operates machine used in laying paint stripes or markers on all types of paving. Loads machine with appropriate materials and may walk or ride on machine. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Piledriverman

Sets in place, aligns, plumbs directs driving of timber, concrete, steel, pipe and any other type of piling. Sets, drives and pulls steel, concrete and other types of sheet piling. Rigs pile and leads and bracing. Signals operator. Splices piles before and after driving. Directs pile cutoff. May direct jetting or drilling equipment in connection with installing piles to grade. Performs other related duties.

Pipelayer

Installs concrete, clay, steel, ductile iron, plastic, corrugated pipe and any other type of pipe for storm drainage, water lines, gas lines and sanitary sewer lines. Lays underground communication and electrical ducts. May install and set electrical ground boxes, hand holes, manholes, inlets and other structures. Caulks joints, make threaded and flanged connections. Installs valves and other accessories. Performs other related duties.

Reinforcing Steel Setter, Paving

Works from plans to lay out and install reinforcing steel within forms or in mats of concrete paving. May direct unloading of material. Determines rigging required to complete work. Gives direction to reinforcing steel worker (helper) or common or utility laborers. May install miscellaneous materials integral to concrete structure or paving. May work with power tools. Performs other related duties.

00820-8
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Reinforcing Steel Setter, Structure

Works from plans to lay out and install reinforcing steel within forms or in mats of concrete paving. May direct unloading of material. Determines rigging required to complete work. Gives direction to reinforcing steel worker (helper) or common or utility laborers. May install miscellaneous materials integral to concrete structure or paving. May work with power tools. Performs other related duties.

Roller Operator, Pneumatic, Self-Propelled

Operates a self-propelled machine with either steel wheels pneumatic tires, which is used to compact and smooth all bituminous materials. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Roller Operator, Steel Wheel, Flat Wheel/Tamping

Operates a self-propelled machine with either steel wheels or pneumatic tires which is used to compact earth fills, subgrade, flexible base and all other types of materials except bituminous. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Roller Operator, Steel Wheel, Plant Mix Pavement

Operates a self-propelled machine with either steel wheels pneumatic tires, which is used to compact and smooth all bituminous materials. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Scraper Operator

Operates a self-contained wheeled tractor scraper both self loading or assisted by crawler tractors or other scrapers. Used to excavate and transport earth or other materials. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Servicer

Drives a truck, which carries various fuels, oils, greases and filters. Must have knowledge of and is responsible for the correct oiling and greasing and changing of filters on equipment according to the manufacturers' specifications. Uses compressed air grease guns, wrenches and other tools. May make adjustments to clutches, brakes and other mechanical items. Keeps record of service preventive maintenance records. May have laborer assisting him. May require CDL if driving truck on public highways. Performs other related duties.

Sign Installer (PGM)

Sets forms, reinforcing steel, anchor bolts and pours concrete for Sign foundations. Fabricates and erects pipe and angle Frameworks by bolting, welding or other means prior to installation of signs that are normally prefabricated. Works from plans in location and drilling holes for proper location and alignment of signs. May direct hoisting of signs into place. Fastens signs to framework by bolting and other means. Locates and sets lighting brackets. May perform other work associated with signing projects. Supervises sign erector helper. Performs other related duties.

Slip Form Machine Operator

Cleans and seals joints requiring a hot or cold sealing compound in concrete paving, sidewalks, driveway and approach slabs. May oil, grease or make necessary repairs adjustments to equipment as needed. Performs other related duties.

Spreader Box operator

Operates spreader box by adjusting hopper and strike off blade so that the gravel, stone or other material may be spread to a specific depth on road surface during seal coat and surface treatment operations. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Structural Steel Worker

Works from plans to lay out and install reinforcing steel within forms or in mats of concrete paving. May direct unloading of material. Determines rigging required to complete work. Gives direction to reinforcing steel worker (helper) or common or utility laborers. May install miscellaneous materials integral to concrete structure or paving. May work with power tools. Performs other related duties.

00820-9
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

Tractor operator, Crawler Type

Operates a crawler tractor with a bulldozer mounted in front of chassis to level, distribute and push earth or other material. May operate a ripper attachment to break up rock or other hard material. May use a push block on front of tractor to push load scrapers. May oil grease, or otherwise service and make minor repairs to equipment as needed. Performs other related duties.

Tractor Operator, Pneumatic

Operates a gasoline or diesel powered agricultural tractor that tows compaction rollers, plow, disc, water tanks, scrapers and other similar operations. May use other miscellaneous attachments. May oil, grease or otherwise service and make necessary adjustments to equipment as needed. Performs other related duties.

Traveling Mixer Operator

Drives a gasoline or diesel truck upon which is mounted a concrete mixer. Operates concrete mixer and dumps concrete on the grade, into forms or into concrete pumps or buckets. Cleans mixer drum. May require CDL license for on highway use. May service and make necessary adjustments for proper operation of equipment. Performs other related duties.

Truck driver, lowboy-Float

Drives a heavy-duty diesel powered truck to which is attached a trailer upon which heavy equipment is hauled. Driver is often required to operate heavy equipment to load or unload the lowboy. May require CDL license for on highway use. May service and make necessary adjustments for proper operation of equipment. Performs other related duties.

Truck driver, Single Axle, Heavy

Drive a light capacity truck for transporting loads of construction material. The truck is of single rear axle type, may have various kinds of beds attached, such as dump, flat bed, tank, etc. May require CDL license for driving on highway. May service and make necessary adjustments for proper operation equipment. Performs other related duties.

Truck driver, Single Axle-Light

Drive a light capacity truck for transporting loads of construction material. The truck is of single rear axle type, may have various kinds of beds attached, such as dump, flat bed, tank, etc. May require CDL license for driving on highway. May services and make necessary adjustments for proper operation equipment. Performs other related duties.

Truck Driver, Tandem Axle, Semi-Trailer

Drives a diesel-powered tractor pulling a semi trailer hauling materials. Hauls dirt, rock, aggregates or other material. May require CDL license for driving on highway. May service and make necessary adjustments for proper operation of equipment. Performs other related duties.

Work Zone Barricade Servicer

Fabricates, erects and maintains temporary traffic control devices, including arrow boards, signs, barricades, channelizing devices, barrels and all message boards. May operates a truck during traffic control operations.

WELDERS - Receives rate for craft being performed to which welding is incidental.

00820-10
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

EXHIBIT "B"

**CERTIFICATE FROM CONTRACTOR APPOINTING OFFICER OR EMPLOYEE
TO SUPERVISE PAYMENT OF EMPLOYEES**

Project Name _____

Project WBS#: _____ Date _____

(I) (We) hereby certify that (I am) (we are) the prime Contractor for _____

_____ (specify type of job)
in connection with construction of the above-mentioned Project, and that (I) (we) have appointed _____, whose signature appears below, to supervise the payment of (my) (our) employees beginning _____, 20____; that he/she is in a position to have full knowledge of the facts set forth in the payroll documents and in the statement of compliance required by the Copeland Act and the City of Houston, which he/she is to execute with (my) (our) full authority and approval until such time as (I) (we) submit to the City of Houston a new certificate appointing some other person for the purposes hereinabove stated.

_____ Phone: _____
(Identifying Signature of Appointee)

Attest: _____
(Name of Firm or Corporation)

By: _____ By: _____
(Signature) (Signature)

_____ _____
(Title) (Title)

NOTE: This certificate must be executed by an authorized officer of a corporation or by a member of a partnership, and shall be executed prior to and be submitted with the first payroll. Should the appointee be changed, a new certificate must accompany the first payroll for which the new appointee executes a statement of compliance required by the Copeland Act and the City of Houston.

00820-11
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

EXHIBIT "C"

**CERTIFICATE FROM SUBCONTRACTOR APPOINTING OFFICER OR EMPLOYEE
TO SUPERVISE PAYMENT OF EMPLOYEES**

Project Name _____

Project WBS#: _____ Date _____

(I) (We) hereby certify that (I am) (we are) the prime Contractor for _____

_____ (specify type of job)

in connection with construction of the above-mentioned Project, and that (I) (we) have appointed _____, whose signature appears below, to supervise the payment of (my) (our) employees beginning _____, 20__;
that he/she is in a position to have full knowledge of the facts set forth in the payroll documents and in the statement of compliance required by the Copeland Act and the City of Houston, which he/she is to execute with (my) (our) full authority and approval until such time as (I) (we) submit to the City of Houston a new certificate appointing some other person for the purposes hereinabove stated.

_____ Phone: _____
(Identifying Signature of Appointee)

Attest: _____
(Name of Firm or Corporation)

By: _____
(Signature)

By: _____
(Signature)

_____ (Title)

_____ (Title)

NOTE: This certificate must be executed by an authorized officer of a corporation or by a member of a partnership, and shall be executed prior to and be submitted with the first payroll. Should the appointee be changed, a new certificate must accompany the first payroll for which the new appointee executes a statement of compliance required by the Copeland Act and the City of Houston.

END OF DOCUMENT

00820-12
02-01-2013

00 73 46.2 – WAGE SCALE & PAYROLL REQUIREMENTS FOR BUILDING CONSTRUCTION

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR BUILDING CONSTRUCTION**

Document 00821

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR BUILDING CONSTRUCTION**

Wage Scale Requirements

- 1.01 Contractor and its Subcontractors must pay the general prevailing wage rates for building construction for each craft or type of worker or mechanic employed in the execution of any building construction or repair under the Contract in accordance with Chapter 2258 of the Texas Government Code and City of Houston, Texas Ordinance Nos. 85-2070, 2000-1114, 2001-152, 2006-91 and 2006-168, and 2009-247 all as amended from time to time. City Council has determined the prevailing wage rate in the locality in which the work is being performed, which is set forth in Exhibit "A".
- 1.02 This prevailing wage rate does not prohibit the payment of more than the rates stated.
- 1.03 In bidding, Contractor warrants and represents that it has carefully examined the classifications for each craft or type of worker needed to execute the Contract and determined that such classifications in Exhibit "A" include all necessary categories to perform the work under the Contract.
- 1.04 The wage scale for building construction is to be applied to work on a building including an area within 5 feet of the exterior wall.
- 1.05 If Contractor believes that an additional classification for a particular craft or type of worker is necessary to perform work under the Contract, it must submit with its bid a request to the Contract Compliance Division of the Mayor's Office of Business Opportunity ("OBO") to use an additional labor classification not listed in Exhibit "A" and specify the proposed new classification. OBO shall determine whether a proposed classification is already covered in Exhibit "A", and, if it is, specify which classification is appropriate. OBO's decision is conclusive. If OBO decides that a new classification is necessary, it will determine the appropriate prevailing wage rate for any resurveyed, amended, new, or additional craft or type of worker not covered by Exhibit "A". Such determination must be decided in accordance with procedures established by OBO, and in compliance with Chapter 2258 of the Texas Government Code and City of Houston, Texas Ordinance Nos. 85-2070, 2000-1114, 2001-152, 2006-91, 2006-168, and 2009-247 subject to City Council approval.
- 1.06 Contractor must not use any labor classification not covered by Exhibit "A" until such classification is established and approved for use by OBO.
- 1.07 A Contractor or Subcontractor who violates Chapter 2258 of the Texas Government Code must pay to the City, \$60 per each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates set forth in Exhibit "A".

00821-1
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR BUILDING CONSTRUCTION**

- 1.08 The City may withhold money required to be withheld under Chapter 2258 of the Texas Government Code from the final payment to Contractor or earlier payments if City Council makes a determination that there is good cause to believe that Contractor has not complied with these provisions and Chapter 2258 of the Government Code, in which case the City may withhold the money at any time subsequent to the finding by City Council.
- 1.09 Contractor and Subcontractors must keep records specifying:
- (1) the name and classification of each worker employed under the Contract; and
 - (2) the actual per diem wages paid to each worker, and the applicable hourly rate.
- The records must be open at all reasonable hours for inspection by the officers and agents of the City.
- 1.10 The hourly cost of salary for non-exempt workers for labor in excess of 40 hours per worker per week, shall be calculated at 1.5 times the worker's base pay, plus 1.0 times fringe benefits, for the applicable craft and level.

Certified Payroll Requirements

- 2.01 Employees are paid weekly and payrolls are submitted weekly using the City of Houston's electronic payroll submission module, unless the prime Contractor has been instructed to do otherwise by the Office of Business Opportunity. When no work is done after a Contractor has started work, the Contractor is required to submit weekly compliance statement with no work performed. The payrolls must reflect the exact work and classification of the workers, the exact amount that they were paid. Workers must be paid the contracted amount (prevailing wage rates.) The Contractor will be penalized \$60.00 a day for each employee who is underpaid per Texas Government Code 2258-023 for all contracts except Federally Funded Contract.
- 2.02 Payrolls submitted manually must be signed by an authorized person. Only ORIGINAL signatures are acceptable - no copied signatures. Payrolls must clearly indicate whether the worker worked inside or outside the building area.
- 2.03 Payrolls must be numbered and clearly marked: the first payroll as No. 1; etc. Payroll for the final week worked on the job should be marked "FINAL".
- 2.04 Payrolls must have "Week Ending" dates.
- 2.05 Payrolls must have employees' names, addresses, last four digits of the social security numbers, and job classifications. The job classifications must be the same as the classifications on the prevailing wage rate schedule.

00821-2
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR BUILDING CONSTRUCTION**

- 2.06 A payroll deduction authorization form must be submitted for each employee for any deductions other than Federal and FICA taxes and court ordered child support.
- 2.07 Employees must be paid overtime (time and a half) for all hours worked over 40 hours a week on both federally and City-funded contracts.
- 2.08 The Contractor has the responsibility to comply with all Internal Revenue Service rules and regulations. Contractors who submit certified payrolls with owner operators (truckers) must submit a signed tax liability statement from each worker acknowledging the worker's responsibility for payment of Federal Income Tax and FICA.
- 2.09 Companies that have computerized payroll systems must copy the back of the certified payroll, Form WH347, and submit it with the authorized official's original signature.
- 2.10 If the Contractor wants to use the apprentice wage rates for an employee, the apprenticeship certificates must be submitted to the Office of Business Opportunity in advance of the employee working on the project and appearing on the payroll.
- 2.11 A poster of the Prevailing Wage Rate Schedule should be clearly displayed on each job site, or in case of annual service agreements, in the Contractor's office.
- 2.12 The Contractor shall submit the "Certificate from Contractor Appointing Officer or Employee to Supervise Payment of Employees" (Exhibit "B") to the Monitoring Authority listed in Document 00495 prior to final execution of the contract.
- 2.13 During the course of the work, Subcontractors shall submit the "Certificate from Subcontractor Appointing Officer or Employee to Supervise Payment of Employees" (Exhibit "C") to the Monitoring Authority listed in Document 00495.
- 2.14 Upon completion of the Project, as part of the contract-awarding department's total clearance process, the Office of Business Opportunity's Contract Compliance Section must review whether the Wage Rate and Payroll Requirements were met and report the results to the department.

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00821-3
02-01-2013

**CITY OF HOUSTON
 STANDARD DOCUMENT**

**WAGE SCALE
 FOR BUILDING CONSTRUCTION**

EXHIBIT "A"

**CITY OF HOUSTON, TEXAS
 LABOR CLASSIFICATIONS AND PREVAILING WAGE RATES
 FOR
 BUILDING CONSTRUCTION
 2013**

| Worker Classification | Ratio | Base Rate | Fringe Benefit | Wage Total |
|---|-----------------------------------|------------------|-----------------------|-------------------|
| Asbestos Worker/Insulator * | Ratio 1/1 - Apprentice | \$20.27 | \$8.92 | \$29.19 |
| Asbestos Abatement Worker (ceilings, walls ,floors only) | Ratio 1/1 - Apprentice | \$14.00 | \$0.00 | \$14.00 |
| Boilermaker * | Ratio 5/1 - Apprentice | \$23.06 | \$20.28 | \$43.34 |
| Brick Layer * (see Mason Tender Brick) | Ratio 1/3 - Apprentice | \$18.00 | \$0.00 | \$18.00 |
| Carpenter * (including acoustical ceiling work) | Ratio 2/1 - Apprentice | \$21.00 | \$6.43 | \$27.43 |
| Cement Mason/Concrete Finisher * | Ratio 1/3 - Apprentice | \$12.83 | \$0.00 | \$12.83 |
| Drywall Finisher/Taper * | Ratio 1/3 - Helper \$8.54 | \$12.13 | \$1.01 | \$13.14 |
| Drywall Hanger, * incl. metal studs installation | Ratio 1/3 - Helper \$9.46 | \$12.96 | \$1.59 | \$14.55 |
| Electrician * | Ratio 3/2 - Apprentice | \$27.65 | \$7.70 | \$35.35 |
| Elevator Mechanic * | Ratio 1/1 - Apprentice | \$37.35 | \$23.53 | \$60.88 |
| Formbuilder/Formsetter * | Ratio 1/3 - Helper \$7.67 | \$11.82 | \$0.00 | \$11.82 |
| Glazier * | Ratio 1/3 - Helper \$11.51 | \$14.92 | \$2.78 | \$17.70 |
| Insulator * (Batt and Foam) | Ratio 1/3 - Helper \$6.50 | \$10.00 | \$0.00 | \$10.00 |
| Ironworker *(Reinforcing) | Ratio 1/3 - Helper \$7.83 | \$12.06 | \$0.00 | \$12.06 |
| Ironworker *(Structural) | Ratio 1/3 - Helper \$10.19 | \$15.68 | \$0.00 | \$15.68 |
| Lather * | Ratio 1/3 - Helper \$13.38 | \$16.90 | \$3.61 | \$20.51 |
| Painter * (Brush, Roller, and Spray) | Ratio 1/3 - Helper \$7.42 | \$11.17 | \$0.00 | \$11.17 |
| Pipe Fitter *(HVAC Pipe only) | Ratio 1/1 - Apprentice | \$29.63 | \$10.16 | \$39.79 |
| Pipe Fitter *(Excluding HVAC) | Ratio 1/3 - Apprentice \$12.40 | \$19.20 | \$8.23 | \$27.43 |
| Plasterer * | Ratio 1/3 - Apprentice | \$19.42 | \$1.00 | \$20.42 |
| Plumber * | Ratio 3/2 - Apprentice | \$30.29 | \$9.50 | \$39.79 |
| Roofer * | Ratio 1/3 - Helper \$7.85 | \$11.51 | \$0.57 | \$12.08 |
| Sheet Metal Worker *(incl. HVAC duct and system install.) | Ratio 2/1 - Apprentice | \$25.37 | \$7.99 | \$33.36 |
| Sprinkler Fitter * (Fire sprinklers) | Ratio 1/1 - Apprentice | \$25.84 | \$16.47 | \$42.31 |
| Tile Finisher * | Ratio 1/3 - Helper \$8.08 | \$12.00 | \$0.43 | \$12.43 |
| Tile Setter * | Ratio 1/3 - Helper \$10.91 | \$15.70 | \$1.09 | \$16.79 |
| Truck Driver | | \$10.78 | \$1.57 | \$12.35 |
| | | | | |
| Laborers: | | | | |
| Common Laborer | | \$9.29 | \$0.00 | \$9.29 |
| Mason Tender (Brick) | | \$10.13 | \$0.00 | \$10.13 |
| Mason Tender (Cement) | | \$9.86 | \$0.00 | \$9.86 |
| Pipe Layer | | \$12.35 | \$0.00 | \$12.35 |
| Plaster Tender (Plasterer's helper) | | \$12.90 | \$2.51 | \$15.41 |
| | | | | |
| Power Equipment Operator: | | | | |
| Asphalt Paver | | \$13.50 | \$0.25 | \$13.75 |

00821-4
 02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

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|---|--|---------|--------|---------|
| Backhoe – Power Equipment Operator | | \$12.54 | \$0.00 | \$12.54 |
| Crane – Power Equipment Operator | | \$17.95 | \$3.56 | \$21.51 |
| Forklift – Power Equipment Operator | | \$15.46 | \$5.15 | \$20.61 |
| Slab and Wall Saw – Power Equipment Operator | | \$15.54 | \$3.83 | \$19.37 |
| Welders - Receive rate prescribed for craft performing operation in which welding is incidental | | | | |
| * When Apprentices are shown, Helpers cannot be utilized | | | | |

00821-5
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

**Building Construction Prevailing Wages
Classification Definitions**

Asbestos Worker/Insulator * - Ratio 1/1 Apprentice

(Including application of all insulating materials, protective coverings, coatings and finishing to all type of mechanical systems). Applies insulating material to exposed surfaces of structures, such as air ducts, hot and cold pipes, storage tanks, and cold storage rooms: Reads blueprints and selects required insulation material (in sheet, tubular, or roll form), such as fiberglass, foam rubber, styrofoam, cork, or urethane, based on material's heat retaining or excluding characteristics. Brushes adhesives on or attaches metal adhesive-backed pins to flat surfaces as necessary to facilitate application of insulation material. Measures and cuts insulation material to specified size and shape for covering flat or round surfaces, using tape measure, knife, or scissors. Fits, wraps, or attaches required insulation material around or to structure, following blueprint specifications. Covers or seals insulation with preformed plastic covers, canvas strips, sealant, or tape to secure insulation to structure, according to type of insulation used and structure covered, using staple gun, trowel, paintbrush, or caulking gun.

Asbestos Abatement Worker * (Ceilings, Floors, & Walls only)

Ratio 1/3 Apprentice

Removes asbestos from ceilings, walls, beams, boilers, and other structures, following hazardous waste handling guidelines: Assembles scaffolding and seals off work area, using plastic sheeting and duct tape. Positions mobile decontamination unit or portable showers at entrance of work area. Builds connecting walkway between mobile unit or portable showers and work area, using hand tools, lumber, nails, plastic sheeting, and duct tape. Positions portable air evacuation and filtration system inside work area. Sprays chemical solution over asbestos covered surfaces, using tank with attached hose and nozzle, to soften asbestos. Cuts and scrapes asbestos from surfaces, using knife and scraper. Shovels asbestos into plastic disposal bags and seals bags, using duct tape. Cleans work area of loose asbestos, using vacuum, broom, and dustpan. Places asbestos in disposal bags and seals bags, using duct tape. Dismantles scaffolding and temporary walkway, using hand tools, and places plastic sheeting and disposal bags into transport bags. Seals bags, using duct tape, and loads bags into truck.

Boilermaker * - Ratio 5/1 Apprentice

Assembles, analyzes defects in, and repairs boilers, pressure vessels, tanks, and vats in field, following blueprints and using hand tools and portable power tools and equipment: Locates and marks reference points for columns or plates on foundation, using master straightedge, squares, transit, and measuring tape, and applying knowledge of geometry. Attaches rigging or signals crane operator to lift parts to specified position. Aligns structures or plate sections to assemble boiler frame, tanks, or vats, using plumb bobs, levels, wedges, dogs, or turnbuckles. Hammers, flame cuts, files, or grinds irregular edges of sections or structural parts to facilitate fitting edges together. Bolts or arc-welds structures and sections together. Positions drums and headers into supports and bolts or welds supports to frame. Aligns water tubes and connects and expands ends to drums and headers, using tube expander. Bells, beads with power hammer, or welds tube ends to ensure leak proof joints. Bolts or welds casing sections, uptakes, stacks, baffles, and such fabricated parts as chutes, air heaters, fan stands, feeding tube, catwalks, ladders, coal hoppers, and safety hatch to frame, using wrench. Installs manholes, hand holes, valves, gauges, and feed water connection in

00821-6
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

drums to complete assembly of water tube boilers. Assists in testing assembled vessels by pumping water or gas under specified pressure into vessel and observing instruments for evidence of leakage. Repairs boilers or tanks in field by unbolting or flame cutting defective sections or tubes, straightening plates, using torch or jacks, installing new tubes, fitting and welding new sections and replacing worn lugs on bolts. May rivet and caulk sections of vessels, using pneumatic riveting and caulking hammers.

Bricklayer * (See Mason Tender) - Ratio 1/3 Apprentice

Lays building materials, such as brick, structural tile, and concrete cinder, glass, gypsum, and terra cotta block (except stone) to construct or repair walls, partitions, arches, sewers, and other structures: Measures distance from reference points and marks guidelines on working surface to lay out work. Spreads soft bed (layer) of mortar that serves as base and binder for block, using trowel. Applies mortar to end of block and positions block in mortar bed. Taps block with trowel to level, align, and embed in mortar, allowing specified thickness of joint. Removes excess mortar from face of block, using trowel. Finishes mortar between brick with pointing tool or trowel. Breaks bricks to fit spaces too small for whole brick, using edge of trowel or brick hammer. Determines vertical and horizontal alignment of courses, using plumb bob, gauge line (tightly stretched cord), and level. Fastens brick or terra cotta veneer to face of structures, with tie wires embedded in mortar between bricks, or in anchor holes in veneer brick. May weld metal parts to steel structural members. May apply plaster to walls and ceiling, using trowel, to complete repair work.

Carpenter * (Including Acoustical Ceiling Work) - Ratio 2/1 Apprentice

Constructs, erects, installs, and repairs structures and fixtures of wood, plywood, and wallboard, using carpenter's hand tools and power tools, and conforming to local building codes: Studies blueprints, sketches, or building plans for information pertaining to type of material required, such as lumber or fiberboard, and dimensions of structure or fixture to be fabricated. Selects specified type of lumber or other materials. Prepares layout, using rule, framing square, and calipers. Marks cutting and assembly lines on materials, using pencil, chalk, and marking gauge. Shapes materials to prescribed measurements, using saws, chisels, and planes. Assembles cut and shaped materials and fastens them together with nails, dowel pins, or glue. Verifies trueness of structure with plumb bob and carpenter's level. Erects framework for structures and lays subflooring. Builds stairs and lays out and installs partitions and cabinetwork. Covers sub floor with building paper to keep out moisture and lays hardwood, parquet, and wood-strip-block floors by nailing floors to sub floor or cementing them to mastic or asphalt base. Applies shock-absorbing, sound-deadening, and decorative paneling to ceilings and walls. Fits and installs prefabricated window frames, doors, doorframes, weather stripping, interior and exterior trim, and finish hardware, such as locks, letter drops, and kick plates. Constructs forms and chutes for pouring concrete. Erects scaffolding and ladders for assembling structures above ground level. May weld metal parts to steel structural members.

Cement Mason/Concrete Finisher *(See Concrete Mason/Concrete Finisher) - Ratio 1/3 Apprentice

Finisher; concrete floater Smooths and finishes surfaces of poured concrete floors, walls, sidewalks, or curbs to specified textures, using hand tools or power tools, including floats, trowels, and screeds: Signals concrete deliverer to position truck to facilitate pouring concrete. Moves discharge chute of truck to direct concrete into forms. Spreads concrete into inaccessible sections of forms, using rake or shovel. Levels concrete to specified depth and workable consistency, using hand held screed and floats to bring water to surface and produce soft topping. Smooths, and shapes surfaces of freshly poured concrete, using straightedge and float or power screed. Finishes concrete surfaces, using power trowel, or wets and rubs concrete with abrasive stone to impart finish. Removes rough or defective spots from concrete surfaces, using power grinder or chisel and hammer, and patches holes with fresh concrete or epoxy compound. Molds expansion joints and edges, using edging tools, jointers, and straightedge. May sprinkle colored stone chips, powdered steel, or coloring powder on concrete to produce prescribed finish. May produce rough concrete surface, using broom. May mix cement, using hoe or concrete-mixing machine. May direct sub grade work, mixing of concrete, and setting of forms.

00821-7
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

Drywall Finisher/Taper - Ratio 1/3 Helpers

Wallboard and plasterboard; sheetrock taper; taper and bedder; taper and floater Seals joints between plasterboard or other wallboards to prepare wall surface for painting or papering; Mixes sealing compound by hand or with portable electric mixer, and spreads compound over joints between boards, using trowel, broad knife, or spatula. Presses paper tape over joint to embed tape into compound and seal joint, or tapes joint, using mechanical applicator that spreads compound and embeds tape in one operation. Spreads and smoothes cementing material over tape, using trowel or floating machine to blend joint with wall surface. Sands rough spots after cement has dried. Fills cracks and holes in walls and ceiling with sealing compound. Installs metal molding at corners in lieu of sealant and tape. Usually works as member of crew. May apply texturing compound and primer to walls and ceiling preparatory to final finishing, using brushes, roller, or spray gun. May countersink nails or screws below surface of wall prior to applying sealing compound, using hammer or screwdriver.

Drywall Hanger (Includes Installing Metal Studs) - Ratio 1/3 Helpers

Dry-wall installer; gypsum dry-wall systems installer Plans gypsum drywall installations, erects metal framing and furring channels for fastening drywall, and installs drywall to cover walls, ceilings, soffits, shafts, and movable partitions in residential, commercial, and industrial buildings: Reads blueprints and other specifications to determine method of installation, work procedures, and material, tool, and work aid requirements. Lays out reference lines and points for use in computing location and position of metal framing and furring channels and marks position for erecting metalwork, using chalk line. Measures, marks, and cuts metal runners, studs, and furring channels to specified size, using tape measure, straightedge and hand and portable power cutting tools. Secures metal framing to walls and furring channels to ceilings, using hand and portable power tools. Measures and marks cutting lines on drywall, using square, tape measure, and marking devices. Scribes cutting lines on drywall, using straightedge and utility knife and breaks board along cut lines. Fits and fastens board into specified position on wall, using screws, hand tools, portable power tools, or adhesive. Cuts openings into board for electrical outlets, vents, or fixtures, using keyhole saw or other cutting tools. Measures, cuts, assembles, and installs metal framing and decorative trim for windows, doorways, and vents. Fits, aligns, and hangs doors and installs hardware, such as locks and kick plates

Electrician * (Including Pulling Wire and Low Voltage Wiring and Installation of Fire Alarms, Security Systems, Telephones, and Computers.) - Ratio 3/2 Apprentice

Plans layout, installs, and repairs wiring, electrical fixtures, apparatus, and control equipment: Plans new or modified installations to minimize waste of materials, provide access for future maintenance, and avoid unsightly, hazardous, and unreliable wiring, consistent with specifications and local electrical codes. Prepares sketches showing location of wiring and equipment, or follows diagrams or blueprints, ensuring that concealed wiring is installed before completion of future walls, ceilings, and flooring. Measures, cuts, bends, threads, assembles, and installs electrical conduit, using tools, such as hacksaw, pipe threader, and conduit bender. Pulls wiring through conduit. Splices wires by stripping insulation from terminal leads, using knife or pliers, twisting or soldering wires together, and applying tape or terminal caps. Connects wiring to lighting fixtures and power equipment, using hand tools. Installs control and distribution apparatus, such as switches, relays, and circuit-breaker panels, fastening in place with screws or bolts, using hand tools and power tools. Connects power cables to equipment, such as electric range or motor, and installs grounding leads. Tests continuity of circuit to ensure electrical compatibility and safety of components, using testing instruments, such as ohmmeter, battery and buzzer, and oscilloscope. Observes functioning of installed equipment or system to detect hazards and need for adjustments, relocation, or replacement.

00821-8
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

Elevator Mechanic * - Ratio 1/1 Apprentice

FOOTNOTES: a. - Employer contributes 8% of basic hourly rate for over 5 years' service and 6% of basic hourly rate for 6 months to 5 years' service as Vacation Pay Credit. Paid Holidays: New Year's Day; Memorial Day; Independence Day Labor Day; Thanksgiving Day; Friday after Thanksgiving Day; Christmas Day

Erector; elevator installer; elevator mechanic Assembles and installs electric and hydraulic freight and passenger elevators, escalators, and dumbwaiters, determining layout and electrical connections from blueprints: Studies blueprints and lays out location of framework, counterbalance rails, motor pump, cylinder, and plunger foundations. Drills holes in concrete or structural steel members with portable electric drill. Secures anchor bolts or welds brackets to support rails and framework, and verifies alignment with plumb bob and level. Cuts prefabricated sections of framework, rails, and other elevator components to specified dimensions, using acetylene torch, power saw, and disk grinder. Installs cables, counterweights, pumps, motor foundations, escalator drives, guide rails, elevator cars, and control panels, using hand tools. Connects electrical wiring to control panels and electric motors. Installs safety and control devices. Positions electric motor and equipment on top of elevator shaft, using hoists and cable slings.

Formbuilder/Formsetter - Ratio 1/3 Helpers

Constructs built-in-place or prefabricated wooden forms, according to specifications, for molding concrete structures: Studies blueprints and diagrams to determine type and dimension of forms to be constructed. Saws lumber to blueprint dimensions, using handsaw or power saw, and nails lumber together to make form panels. Erects built-in-place forms or assembles and installs prefabricated forms on construction site according to blueprint specifications, using hand tools, plumb rule, and level. Inserts spreaders and tie rods between opposite faces of form to maintain specified dimensions. Anchors and braces forms to fixed objects, using nails, bolts, anchor rods, steel cables, planks, and timbers.

Glazier - Ratio 1/3 Helpers

Installs glass in windows, skylights, store fronts, and display cases, or on surfaces, such as building fronts, interior walls, ceilings, and tabletops: Marks outline or pattern on glass, and cuts glass, using glasscutter. Breaks off excess glass by hand or with notched tool. Fastens glass panes into wood sash with glaziers points, and spreads and smoothes putty around edge of panes with knife to seal joints. Installs mirrors or structural glass on building fronts, walls, ceilings, or tables, using mastic, screws, or decorative molding. Bolts metal hinges, handles, locks, and other hardware to prefabricated glass doors. Sets glass doors into frame and fits hinges. May install metal window and doorframes into which glass panels are to be fitted. May press plastic adhesive film to glass or spray glass with tinting solution to prevent light glare. May install stained glass windows.

Insulator (Batt and Foam) - Ratio 1/3 Helpers

Applies batt and form insulation to walls, ceilings and other surfaces according to manufacturers specifications and blue print instructions. May use sealants such as cement plaster or asphalt compound to seal insulation; may spread concrete over floor slabs to form wearing floor: brushes adhesives, cuts insulating materials to specified shape to cover surfaces; uses tape or other sealants to adhere insulation to surfaces. May use staple gun, towel, paintbrushes and caulking guns.

Ironworker (Reinforcing) - Ratio 1/3 Helpers

Positions and secures steel bars in concrete forms to reinforce concrete; places rods in forms, spacing and fastening together with wire and pliers. Cuts bars using hacksaw, bar cutters or acetylene torch. Bends steel rods with hand tools or rod bending machine; reinforces concrete with wire mesh; welds reinforcing bars together.

00821-9
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

Ironworker (Structural) - Ratio 1/3 Helpers

Erector; ironworker; steel erector; structural-iron erector; structural-iron worker; structural steel erector Performs any combination of following duties to raise, place, and unite girders, columns, and other structural-steel members to form completed structures or structure frameworks, working as member of crew: Sets up hoisting equipment for raising and placing structural-steel members. Fastens steel members to cable of hoist, using chain, cable, or rope. Signals worker operating hoisting equipment to lift and place steel member. Guides member, using tag line (rope) or rides on member in order to guide it into position. Pulls, pushes, or pries steel members into approximate position while member is supported by hoisting device. Forces members into final position, using turnbuckles, crowbars, jacks, and hand tools. Aligns rivet holes in member with corresponding holes in previously placed member by driving drift pins or handle of wrench through holes. Verifies vertical and horizontal alignment of members, using plumb bob and level.

Lather - Ratio 1/3 Helpers

Fastens wooden, metal, or rockboard lath to walls, ceilings, and partitions of buildings to provide supporting base for plaster, fireproofing, or acoustical material, using hand tools and portable power tools: Erects horizontal metal framework to which laths are fastened, using nails, bolts, and studgun. Drills holes in floor and ceiling, using portable electric tool, and drives ends of wooden or metal studs into holes to provide anchor for furring or rockboard lath. Wires horizontal strips to furring to stiffen framework. Cuts lath to fit openings and projections, using hand tools or portable power tools. Wires, nails, clips, or staples lath to framework, ceiling joists, and flat concrete surfaces. Bends metal lath to fit corners, or attaches preformed corner reinforcements. Wires plasterer's channels to overhead structural framework to provide support for plaster or acoustical ceiling tile.

Painter (Brush, Roller, and Spray) - Ratio 1/3 Helpers

Applies coats of paint, varnish, stain, enamel, or lacquer to decorate and protect interior or exterior surfaces, trimmings, and fixtures of buildings and other structures: Reads work order or receives instructions from supervisor or homeowner regarding painting. Smooths surfaces, using sandpaper, brushes, or steel wool, and removes old paint from surfaces, using paint remover, scraper, wire brush, or blowtorch to prepare surfaces for painting. Fills nail holes, cracks, and joints with caulk, putty, plaster, or other filler, using caulking gun and putty knife. Selects premixed paints, or mixes required portions of pigment, oil, and thinning and drying substances to prepare paint that matches specified colors. Removes fixtures, such as pictures and electric switchcovers, from walls prior to painting, using screwdriver. Spreads dropcloths over floors and room furnishings, and covers surfaces, such as baseboards, doorframes, and windows with masking tape and paper to protect surfaces during painting. Paints surfaces, using brushes, spray gun, or paint rollers. Simulates wood grain, marble, brick, or tile effects. Applies paint with cloth, brush, sponge, or fingers to create special effects. Erects scaffolding or sets up ladders to perform tasks above ground level.

Pipe fitter * (HVAC Pipe Only) - Ratio 1/3 Apprentice

Lays out, assembles, installs, and maintains pipe systems, pipe supports, and related hydraulic and pneumatic equipment for steam, hot water, heating, cooling, lubricating, sprinkling, and industrial production and processing systems, applying knowledge of system operation, and following blueprints: Selects type and size of pipe, and related materials and equipment, such as supports, hangers, and hydraulic cylinders, according to specifications. Inspects work site to determine presence of obstructions and to ascertain that holes cut for pipe will not cause structural weakness. Plans installation or repair to avoid obstructions and to avoid interfering with activities of other workers. Cuts pipe, using saws, pipe cutter, hammer and chisel, cutting torch, and pipe cutting machine. Threads pipe, using pipe threading machine. Bends pipe, using pipe bending tools and pipe bending machine. Assembles and installs variety of metal and nonmetal pipes, tubes, and fittings, including iron, steel, copper, and plastic. Connects pipes, using threaded, caulked, soldered, brazed, fused, or cemented joints, and hand tools. Secures pipes to structure with brackets, clamps, and hangers, using hand tools and power tools. Installs and maintains hydraulic and pneumatic components of machines and equipment, such as pumps and cylinders, using hand tools. Installs and maintains refrigeration and air conditioning systems, including compressors, pumps, meters, pneumatic and hydraulic controls, and piping, using hand tools and power tools, and following

00821-10
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

specifications and blueprints. Increases pressure in pipe system and observes connected pressure gauge to test system for leaks. May weld pipe supports to structural steel members. May observe production machines in assigned area of manufacturing facility to detect machinery malfunctions. May operate machinery to verify repair. May modify programs of automated machinery, such as robots and conveyors, to change motion and speed of machine, using teach pendant, control panel, or keyboard and display screen of robot controller and programmable controller. May be designated Steam Fitter (construction) when installing piping systems that must withstand high pressure.

Pipe Fitter * (Excluding HVAC) – Ratio 1/1 See Journeyman / Apprentice schedule

Lays out, assembles, installs, and maintains pipe systems, pipe supports, and related hydraulic and pneumatic equipment for steam, hot water, heating, cooling, lubricating, sprinkling, and industrial production and processing systems, applying knowledge of system operation, and following blueprints: Selects type and size of pipe, and related materials and equipment, such as supports, hangers, and hydraulic cylinders, according to specifications. Inspects work site to determine presence of obstructions and to ascertain that holes cut for pipe will not cause structural weakness. Plans installation or repair to avoid obstructions and to avoid interfering with activities of other workers. Cuts pipe, using saws, pipe cutter, hammer and chisel, cutting torch, and pipe cutting machine. Threads pipe, using pipe-threading machine. Bends pipe, using pipe bending tools and pipe bending machine. Assembles and installs variety of metal and nonmetal pipes, tubes, and fittings, including iron, steel, copper, and plastic. Connects pipes, using threaded, caulked, soldered, brazed, fused, or cemented joints, and hand tools. Secures pipes to structure with brackets, clamps, and hangers, using hand tools and power tools. Installs and maintains hydraulic and pneumatic components of machines and equipment, such as pumps and cylinders, using hand tools. Installs and maintains refrigeration and air conditioning systems, including compressors, pumps, meters, pneumatic and hydraulic controls, and piping, using hand tools and power tools, and following specifications and blueprints. Increases pressure in pipe system and observes connected pressure gauge to test system for leaks.

Plasterer * See Plaster Tender - Ratio 1/3 Apprentice

Applies coats of plaster to interior walls, ceilings, and partitions of buildings, to produce finished surface, according to blueprints, architect's drawings, or oral instructions, using hand tools and portable power tools: Directs workers to mix plaster to desired consistency and to erect scaffolds. Spreads plaster over lath or masonry base, using trowel, and smooths plaster with darby and float to attain uniform thickness. Applies scratch, brown, or finish coats of plaster to wood, metal, or board lath successively. Roughens undercoat with scratcher (wire or metal scraper) to provide bond for succeeding coats of plaster.

Plumber * (Excluding HVAC Pipe) - Ratio 3/2 Apprentice

Assembles, installs, and repairs pipes, fittings, and fixtures of heating, water, and drainage systems, according to specifications and plumbing codes: Studies building plans and working drawings to determine work aids required and sequence of installations. Inspects structure to ascertain obstructions to be avoided to prevent weakening of structure resulting from installation of pipe. Locates and marks position of pipe and pipe connections and passage holes for pipes in walls and floors, using ruler, spirit level, and plumb bob. Cuts openings in walls and floors to accommodate pipe and pipe fittings, using hand tools and power tools. Cuts and threads pipe, using pipe cutters, cutting torch, and pipe-threading machine. Bends pipe to required angle by use of pipe-bending machine or by placing pipe over block and bending it by hand. Assembles and installs valves, pipe fittings, and pipes composed of metals, such as iron, steel, brass, and lead, and nonmetals, such as glass, vitrified clay, and plastic, using hand tools and power tools. Joins pipes by use of screws, bolts, fittings, solder, plastic solvent, and caulks joints. Fills pipe system with water or air and reads pressure gauges to determine whether system is leaking. Installs and repairs plumbing fixtures, such as sinks, commodes, bathtubs, water heaters, hot water tanks, garbage disposal units, dishwashers,

00821-11
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

and water softeners. Repairs and maintains plumbing by replacing washers in leaky faucets, mending burst pipes, and opening clogged drains.

Roofer - Ratio 1/3 Helpers

Covers roofs with roofing materials other than sheet metal, such as composition shingles or sheets, wood shingles, or asphalt and gravel, to waterproof roofs: Cuts roofing paper to size, using knife, and nails or staples it to roof in overlapping strips to form base for roofing materials. Installs gutters and down spouts. Aligns roofing material with edge of roof, and overlaps successive layers, gauging distance of overlap with chalkline, gauge on shingling hatchet, or by lines on shingles. Fastens composition shingles or sheets to roof with asphalt, cement, or nails. Punches holes in slate, tile, terra cotta, or wooden shingles, using punch and hammer. Cuts strips of flashing and fits them into angles formed by walls, vents, and intersecting roof surfaces. When applying asphalt or tar and gravel to roof, mops or pours hot asphalt or tar onto roof base. Applies alternate layers of hot asphalt or tar and roofing paper until roof covering is as specified. Applies gravel or pebbles over top layer, using rake or stiff bristled broom.

Sheet metal worker * Ratio 2/1 Apprentice (Including Setting HVAC System)(Excluding HVAC Duct)
Ratio 3/1 Apprentice

Fabricates, assembles, installs and repairs sheet metal products, including sheet metal roof (also see Roofer). Operates soldering and welding equipment to join together sheet metal parts. Seals seams and joints with sealant. Installs roof sheets, trims, flashing, gutters down spouts and other related items. Performs other related duties.

Sprinkler Fitter (Fire) * - Ratio 1/1 Apprentice

Lays out, assembles, installs, and maintains pipe systems, pipe supports, and related hydraulic and pneumatic equipment for steam, hot water, heating, cooling, lubricating, sprinkling, and industrial production and processing systems, applying knowledge of system operation, and following blueprints: Selects type and size of pipe, and related materials and equipment, such as supports, hangers, and hydraulic cylinders, according to specifications. Inspects work site to determine presence of obstructions and to ascertain that holes cut for pipe will not cause structural weakness. Plans installation or repair to avoid obstructions and to avoid interfering with activities of other workers. Cuts pipe, using saws, pipe cutter, hammer and chisel, cutting torch, and pipe cutting machine. Threads pipe, using pipe-threading machine. Bends pipe, using pipe bending tools and pipe bending machine. Assembles and installs variety of metal and nonmetal pipes, tubes, and fittings, including iron, steel, copper, and plastic. Connects pipes, using threaded, caulked, soldered, brazed, fused, or cemented joints, and hand tools. Secures pipes to structure with brackets, clamps, and hangers, using hand tools and power tools. Installs and maintains hydraulic and pneumatic components of machines and equipment, such as pumps and cylinders, using hand tools. Installs and maintains refrigeration and air conditioning systems, including compressors, pumps, meters, pneumatic and hydraulic controls, and piping, using hand tools and power tools, and following specifications and blueprints. Increases pressure in pipe system and observes connected pressure gauge to test system for leaks. May weld pipe supports to structural steel members. May observe production machines in assigned area of manufacturing facility to detect machinery malfunctions. May operate machinery to verify repair. May modify programs of automated machinery, such as robots and conveyors, to change motion and speed of machine, using teach pendant, control panel, or keyboard and display screen of robot controller and programmable controller.

Tile Finisher - Ratio 1/3 Helpers

Supplies and mixes construction materials for TILE SETTER (construction) 861.381-054, applies grout, and cleans installed tile: Moves tiles, tile setting tools, and work devices from storage area to installation site manually or using wheelbarrow. Mixes mortar and grout according to standard formulas and request from TILE SETTER (construction), using bucket, water hose, spatula, and portable mixer. Supplies TILE SETTER (construction) with mortar, using wheelbarrow and shovel. Applies grout between joints of installed tile, using grouting trowel. Removes excess grout from tile

00821-12
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

joints with wet sponge and scrapes corners and crevices with trowel. Wipes surface of tile after grout has set to remove grout residue and polish tile, using nonabrasive materials. Cleans installation site, mixing and storage areas, and installation machines, tools, and equipment, using water and various cleaning tools. Stores tile setting materials, machines, tools, and equipment. May apply caulk, sealers, acid, steam, or related agents to caulk, seal, or clean installed tile, using various application devices and equipment. May modify mixing, grouting, grinding, and cleaning procedures according to type of installation or material used. May assist TILE SETTER (construction) to position and secure metal lath, wire mesh, or felt paper prior to installation of tile. May cut marked tiles to size, using power saw or tile cutter.

Tile Setter - Ratio 1/3 Helpers

Applies tile to walls, floors, ceilings, and promenade roof decks, following design specifications: Examines blueprints, measures and marks surfaces to be covered, and lays out work. Measures and cuts metal lath to size for walls and ceilings with tin snips. Tacks lath to wall and ceiling surfaces with staple gun or hammer. Spreads plaster base over lath with trowel and levels plaster to specified thickness, using screed. Spreads concrete on sub floor, with trowel and levels it with screed. Spreads mastic or other adhesive base on roof deck, using serrated spreader to form base for promenade tile. Cuts and shapes tile with tile cutters and biters. Positions tile and taps it with trowel handle to affix tile to plaster or adhesive base.

Truck Driver

Drives truck with capacity of more than 3 tons, to transport materials to and from specified destinations: Drives truck to destination, applying knowledge of commercial driving regulations and area roads. Prepares receipts for load picked up. Collects payment for goods delivered and for delivery charges. May maintain truck log, according to state and federal regulations. May maintain telephone or radio contact with supervisor to receive delivery instructions. May load and unload truck. May inspect truck equipment and supplies, such as tires, lights, brakes, gas, oil, and water. May perform emergency roadside repairs, such as changing tires, installing light bulbs, tire chains, and spark plugs. May position blocks and tie rope around items to secure cargo during transit.

Laborers

Common Laborer

Performs any combination of the following tasks in erecting, repairing and wrecking buildings; dig, spread and level dirt and gravel; lift carry and hold building materials, tools and supplies; clean tools, equipment, materials and work areas; mix, pour and spread concrete, asphalt, gravel and other materials; join, wrap and seal sections of pipe; routine non-machine tasks such as removing forms from set concrete, filling expansion joints with asphalt, and placing culverts in trench. May also signal construction equipment operators; measure distances from grade stakes, drive stakes and stretch lines; bolt, nail align and block up under forms; mix and finish poured concrete, erect scaffolding; spread paint or coating to seal surfaces; caulking compounds to seal surfaces; remove projections from concrete, and mount pipe hangers.

Mason Tender Brick (Bricklayer's Helper)

Mason Tender Cement (Concrete Mason's / Concrete Finisher's Helper)

Pipe layer

Lay pipe for storm or sanitation sewers, drains, and water mains. Perform any combination of the following tasks: grade trenches or culverts, position pipe, or seal joints.

Plaster Tender (Plaster's Helper)

Tends machine that pumps plaster or stucco through spraygun for application to ceilings, walls, and partitions of buildings: Starts and stops machine on signals from PLASTERER (construction). Fills

00821-13
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE
FOR BUILDING CONSTRUCTION**

hopper of machine with plaster. Turns valves to regulate pump and compressor. Assists in erecting scaffolds.

Power Equipment Operator:

Asphalt Paver (operator)

Operator; bituminous-paving-machine operator; blacktop-paver operator; blacktop spreader; mechanical-spreader operator; paving-machine operator, asphalt or bituminous Operates machine that spreads and levels hot-mix bituminous paving material on sub grade of highways and streets: Bolts extensions to screed to adjust width, using wrenches. Lights burners to heat screed. Starts engine and controls paving machine to push dump truck and maintain constant flow of asphalt into hopper. Observes distribution of paving material along screed and controls direction of screed to eliminate voids at curbs and joints. Turns valves to regulate temperature of asphalt flowing from hopper when asphalt begins to harden on screed.

Backhoe (operator)

Operates power-driven machine, equipped with movable shovel, to excavate or move coal, dirt, rock, sand, and other materials: Receives written or oral instructions from supervisor regarding material to move or excavate. Pushes levers and depresses pedals to move machine, to lower and push shovel into stockpiled material, to lower and dig shovel into surface of ground, and to lift, swing, and dump contents of shovel into truck, car, or onto conveyor, hopper, or stockpile. Observes markings on ground, hand signals, or grade stakes to remove material, when operating machine at excavation site.

Crane (operator)

Operates electric-, diesel-, gasoline-, or steam-powered guy-derrick or stiff-leg derrick (mast supported by fixed legs or tripod), to move products, equipment, or materials to and from quarries, storage areas, and processes, or to load and unload trucks or railroad cars: Pushes and pulls levers and depresses pedals to raise, lower, and rotate boom and to raise and lower load line in response to signals.

Forklift (operator)

Drives gasoline-, liquefied gas-, or electric-powered industrial truck equipped with lifting devices, such as forklift, boom, scoop, lift beam and swivel-hook, fork-grapple, clamps, elevating platform, or trailer hitch, to push, pull, lift, stack, tier, or move products, equipment, or materials in warehouse, storage yard, or factory: Moves levers and presses pedals to drive truck and control movement of lifting apparatus. Positions forks, lifting platform, or other lifting device under, over, or around loaded pallets, skids, boxes, products, or materials or hooks tow trucks to trailer hitch, and transports load to designated area. Unloads and stacks material by raising and lowering lifting device.

Slab & Wall Saw (operator)

Apprentices

Apprentices may be used in any of the crafts listed above where noted, if they are currently certified in a program recognized by the Bureau of Apprenticeship and Training, U.S. Department of Labor, providing the proper ratio between journeyman and apprentice is observed. Apprentice certification certificates must be supplied with the first weekly payroll upon which the apprentice's name appears.

Helper (65% of the journeyman classification)

(Must not exceed 3 helpers to 1 journeyman)

A Helper is a semi-skilled worker (rather than a skilled journeyman) who works under the direction of and assists a journeyman. Under the journeyman's direction and supervision, the helper performs a variety of duties to assist the journeyman such as preparing, carrying, and furnishing equipment,

00821-14
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

supplies and maintaining them in order; cleaning and preparing work areas; lifting, positioning, and holding materials or tools; and other related semi-skilled tasks as directed by the journeyman. A helper may use the tools of the trade at and under the direction of the journeyman. The particular duties performed by a helper vary according to area practice. The journeyman must work in close proximity to the location of the helpers work area. The helpers wage rate shall be calculated at no less than 65% of the prevailing wage for that journeyman's classification.

Helper who assists more than one journeyman craft should be listed with the notation indicating each journeyman craft classification they assist.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Pipe fitters * Apprentice Schedule (Excluding HVAC Pipe)

| Journeyman | Indentured Apprentice | Apprentice Applicant | Total |
|------------|-----------------------|----------------------|----------|
| 1 | 1 | 0 | 1 to 1 |
| 3 | 2 | 1 | 3 to 3 |
| 5 | 3 | 2 | 5 to 5 |
| 8 | 4 | 3 | 8 to 7 |
| 12 | 5 | 4 | 12 to 9 |
| 16 | 6 | 5 | 16 to 11 |
| 20 | 7 | 6 | 20 to 13 |
| 25 | 8 | 7 | 25 to 15 |
| 30 | 9 | 8 | 30 to 17 |
| 40 | 10 | 9 | 40 to 19 |
| 50 | 11 | 10 | 50 to 21 |

NOTE: Continue after 50 Journeyman — ONE (1) Indentured Apprentice and one (1) Apprentice Applicant for every ten (10) Journeyman

*** When Apprentices are shown, Helpers cannot be utilized**

If there are questions as to the classification of a worker, contact the Contract Compliance Officer in writing with a description of the work the worker will be performing. After review the Contract Compliance Officer will respond in writing with the classification and wage rate to be paid the worker in question.

00821-15
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

EXHIBIT "B"

**CERTIFICATE FROM CONTRACTOR APPOINTING OFFICER OR EMPLOYEE
TO SUPERVISE PAYMENT OF EMPLOYEES**

Project Name _____

Project WBS#: _____ Date _____

(I) (We) hereby certify that (I am) (we are) the prime Contractor for _____

_____ (specify type of job)
in connection with construction of the above-mentioned Project, and that (I) (we) have appointed _____, whose signature appears below, to supervise the payment of (my) (our) employees beginning _____, 20____; that he/she is in a position to have full knowledge of the facts set forth in the payroll documents and in the statement of compliance required by the Copeland Act and the City of Houston, which he/she is to execute with (my) (our) full authority and approval until such time as (I) (we) submit to the City of Houston a new certificate appointing some other person for the purposes hereinabove stated.

_____ Phone: _____
(Identifying Signature of Appointee)

Attest: _____
(Name of Firm or Corporation)

By: _____ By: _____
(Signature) (Signature)

_____ _____
(Title) (Title)

NOTE: This certificate must be executed by an authorized officer of a corporation or by a member of a partnership, and shall be executed prior to and be submitted with the first payroll. Should the appointee be changed, a new certificate must accompany the first payroll for which the new appointee executes a statement of compliance required by the Copeland Act and the City of Houston.

00821-16
02-01-2013

**CITY OF HOUSTON
STANDARD DOCUMENT**

**WAGE SCALE AND PAYROLL REQUIREMENTS
FOR ENGINEERING CONSTRUCTION**

EXHIBIT "C"

**CERTIFICATE FROM SUBCONTRACTOR APPOINTING OFFICER OR EMPLOYEE
TO SUPERVISE PAYMENT OF EMPLOYEES**

Project Name _____

Project WBS#: _____ Date _____

(I) (We) hereby certify that (I am) (we are) the prime Contractor for _____

_____ (specify type of job)

in connection with construction of the above-mentioned Project, and that (I) (we) have appointed _____, whose signature appears below, to supervise the payment of (my) (our) employees beginning _____, 20__;
that he/she is in a position to have full knowledge of the facts set forth in the payroll documents and in the statement of compliance required by the Copeland Act and the City of Houston, which he/she is to execute with (my) (our) full authority and approval until such time as (I) (we) submit to the City of Houston a new certificate appointing some other person for the purposes hereinabove stated.

_____ Phone: _____
(Identifying Signature of Appointee)

Attest: _____
(Name of Firm or Corporation)

By: _____
(Signature)

By: _____
(Signature)

_____ (Title)

_____ (Title)

NOTE: This certificate must be executed by an authorized officer of a corporation or by a member of a partnership, and shall be executed prior to and be submitted with the first payroll. Should the appointee be changed, a new certificate must accompany the first payroll for which the new appointee executes a statement of compliance required by the Copeland Act and the City of Houston.

END OF DOCUMENT

00821-17
02-01-2013

DIVISION 1 – GENERAL REQUIREMENTS

01 00 00 – MISCELLANEOUS REQUIREMENTS

1.1 SUMMARY

- A. These Miscellaneous Requirements are issued as supplements to the Uniform General Conditions for Construction Contracts (UGCs) 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 UGCs or the Special Conditions, the latter shall govern.

1.2 REMOVAL OF DEBRIS (SEE SECTION 01 52 40)

- A. 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.

1.3 DRAWINGS AND SPECIFICATIONS (ALSO SEE UGC ARTICLE 6)

- A. 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.
 - 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.
 - 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. 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.

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.
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.
6. Explanatory notes on Drawings;
 - a) Recorded dimensions;
 - b) Large scales details;
 - c) Small scale details;
 - d) Scaled measurements
7. 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.

1.4 INTERPRETATIONS OF DOCUMENTS (SEE UGC 3.2.2)

- A. 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.

1.5 MATERIALS AND WORK (SEE UGC 8.1)

- A. 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)

- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. 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.
- J. All temporary shoring required for the installation of Work shall be provided by the

Contractor who will take all responsibility.

- K. 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.
- L. Also see Sections 013100, 013523 and 015000 for related requirements.

1.6 INTENT OF THE DOCUMENTS (SEE UGC 11.1.2)

- A. 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.
- B. 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).
- C. 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.

1.7 EXISTING UNDERGROUND UTILITIES

- A. 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.

1.8 PUMPING, SHORING, ETC.

- A. 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
- B. 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.

1.9 HAZARDOUS MATERIALS

- A. 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)
- B. 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.

1.10 SUBSTANTIAL COMPLETION (SEE UGC 1.26 AND 12.1.1)

- A. "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.

1.11 COORDINATION (SEE UGC 3.3.6.2)

- A. 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.

1.12 OBSERVATION OF WORK (SEE UGC 8.5.1)

- A. 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.

1.13 COOPERATION WITH BUILDING OFFICIALS

- A. 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.

1.14 NOTIFICATION

- A. 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.

1.15 ONGOING OPERATIONS/CONSTRUCTION PERSONNEL

- A. 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.
- B. 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.
- C. Adjacent facilities will continue to be used for their intended purpose while this Project is underway and the following requirements shall apply:
 - 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.
 - 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.
 - 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.
 - 4. Firearms, drugs, intoxicating beverages, X-rated materials, etc. are banned from the Owner's property.

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.
 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.
- D. 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 deactivate any campus utility system or component of any system, without express written direction from the Owner.
- E. 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.

1.16 FIELD MEASUREMENTS (SEE 014518 – FIELD ENGINEERING)

- A. 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.
- B. 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.

1.17 SUBSTITUTIONS (SEE UGC 8.3.5 AND 8.3.6)

- A. 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 01 00 00

01 20 00 – PROJECT MEETINGS

1.1 PRE–CONSTRUCTION CONFERENCES (SEE UGC 3.1.1)

- A. 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, Project Manager and Contractor prior to scheduling.
- B. The following is a tentative agenda for the Pre–Construction Conference:
 - 1. Critical work sequencing;
 - 2. Designation of responsible personnel;
 - 3. Procedures for processing submittals, substitutions, applications for payment, proposal requests, change letters and Contract Close–out procedures;
 - 4. Parking and access to the site;
 - 5. Office, storage areas and temporary facilities;
 - 6. Utility information;
 - 7. Testing procedures;
 - 8. Procedures for maintaining record documents.
- C. 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.

1.2 PRE–INSTALLATION CONFERENCES

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

1.3 PROGRESS MEETINGS (SEE UGC 8.5 AND 8.6)

- A. 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.
- B. Minutes of the Progress Meeting shall be kept and distributed to all attendees and to all team members not present at the meeting.

1.4 CLOSE–OUT MEETINGS

- A. 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.

- B. 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.
- C. 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 01 20 00

01 27 00 – UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Contractor to provide unit prices of Cost to Add as well as the Credit to Deduct for each of the items in PART 3 below.**
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. Concrete Pavers
 - 1. Description: Cost to add 1 square foot of concrete pavers according to paver drawing detail and according to Division 32 Section "Unit Paving." Include concrete base, sand bed, and all other shown design components.
 - 2. Unit of Measurement: Per Square Foot.

B. Fly Ash Pavers

1. Description: Cost to add 1 square foot of pavers according to paver drawing detail and according to Division 32 Section "Unit Paving." Include concrete base, sand bed, and all other shown design components.
2. Provide separate price for engraving text per paver on Fly Ash Pavers as per sample on Drawing No. 9/AS-3.05.
3. Unit of Measurement: Per Square Foot.

C. Egyptian Limestone Pavers

1. Description: Cost to add 1 square foot of pavers according to paver drawing detail and according to Division 32 Section "Unit Paving." Include concrete base, sand bed, and all other shown design components.
2. Unit of Measurement: Per Square Foot.

D. Sugari Stone Pavers

1. Description: Cost to add 1 square foot of pavers according to paver drawing detail and according to Division 32 Section "Unit Paving." Include concrete base, sand bed, and all other shown design components.
2. Provide price for engraving text per paver on Sugari Sand Stone Pavers as per sample on Drawing No. 17/AS-3.05.
3. Unit of Measurement: Per Square Foot.

E. Egyptian Limestone Clad Walls

1. Description: Cost to add 1 linear foot of stone veneer units according to drawing detail and according to Division 04 Section "ADHERED MASONRY VENEER SYSTEM."
2. Provide individual add prices for each type of wall section as per drawings.
3. Unit of Measurement: Per Linear Foot.

F. Egyptian Limestone Clad Seating Walls

1. Description: Cost to add 1 linear foot of seating wall according to drawing detail and according to Division 04 & 06. Include concrete base and all other shown design components.
2. Provide individual add prices for each type of wall section as per drawings.
3. Unit of Measurement: Per Linear Foot.

G. Concrete Walkways

1. Description: Cost to add one square foot of concrete sidewalk at the thickness shown on the plans, sand bedding according to sidewalk details and Division 32 Section "Concrete Walks and Ramps."
 2. Provide individual add prices for Light Broom Finish and Sand Blasted Finish concrete walkways..
 3. Unit of Measurement: Per Square Foot.
- H. Wood Deck
1. Description: Cost to add 1 square foot of wood deck area (including framing) according to Division 06.
 2. Unit of Measurement: Per Square Foot.
- I. PVC Deck
1. Description: Cost to add 1 square foot of PVC deck area (including framing) according to Division 06.
 2. Unit of Measurement: Per Square Foot.
- J. Deck Foundations
1. Description: Cost to add 1 foundation for deck area according to drawing detail and Division 32.
 2. Unit of Measurement: Per Unit.
- K. Seats with Table
1. Description: Cost to add and install 1 Unit (4 Seats with Table) according to according to drawing detail and Division 12 Section "Furnishings."
 2. Unit of Measurement: Per Unit.
- L. Bicycle Racks
1. Description: Cost to add and install 1 Unit according to drawing detail and Division 12 Section "Furnishings."
 2. Provide individual add prices for each type shown on drawings.
 3. Unit of Measurement: Per Unit.
- M. Waste & Ash Receptacles
1. Description: Cost to add and install 1 Unit (Waste & Ash Receptacle) according to drawing detail and Division 12 Section "Furnishings."
 2. Provide individual add prices for each type shown on drawings.

3. Unit of Measurement: Per Unit.

N. Site Lighting

1. Description: Cost to add fixture, provide foundation, pole, wire, and install 1 Unit according to Division 26 Section "Site Lighting." and construction drawings. Include 100 feet of underground conduit and wiring.
2. Provide individual add prices for each type shown on drawings.
3. Unit of Measurement: Per Unit.

O. Decomposed Granite

1. Description: Cost to provide, prep ground, and install 1 square foot of Decomposed Granite, details in construction drawings.
2. Unit of Measurement: Per Square Foot.

P. Black Star Gravel

1. Description: Cost to provide, prep ground, and install 1 square foot of Black Star Gravel, details in construction drawings.
2. Unit of Measurement: Per Square Foot.

Q. Washed Limestone

1. Description: Cost to provide, prep ground, and install 1 square foot of Washed Limestone, details in construction drawings.
2. Unit of Measurement: Per Square Foot.

R. Underground Utilities (Storm)

1. Description: Cost to provide material, excavate, install and backfill one (1) linear foot of underground storm sewer piping per Division 33 "Storm Sewage System".
2. Provide prices individually by pipe diameters and materials specified in the Construction Documents.
3. Unit of Measurement: Per Linear Foot.

S. Underground Utilities (Storm Sewer Manhole)

1. Description: Cost to provide material, excavate, install and backfill one (1) unit manhole per Division 33 "Storm Sewage System" and Construction Documents.
2. Unit of Measurement: Per Unit.

T. Underground Utilities (Storm Sewer Inlet)

1. Description: Cost to provide material, excavate, install and backfill one (1) unit

inlet per Division 33 “Storm Sewage System” and Construction Documents.

2. Provide prices individually by inlet type and materials specified in the Construction Documents.
3. Unit of Measurement: Per Unit.

U. Landscape Trees & Plants

1. Description: Cost to add 1 plant or 1 plant container if standard container contains multiple plants and install per Division 32 Sections “Planting” and “Operation and Maintenance of Planting” and construction drawing details.
2. Provide individual add prices for each plant listed in the Plant Schedule.
3. Unit of Measurement: Per Container/Unit.

END OF SECTION 01 27 00

01 31 00 – PROJECT ADMINISTRATION

1.1 SUBCONTRACTS (SEE UGC 3.3.6)

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

1.2 FLOW OF COMMUNICATIONS (SEE UGC 3.2, 3.3.1 AND 3.3.6)

- A. 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)**
- B. The Owner will also designate Project Manager. The ODSR will have the authority, delegated by the ODR, to make decisions on behalf of the Owner concerning coordination with the Owner 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 Project Manager, 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 Project Manager will be the Contractor's primary point of contact on the site.
- C. 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.
 - 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. 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.
- D. 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.
- E. All Project correspondence shall include the Project Number and Name in the title or reference.

- F. 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.
- G. All subcontractor correspondence to either the Owner or the A/E shall be routed through the Contactor.
- H. 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.
- I. 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.

1.3 PROJECT CHANGES (SEE UGC 9.1, 9.3.3.3, 9.6.2.2 AND ARTICLE 11)

- A. All changes to the Contract involving scope, cost, or time will be issued on either a written Contingency Expenditure Authorization (CEA) or the standard Houston Community College (HCC) Change Order form. The determination of whether changes in the Work are funded from the Owner’s Construction Contingency or by Change Order is at the Owner’s sole discretion. Such CEAs or Change Orders are valid only if signed by either the Chancellor of HCC or by the Executive Director for Construction Administration. A single CEA or Change Order may include several different change issues and they will not be required to be related to each other.
- B. Prior to issuing a CEA or 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.
 - 1. The Contactor 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.
 - 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. 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 Construction Change Directive.

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 CEA or Change Order.

- C. Any funds remaining in the Owner's Construction Contingency at the completion of the Project belong to the Owner and shall be credited to the Owner by deductive Change Order.

1.4 LIQUIDATED DAMAGES (SEE UGC 9.11, 12.1.4 AND 25.2)

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

1.5 SITE USE ISSUES

- A. 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.
- B. 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:
 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.
 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.

1.6 SHOP DRAWINGS AND SUBMITTALS (SEE UGC 8.3)

- A. Refer to the UGC for requirements not identified in this section.
- B. 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.
- C. The burden of timeliness to complete the submittal process is on the Contractor. The Contractor shall allow sufficient time (at least 10 business days) within the construction schedule for the A/E and Owner to review and approve all submittals, including time for all re-submittals (at least 10 business days) on any unaccepted/rejected submittal.
- D. 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.
- E. 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.
- F. 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.
- G. 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)**
- H. 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.

1.7 SUBSTITUTION OF MATERIALS, LABOR AND EQUIPMENT (SEE UGC 8.3.5)

- A. Refer to the UGC for requirements not identified in this section.
- B. 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.
- C. 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.
- D. 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.

- E. 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.
- F. 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.
- G. 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.
- H. 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.

1.8 ALLOWANCES

- A. Allowances shall include:
 - 1. Cost of materials to Contractor.
 - 2. Delivery to project site; handling, storage and installation at project site.
 - 3. Protection, security, including insurance.
- B. At contract closeout, monies remaining in any allowance line item will be credited to the Owner by Change Order.

1.9 ALTERNATES

- A. Alternates will be exercised and added to the proposed contract sum at the option of the Owner.
- B. 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.

1.10 UNIT PRICES (SEE UGC 11.2)

- A. 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.

1.11 APPLICATIONS FOR PAYMENT (SEE UGC ARTICLE 10 AND 12.3)

- A. 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.
- B. 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.
- C. Prior to the submission of the initial Application for Payment the Contractor shall submit the following documents to the A/E, Project Manager and Owner for review:
 - 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.
 - a) The breakdown shall follow the trade divisions of the specifications.
 - b) 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.
 - c) Construction Manager at Risk or Design-Builders will be allowed to reallocate among General Conditions line items after consultation with, and written 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.
 - 2. The Contractor shall not use subcontractor invoices/pay applications in lieu of a single Schedule of Values from the Contractor.
 - 3. The breakdown shall anticipate future CEAs and Change Orders and make provisions for incorporating all changes into the breakdown listing. If issued, CEAs and Change Orders shall be identified separately and shall itemize the GMP, CEAs, Change Orders, Change Proposals and/or Field Orders, which are incorporated into each CEA or 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.
 - 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.

- D. At a minimum, the Contractor shall provide attachments to each month's payment request as follows:
1. One copy of the monthly Small Business Progress Assessment reports.
 2. One copy of the updated Submittal Schedule.
 3. One copy of all invoices required by the contract.
 4. One copy of the certified wage rate notification form for each member of the workforce not previously submitted.
 5. One copy of the updated RFI and ASI logs.
 6. One copy of the updated Work Progress Schedule as specified herein.
- E. All regular monthly applications for payment shall be submitted to the Owner, Project Manager 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.
1. Payments cannot exceed the contract, work in-place, or subcontract amounts as noted on the Schedule of Values line items.
 2. All as-built drawings shall be up to date and available for review by the A/E and Owner.
 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.
- F. Request for payments in association with release of, or reduction in retainage, or completion of work have additional requirements outlined in the UGC.

1.12 PROCUREMENT OF SUBCONTRACTS (APPLIES TO CONSTRUCTION MANAGER AT RISK AND DESIGN-BUILD CONTRACTS ONLY)

- A. 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 and approved by the Owner.

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 for each package (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.
 2. The B/PPS shall include the following for each bid package contemplated:
 - a) Anticipated scope of work to be procured;
 - b) A current Work Progress Schedule;
 - c) Anticipated selection criteria and questions;
 - d) Self-perform work proposals to be submitted by the CM/DB;
 - e) Proposed advertising dates;
 - f) Proposed pre-proposal meeting(s) dates;
 - g) Proposed receipt, review and award dates;
 - h) Anticipated notice to proceed dates.
- B. The CM/DB shall update the B/PPS monthly at a minimum, as conditions change, or as proposed dates are revised.
- C. Per the Texas Government Code Sections 2267.255: "A Construction Manager at-Risk shall publicly advertise for bids or proposals 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." The CM may seek to perform portions of the work itself by submitting bids or proposals in the same manner as and prior to all other trade or subcontractors, and if the Owner determines that the CM's bid or proposal provides the best value to the Owner.
- D. 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 \$50,000.00 Obtain two solicitations Greater than \$50,000.00 Advertised competitive proposals as required by Texas Government Code Section 2267.255 If the CM does not receive at least two competitive proposals on procurements over \$50,000.00, or the Owner does not receive at least three competitive proposals on packages for which the CM seeks to self-perform, the Owner may require that the CM 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.
- E. 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.

- F. 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.
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.
 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.
 3. After selection criteria have been established, the CM/DB shall publicly advertise the work in general circulations and trade associations as required by law. This advertisement shall include, at a minimum, the following:
 - a) HCC Project Number and Project Name;
 - b) Institution/Campus name;
 - c) CM/DB name and address;
 - d) CM/DB contract name and phone number;
 - e) Location for viewing of plans and specifications;
 - f) Date, time and location of Pre-proposal meeting(s);
 - g) Date, time deadlines(s), and location for receiving proposals;
 - h) Instruction to respondents for submitting proposals;
 - i) Selection criteria, questions and submittal requirements.
- G. 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:
1. The general scope of the project and specific scope of work included in this package;
 2. Instructions to respondents for submitting proposals;
 3. Selection criteria and questions;
 4. Small Business Program Requirements;
 5. Project safety requirements;

6. Project schedule requirements;
 7. Payment procedures and requirements, including retainage;
 8. Commissioning and Close-out requirements.
- H. 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.
- I. 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.
- J. 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.
1. The bid tabulation matrix shall compare all equivalent scope proposals to the CM/DB’s estimate.
 2. Each matrix shall indicate the CM/DB estimate(s) for each scope of work and identify the respective cost savings/over-runs.
 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.
 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.
 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.
- K. 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.
1. The CM/DB shall confirm that the respondents are qualified, meet the established selection criteria, and identify the amount of the proposals.
 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.

- L. 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.
- M. 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.
- N. The process identified in this section shall be repeated for each bid package until the project is entirely awarded to trade contractors or subcontractors, self-performed by the CM or self-performed by Owner and removed from the CM’s scope by deductive Change Order.

1.13 CONTRACTOR DAILY REPORTS

- A. The Contractor shall provide the Owner and Project Manager 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, Project Manager 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 and Project Manager on a daily basis. Not receiving these reports in a timely manner may be grounds for the Owner withholding payments until they are submitted.

1.14 AS-BUILT DRAWINGS AND RECORD DRAWINGS (SEE UGC 10.3 AND 11.4)

- A. 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.

- B. Maintenance of current documentation by the Contractor is required in order to process pay applications. The Owner, Project Manager 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.

1.15 UTILITY OUTAGES

- A. 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.
- B. 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.

1.16 COORDINATION OF SPACE (SEE UGC SECTION 3.3 AND 3.3.6.2 IN PARTICULAR)

- A. 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.
- B. 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.
- C. 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.
- D. 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.
- E. All work should be arranged in a neat and orderly manner while maximizing clearances.

- F. 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.

1.17 REPAIR OF DAMAGE (SEE UGC 3.3.11.3)

- A. 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.

1.18 DELIVERIES

- A. 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.
- B. The name and address of Owner shall not be used for delivery of materials and equipment.
- C. 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.

1.19 PROTECTION OF UTILITIES, ETC. (SEE UGC 3.3.11.3)

- A. 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 01 31 00

01 32 00 – PROJECT PLANNING AND SCHEDULING

(see UGC Article 9)

1.1 DEFINITIONS:

- A. Project Schedule (a.k.a. Work Progress Schedule) – the schedule developed, monitored Construction phases of the project.
- B. 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.
- C. Work Day – refers to a day in which work is planned, excluding weekends and legally recognized state holidays.
- D. 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.
- E. 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.

1.2 PURPOSE

- A. 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.
- B. 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.
- C. 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.
- D. 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.

- E. 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.

1.3 CONTRACTOR RESPONSIBILITIES

- A. 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.
- B. The Contractor is responsible for keeping the Owner and Project Team fully informed of schedule status and upcoming activities throughout the project.
- C. 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.
- D. 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.

1.4 SCHEDULE DEVELOPMENT REQUIREMENTS

- A. 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.
- B. The estimated activity duration of an activity shall be expressed in workdays only.
- C. During Pre-Construction Services, the Project Team will establish the maximum duration for every activity included in the schedule.
- D. The Project Schedule should be coordinated with the Contractor's Submittal Schedule and Schedule of Values.

1.5 PLANNING AND SCHEDULING WORKSHOP

- A. 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, Project Manager, A/E, User Representative and any available subcontractors prior to submitting the initial Project Schedule to the Owner.
- B. Two separate Planning and Scheduling Workshops should be held with the aforementioned parties prior to the Contractor submitting the baseline Preconstruction

Project Schedule.

- C. The baseline schedule shall be submitted within 10 workdays after the Planning and Scheduling Workshops are complete.

1.6 CONSTRUCTION PHASE BASELINE SCHEDULE SUBMITTAL

- A. 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.
- B. 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.
- C. 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.
- D. 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.

1.7 UPDATING THE PROJECT SCHEDULE

- A. 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.
- B. Project Schedule updates shall be based on actual work progress, current logic and remaining durations.
- C. 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.

1.8 EXCUSABLE DELAYS AND TIME EXTENSIONS

- A. Excusable delays shall be administered per the UGC.
- B. 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.
 - 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.

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.
- C. 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 01 32 00

01 32 20 – PHOTOGRAPHIC DOCUMENTATION

1.1 PHOTOGRAPHIC MEDIA

- A. 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.
- B. Video Format: Provide DVD+/-R video discs.

1.2 CONSTRUCTION PHOTOGRAPHS

- A. 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.
- B. Maintain key plan with each set of construction photos that identifies each photo location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Date and Time: Include date and time filename for each image.
- E. 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.
- F. Take photos to show existing conditions adjacent to the project site.

1.3 CONSTRUCTION VIDEOS

- A. 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 01 32 20

01 35 23 – PROJECT SAFETY REQUIREMENTS

(see UGC Article 7)

1.1 PURPOSE

- A. The Contractor shall bear overall responsibility for all aspects of safety at the project.
- B. The Contractor shall, at all times, provide adequate resources, equipment, training and documentation to:
 - 1. Assure compliance with all applicable regulatory and contract requirements.
 - 2. Assure a safe work environment at the Project.
 - 3. Instill a culture for safe behavior in all supervisors and workers.
 - 4. Ensure a universal understanding that safety and health issues take precedence over all other considerations at the Project.
- C. 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.
- D. The Owner reserves the right to have any manager, supervisor or worker removed from the project for disregarding the Project's safety requirements.
- E. 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.
- F. 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.

1.2 CONTRACTOR'S PROJECT SAFETY COORDINATOR (PSC)

- A. 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.
- B. 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.

1.3 SUBCONTRACTORS' PROJECT SAFETY REPRESENTATIVE (PSR)

- A. 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.

- B. 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.
- C. The PSR shall transport or accompany any injured co-worker that requires medical attention at facilities outside the project.
- D. 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.

1.4 PROJECT SAFETY PROGRAM

- A. 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.
- B. The Contractor shall incorporate Owner comments into a final draft which shall be resubmitted to the Owner for concurrence.

1.5 PERSONAL PROTECTIVE EQUIPMENT (PPE)

- A. 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:
 - 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.
 - 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.
 - 3. Vests shall be at a minimum a Class II reflective traffic vests and be worn at all times while in the construction areas.
 - 4. Hand protection, Hearing Protection, Respiratory Protection, Fall Arrest Equipment, Other PPE: shall all be furnished as required to comply with OSHA Standards.

1.6 MEDICAL EQUIPMENT

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

1.7 CERTIFICATIONS

- A. 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.

1.8 PROJECT SAFETY SIGNS AND POSTERS

- A. 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.
- B. 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.

1.9 PROJECT SAFETY TRAINING AND MEETINGS

- A. 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.
- B. 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.
- C. The PSC shall maintain a site safety orientation log signed by all persons receiving safety training.
- D. 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.
- E. “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.
- F. Special task training should occur when new equipment or non–routine activities are scheduled.

1.10 SAFETY INSPECTIONS

- A. Daily – The PSC shall observe work operations in all areas of the project and note any violations in the daily progress reports.
- B. 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.
- C. 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.
- D. 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.
- E. 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.

1.11 RECORDS AND REPORTS

- A. 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.

1.12 CONSTRUCTION OPERATIONS

- A. Cranes:
 - 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.
 - 2. Operators of cranes, derricks and/or hoisting equipment shall possess certification from a nationally accredited training organization.
- B. Demolition:
 - 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.
- C. Electrical Power:

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.
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.
3. All receptacles and switches shall have trim plates installed before they are energized.
4. All power distribution panels shall have full covers installed before primary power is brought into the panel.

D. Excavations:

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.
2. When a trench excavation 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.
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.

E. Fall Protection and Prevention:

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:
 - a) Portable step ladders.
 - b) Extension and straight ladders.
 - c) Erection and dismantling of scaffolding.
 - d) Limited exposure for engaging and disengaging a hook.
 - e) Vertical fall exposure protected by a warning line and six foot setback.
2. Provide covers over holes which are secured and clearly marked as covers.
3. Job built ramps and bridges must be covered with non–skid materials.

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.

F. Fire Protection

1. The Contractor shall review fire prevention needs and procedures with the Owner and shall post appropriate information and warnings.
2. The Contractor shall maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes.
3. The Contractor shall provide supervision of welding operations, combustion type temporary heating units and similar sources of ignition.
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.
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.
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 firefighting provisions. Such extinguishers shall be located with twenty-five feet from the perimeter of the task operation.

G. 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:

1. All construction waste, trash, and debris shall be placed in designated receptacles. No glass bottles will be permitted on the project site.
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.
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.
4. Secure and effectively cover all materials on roofs and elevated levels to prevent displacement by wind.
5. All materials and equipment shall be protected from the elements while staged on the project site.

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.
7. Properly store and secure all flammable and combustible liquids and gases.
8. Collect and place all cut-off or waste pieces of rolling stock into waste and scrape containers as they are created.
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.
10. All puncture and impalement exposures shall be covered or eliminated as soon as they are created.

H. Ladders:

1. Portable aluminum ladders are prohibited.
2. Extension, straight and job built ladders shall be secured from movement at the top and bottom.
3. Manufactured portable ladders shall display ANSI heavy duty rating (Class 1-A) and be inspected daily.

I. Medical Assistance and Screening:

1. The PSC shall maintain a First Aid Log for all treatment administered on the project.
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.
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.
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.

J. Petroleum Fuel Operated Equipment:

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

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.
- K. 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.
- L. Project Service Water:
1. Potable water: Comply with city health requirements.
 2. Non-potable water: Water storage containers, hose bibs and faucet shall be posted in English and Spanish “Danger – Do Not Drink”
- M. Welding and Burning:
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.
 2. Anti-flashback arrestors shall be installed at the pressure regulator gauges of all Oxy–Acetylene cutting rigs.
 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 01 35 23

01 36 00 – PROJECT MANAGEMENT SOFTWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – General Requirements, which are hereby made a part of this Section.
- B. Refer to specification Section 01 31 00 – Project Administration for additional information.

1.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, e-Builder® ASP software and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
 - 1. Project management communications is available through e-Builder® as provided by "e-Builder®" in the form and manner required by HCC.
 - 2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited
- B. Training: e-Builder® will provide a group training sessions scheduled by HCC, the cost of which is included in the initial users' fee. Users are required to attend the scheduled training sessions they are assigned to. Requests for specific scheduled classes will be on a first come first served basis for available spaces. Companies may also obtain group training from E-Builder at their own expense, please contact e-Builder® for availability and cost.
- C. Support: e-Builder® will provide on-going support through on-line help files.
- D. Project Archive: The archive shall be available to each team member at a nominal cost. The archive set will contain only documents that the firm has security access to during construction. All legal rights in any discovery process are retained. Archive material shall be ordered from e-Builder®.
- E. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.

- F. Purpose: The intent of using e-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files.
- G. Authorized Users: Access to the web site will be by individuals who are licensed users.
1. Individuals may use the User Application included in these specifications or may request the User Application.
 2. Submit completed user application forms with check made payable to "e-Builder, Inc."
 3. Authorized users will be contacted directly by the web site provider, e-Builder®, who will assign the temporary user password.
 4. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
- H. Administrative Users: Administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!** Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- I. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using e-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
 - a) Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
 - b) The system shall make it easy to identify revised or superseded documents and their predecessors.
 - c) Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
 2. Document Security:
 - a) The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties' communication except for Administrative Users. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**

3. Document Integration:
 - a) Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
4. Reporting:
 - a) The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
5. Notifications and Distribution:
 - a) Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
6. Required Document Types:
 - a) RFI, Request for Information.
 - b) Submittals, including record numbering by drawing and specification section.
 - c) Transmittals, including record of documents and materials delivered in hard copy.
 - d) Meeting Minutes.
 - e) Application for Payments (Draft or Pencil).
 - f) Review Comments.
 - g) Daily Field Reports.
 - h) Construction Photographs.
 - i) Drawings.
 - j) Supplemental Sketches.
 - k) Schedules.
 - l) Specifications.
- J. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the e-Builder® web site by licensed users.
 1. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier shall respond to documents received

- in electronic form on the web site, and consider them as if received in paper document form.
2. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
 3. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
 4. The following are some but not all of the paper documents which require original signature:
 - a) Contract
 - b) Change Orders
 - c) Application & Certificates for Payment
 - d) Construction Change Directives (CCD)
 - e) Forms and reports in Division 0
- K. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:
1. Providing suitable computer systems for each licensed user at the users normal work location with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
 2. Each of the above referenced computer systems shall have the following minimum system and software requirements:
 - a) Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) PC system 500 MHz Intel Pentium III or equivalent AMD processor
 - 2) 128 MB Ram
 - 3) Display capable of SVGA (1024 x 768 pixels) 256 colors display
 - 4) 101 key Keyboard
 - 5) Mouse or other pointing device
 - b) Operating system and software shall be properly licensed.
 - 1) Internet Explorer or other browser (current version is a free distribution

for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.

- 2) Adobe Acrobat Reader (current version is a free distribution for download).
- 3) Or, users intending to scan and upload to the documents area of e-Builder® should have Adobe Acrobat (current version must be purchased).
- 4) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS

2.1 LICENSE



- A.
- B. Houston Community College will issue license as needed.**

PART 3 - EXECUTION (Not Applicable.)

END OF SECTION 01 36 00

01 42 00 – REFERENCE STANDARDS

1.1 GOVERNING REGULATIONS/AUTHORITIES

- A. 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.**

1.2 STANDARDS

- A. 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.
- B. Applicable portions of standards listed that are not in conflict with the Construction Documents are hereby made a part of the Specifications
- C. 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.
- D. 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.

1.3 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

AISI 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
Page 37 of 69
Date 3/02/09
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.chemicalfabricsandfilm.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
Page 40 of 69
Date 3/02/09
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, MD 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 01 42 00

01 43 00 – QUALITY ASSURANCE

1.1 GENERAL REQUIREMENTS

- A. 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.
- B. 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. 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.
 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.
 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.
 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.
- C. Limits of testing laboratory authority: Laboratory is not authorized to:
1. Approve or reject any portion of the work.
 2. Perform any duties of the Contractor and subcontractors.
 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.
 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.

- D. When requested by the Owner, the Contractor will demonstrate a material's compliance with the specifications in one of the following ways:
1. Manufacturer's Certificate of Compliance
 2. Mill Certificate
 3. Testing Laboratory Certifications
 4. 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.
- E. 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.
- F. 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.
- G. 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.

1.2 BELOW GRADE INSPECTIONS

- A. 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.

1.3 CONCRETE INSPECTIONS

- A. 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.

1.4 WALL CLOSURE/ABOVE-CEILING INSPECTIONS

- A. 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:

1. All light fixtures installed and working;
2. All plumbing installed and insulation complete;
3. All rigid and flexible ducts installed;
4. All required valve identification tags installed;
5. All air devices installed and connected;
6. All control wiring and devices installed and connected;
7. The ceiling support structure installed.

1.5 SUBSTANTIAL COMPLETION INSPECTION (SEE UGC 12.1.1)

- A. 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.

1.6 FINAL INSPECTION & ACCEPTANCE (SEE UGC 12.1.2 & 12.3)

- A. 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.

1.7 ONE-YEAR WARRANTY INSPECTION

- A. 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.

1.8 EXECUTION

- A. Pier Drilling Operations
 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.

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.

B. Reinforcing Steel Mechanical Splices

1. Visually inspect and report on the completed condition of each mechanical splice of reinforcing steel.
2. Each mechanical splice shall be visually inspected to ensure compliance with building code and the manufacturer's published criteria for acceptable completed splices.
3. Special emphasis shall be placed on inspection of the end preparation of each bar to be spliced.
4. Submit copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.
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.

C. 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.

1. Observe and report on the following:
 - a) Number and size of bars;
 - b) Bending and lengths of bars;
 - c) Splicing;
 - d) Clearance to forms including chair heights;
 - e) Clearance between bars or spacing;
 - f) Rust, form oil and other contaminants;
 - g) Grade of steel;
 - h) Securing, tying and charring of bars;
 - i) Excessive congestion of reinforcing steel;
 - j) Installation of anchor bolts and placement of concrete around such bolts;
 - k) Fabrication of embedded metal assemblies, including visual
 - l) inspection of all welds;

- m) Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with the Construction Documents.

D. Concrete Inspection & Testing

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.
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.
3. Inspect the application of curing compounds and monitor all curing conditions to assure compliance with the Construction Documents.

E. Post-tensioning of Concrete

1. Verify certification of calibration of jacking equipment used in the p o s t - tensioning operations.
2. Observe and report on placement and anchorage of tendons immediately prior to placement of concrete.
3. Provide a registered professional engineer experienced in posttension operations to observe and report on the placement, posttensioning and elongation measurement of each tendon.
4. Observe and report on grouting of tendons noted to be bonded.

F. Masonry

1. Provide a qualified inspector to inspect all structural masonry work on a periodic basis.
2. Inspect the following:
 - a) Preparation of masonry prisms for testing;
 - b) Placement of reinforcing;
 - c) Grout spaces;
 - d) Mortar mix operations;
 - e) Bedding of mortar for each type of unit and placing of units;
 - f) Grouting operations;
 - g) Condition of units before laying for excessive absorption.
3. Provide a report of each inspection.

G. Structural Steel

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.
 2. Inspect the following:
 - a) Proper erection of all pieces;
 - b) Proper installation of all bolts;
 - c) Plumbness of structure and proper bracing;
 - d) Proper field painting;
 - e) Visual examination of all field welding;
 - f) Inspect all shop fabricated members, upon arrival at the jobsite, for;
 - g) Inspection of shop and field welding shall be in accordance with the AWS Structural Welding Code – Steel, latest edition;
 - h) Inspection of bolted construction shall be in accordance with AISC specifications for structural steel buildings;
 - i) Review all shop and field welder certifications;
 - j) Perform magnetic particle testing in accordance with ASTM E709 and at the discretion of the testing agency for all questionable welds;
 - k) Ultrasonic test 100% of all complete penetration welds in accordance with AWS Structural Welding Code – Steel, latest edition, by ASNT Level II technicians;
 - l) Inspection of stud field welding shall be in accordance with AWS structural welding code latest edition.
- H. Expansion Bolt Installations
1. Inspect the drilling of holes and installation of expansion bolts for compliance with the Construction Documents and shop drawings.
 2. Verify the installation torque of the expansion bolts for compliance with the manufacturer's installation instructions.
- I. Metal Floor Deck - Field inspection shall consist of the following:
1. Check types, gauges and finishes for conformance with Construction Documents and shop drawings;
 2. 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.
- J. Metal Roof Deck - Field inspection shall consist of the following:

1. Check types, gauges and finishes for conformance with Construction Documents and shop drawings;
2. 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 01 43 00

01 43 39 – SITE MOCK-UPS

(see UGC 8.4)

PART 1 - General

- A. The Contractor shall direct all the appropriate subcontractors in the construction of all site mock-ups for review by the Owner, Project Manager and Architect/Engineer (A/E) as required by the Construction Documents.
- B. The mock-up(s) when approved by the A/E, Project Manager and Owner shall become the site reference for quality of the incorporated features of materials and workmanship.
- C. 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 01 43 39

01 45 00 – QUALITY CONTROL

(see 01 40 00)

PART 1 - General

- A. 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.
- B. Specific quality control requirements for individual construction activities are specified in sections that govern those activities.
- C. The Contractor employed testing agency shall comply with the requirements of ASTM C – 1021, 1077, 1093, E – 329, 543 and 548.
- D. 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 01 45 00

01 45 18 – FIELD ENGINEERING

1.1 QUALITY ASSURANCE

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

1.2 EXAMINATION

- A. 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.
 - 1. Do not change or relocate benchmarks or control points without prior written approval from the Owner.
 - 2. Establish and maintain a minimum of two permanent benchmarks on the site.

1.3 PERFORMANCE

- A. 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.
- B. Record deviations from required lines and levels and advise A/E immediately when deviations exceed indicated or recognized tolerances.
- C. Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines services, or other appurtenances located in or affect by construction.
- D. The as-built documents shall include a final Title I property survey.

END OF SECTION 01 45 18

01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

(see UGC 3.3.4, 8.1 & 13.1)

1.1 GENERAL REQUIREMENTS

- A. 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.
- B. 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)
- C. 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)
- D. Contractor shall pay all charges for all connections to and distribution from existing services and sources of supply.
- E. 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.
- F. 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.
- G. Contractor shall relocate temporary services and facilities at it own expense, as required by progress of construction. (See UGC 7.2.1)
- H. 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)

- I. 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)

1.2 YARD REPAIRS

- A. 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.

1.3 TEMPORARY UTILITIES AND SERVICES

- A. The Contractor shall provide for all necessary and appropriate temporary utilities and services for execution and protection of the work.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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:

- G. Provide and maintain lighting for construction operations to achieve a minimum lighting level of two watts per square foot.
- H. Provide and maintain one watt per square foot lighting for exterior staging and storage areas after dark for security purposes.
- I. Provide and maintain one-quarter watt per square foot lighting to interior work areas after dark for security purposes.
- J. Permanent building lighting may be utilized during construction.
- K. 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.
- L. 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.

1.4 CONSTRUCTION AIDS

- A. 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.
- B. Stairs: Provide temporary protective treads, handrails and wall coverings at stairways.

1.5 BARRIERS AND ENCLOSURES

- A. 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.
- B. Contractor shall furnish and install construction fences and gates within the limits of construction, prior to beginning any other work on the project.

- C. Contractor shall furnish and install movable fences as may be necessary and appropriate to facilitate execution of the work.
- D. 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.
- E. 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.
- F. 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.
- G. 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.

1.6 SECURITY

- A. 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.
- B. The Campus Police will not provide security for the Project Site or the areas that are given over to the Contractor's control.

1.7 TEMPORARY CONTROLS

- A. 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)

- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Protection of installed work: (see UGC 10.3.4.1)
 - 1. Protect installed work and provide special protection where specified in individual specification sections.
 - 2. Provide temporary and removable protection of installed products and control activity in the immediate area to prevent damage.
 - 3. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
 - 4. Protect finished floors, stairs and other surfaces from dirt traffic, wear, damage, or movement of heavy objects.

5. Prohibit traffic or storage upon waterproofed or roofed surfaces, or in the alternative obtain the manufacturer's recommendations for protection.
6. Prohibit traffic from landscaped areas.

1.8 PARKING: (SEE UGC 3.3.11.1)

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

1.9 FIELD OFFICES AND SHEDS

- A. 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.
- B. Provide adequate space for projects meetings.

1.10 TEMPORARY TOILETS (SEE UGC 3.3.4)

- A. 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.
- B. 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.
- C. Do not use the Owner's toilet facilities, unless specifically approved by the Owner.

END OF SECTION 01 50 00

01 50 10 – PROJECT SIGNAGE

1.1 INSTALLATION OF TEMPORARY PROJECT SIGNAGE

- A. 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.
- B. 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.
- C. 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.
- D. The Contractor may install one sign bearing the company name, logo, project address and point of contact.
- E. 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.

1.2 SIGNAGE DIMENSIONS AND MATERIALS

- A. 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 01 50 10

01 52 40 – CONSTRUCTION WASTE MANAGEMENT

1.1 DEFINITIONS

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

1.2 PERFORMANCE GOALS

- A. 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.

1.3 QUALITY ASSURANCE

- A. 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.

1.4 WASTE MANAGEMENT PLAN

- A. 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.

1.5 SALVAGING DEMOLITION WASTE

- A. Salvage of items for sale or donation by the Contractor or subcontractors is not permitted.
- B. Salvaged items for Owner's use:
 - 1. Clean salvaged items;
 - 2. Pack or crate items and properly identify contents on the container;

3. Store items in a secure area until delivery to Owner;
4. Transport items to Owner's designated storage area.

1.6 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. Separate recyclable waste by type at project site to maximum extent practical.
- B. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from the project site.
- C. 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 01 52 40

01 55 26 – TRAFFIC CONTROL AND REGULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. 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.
- B. Requirement for and qualifications of flagmen.

1.2 SUBMITTALS

- A. A traffic control plan responsive to the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and sealed by a Registered Professional
- B. 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.
- C. For both the traffic control plan and flagmen use, submit schedules of values within 30 days following the Notice to Proceed.
- D. 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.
- E. 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.
- F. Make submittals in accordance with Section 013300 - Submittal Procedures.

1.3 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 012700 – Unit Prices for unit price procedures.

1.4 FLAGMEN

- A. Use flagmen, qualified as described under paragraph 1.4.B, Uniformed Peace Officers, or paragraph 1.4.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,

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

2.1 SIGNS, SIGNALS, AND DEVICES

- A. Comply with Texas State Manual on Uniform Traffic Control Devices.
- B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

PART 3 - EXECUTION

3.1 PUBLIC ROADS

- A. 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.
- B. 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.
- C. 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.
- D. Contractor shall maintain local driveway access to residential and commercial properties adjacent to work areas at all times.
- E. 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.

3.2 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and City's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

- C. Prevent parking on or adjacent to access roads or in non designated areas.

3.3 FLARES AND LIGHTS

- A. Provide flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.4 HAUL ROUTES

- A. Utilize haul routes designated by authorities or shown on the Drawings for construction traffic.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.5 TRAFFIC SIGNS AND SIGNALS

- A. 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.
- B. 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.
- C. Relocate traffic signs and signals as Work progresses to maintain effective traffic control.

3.6 BRIDGING TRENCHES AND EXCAVATIONS

- A. Whenever necessary, bridge trenches and excavation to permit an unobstructed flow of traffic.
- B. 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.
- C. Install bridging to operate with minimum noise.
- D. Adequately shore the trench or excavation to support bridge and traffic.

- E. 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.
- F. Use steel plates of sufficient thickness to support H-20 loading, truck or lane, that produces maximum stress.

3.7 REMOVAL

- A. Remove equipment and devices when no longer required.
- B. Repair damage caused by installation.
- C. Remove post settings to a depth of 2 feet.

END OF SECTION 01 55 26

01 70 00 – CONTRACT CLOSE-OUT

1.1 GENERAL (SEE UGC ARTICLE 12)

- A. 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.
- B. 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.
- C. 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.

1.2 RECORD DOCUMENTS (SEE UGC 6.2)

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

1.3 REQUIRED DOCUMENTS

- A. Required documents for final payment to be released included final versions of all of the above and the following:
 - 1. Final release of claims and liens;
 - 2. Affidavit of payment of debts and claims;
 - 3. Consent(s) of surety;

4. Certificate of Substantial Completion;
5. City of Houston Certificate of Compliance (Occupancy) for Project;
6. Final Change Order (if applicable);
7. Final Application for Payment;
8. Contractor's Letter for Confirmation of General Guarantee;
9. Subcontractor and Material Suppliers' Release and Guarantee, notarized;
10. Transmittal Listing Keys turn over to HCC Director of Operation and Maintenance;
11. Completed SWPPP documents and Notice of Termination;
12. Completed commissioning and closeout manuals.

1.4 REQUIREMENTS FOR SUBSTANTIAL COMPLETION (SEE UGC 12.1.1)

- A. 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:
 1. Contractor's payment request should reflect a minimum of 95% completion for all applicable work.
 2. Provide A/E, Project Manager and Owner with a complete copy of the Contractor's most current punch list.
 3. Submit to the A/E for review a full set of as-built record drawings and specifications.
 4. Submit to the A/E, Project Manager and Owner for review preliminary copies of the operating and maintenance manuals.
 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.
 6. Contractor shall make provisions for final changeover of locks with the Owner's personnel.
 7. Complete initial clean up requirements as described in the specifications.
- B. 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.

1.5 REQUIREMENTS FOR FINAL ACCEPTANCE (SEE UGC 12.1.2)

- A. Prior to requesting Project Manager to schedule final inspection for the project, the

Contractor shall complete the following:

1. Prepare draft payment request showing 100% completion for each line item on the schedule of values, including all appropriate releases and supporting documentation.
2. Submit a copy of the pre-final punch list which includes evidence that each item has been completed or otherwise resolved.
3. Submit final meter readings for utilities as of the time when the Owner took possession.
4. Transmit completed commissioning and close-out manuals to the Owner.
5. Complete final cleaning and touch-up.
6. Submit final payment request.
7. Submit evidence of final and continuing insurance coverage complying with applicable insurance requirements.

1.6 OPERATING AND MAINTENANCE MANUALS (SEE UGC 6.2.3 & 6.2.4)

- A. 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.
- B. 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.
- C. 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.

1.7 RECORD PRODUCT SUBMITTALS

- A. 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.

1.8 RECORD SAMPLE SUBMITTALS

- A. Immediately prior to the date(s) of Substantial Completion, arrange for A/E, Project Manager 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.

1.9 COMMISSIONING AND CLOSE-OUT MANUAL

- A. 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 01 70 00

01 73 00 – EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.
- B. See Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner–accepted deviations from indicated lines and levels, and final cleaning.

1.2 SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water–service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing–in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown

diagrammatically on Drawings.

- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING:

- A. Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory–authorized service representative is required to inspect field–assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching." Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

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: 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

01 91 00 – GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

A. Scope of Work Included

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".
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.

B. Commissioning Plan

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

C. Equipment Documentation Requirements

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:
 - a) Brief equipment identification text;

- b) Equipment or device i.d. number;
- c) Start-up inspection required;
- d) Associated building system;
- e) Governing specification section;
- f) Appropriate submittal reference number(s);
- g) Installation location (room number or column coordinates).

D. Test Equipment

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.
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.

E. Pre-commissioning Meeting

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.
2. The Contractor shall establish target dates for each of the commissioning activities and these will be discussed at all future project progress meetings.

F. Pre-installation Meeting - 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.

G. Contractor's Verification of Installation

1. The Contractor shall perform a review of all tests to confirm completion and compliance with the specified performance specifications. The Contractor shall verify:
 - a) Each component device has been properly installed;
 - b) All shop drawings and product data submittals have been approved;
 - c) All valve charts, wiring diagrams, control schematics, electrical panel directories, etc. have been submitted, approved and properly installed;
 - d) All tabulated data has been submitted for each system and/or device as required by the specifications;
 - e) All test reports and/or certifications required have been submitted and accepted;

- f) Any and all deficiencies have been corrected and re-tested to conformance with the specifications.

H. Contractor's Operational Testing

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.
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.

I. Integrated System Demonstration

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.
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.

J. Owner Training

1. Training shall consist of classroom type sessions followed by on-site demonstrations of system operations.
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 01 91 00

DIVISION 2 – EXISTING CONDITIONS

02 41 13 – REMOVE 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. Unit Prices.
 - 1. Payment for removing and disposing of asphaltic surfacing and of unreinforced concrete base under asphaltic surfacing, regardless of the thickness encountered, is on a square yard basis measured between lips of gutters.
 - 2. Payment for removing and disposing of concrete base under surfacing with curbs, regardless of the thickness encountered, is on a square yard basis measured from back-to-back of curbs. Payment includes removal of all concrete base, asphaltic surfacing, concrete pavement, esplanade curbs, curb and gutters, and paving headers.
 - 3. Payment for removing and disposing of reinforced concrete pavement, regardless of its thickness, is on a square yard basis measured from back-to-back of curbs. Payment includes concrete pavement, esplanade curbs, curbs and gutters, and paving headers.
 - 4. Payment for removing and disposing of monolithic curbs and gutters, and concrete curbs, is on a linear foot basis measured along the face of the curb.
 - 5. Payment for removing and disposing of cement stabilized shell base course, with or without asphaltic surfacing, is on a square yard basis.
 - 6. Payment for removing and disposing of concrete sidewalks and driveways is on a square yard basis.
 - 7. Payment for removing and disposing of miscellaneous concrete and masonry is on

a cubic yard basis of the structure in place.

8. Payment for removing and disposing of pipe culverts and sewers is on a linear foot basis for each diameter and each material type of pipe removed.
 9. Payment for removing and disposing of existing inlets is on a unit price basis for each inlet removed.
 10. Payment for removing and disposing of existing manholes is on a unit price basis for each manhole removed.
 11. No payment for saw cutting of pavement, curbs, or curbs and gutters will be made under this section. Refer to Section 32 13 19 – Concrete Pavement Joints for payment of saw cutting.
 12. No payment will be made for work outside maximum payment limits indicated on Drawings, or for pavements or structures removed for the Contractor's convenience.
 13. Refer to Section 01 27 00 – Unit Prices for unit price procedures.
- B. 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 31 23 00 – Grading Excavation 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 31 11 00 – Clearing and Grubbing.
- B. Remove from the site debris resulting from work under this section in accordance with requirements of Section 31 11 00 – Clearing and Grubbing.

END OF SECTION 02 41 13

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 01 33 00 – Submittal Procedures of these Specifications, 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

1. Comply with applicable OSHA and EPA regulations and codes and local ordinances.

C. Occupancy

1. Structures to be demolished will be discontinued in use prior to start of Work.

D. Condition of Structures and Work Site

1. 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

1. 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

1. Use of explosives will not be permitted.

G. Traffic

1. Contractor shall comply with Section 01 55 26 – 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

1. Contractor shall comply with Section 01 50 00 – 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.
2. Contractor shall comply with Section 31 13 16 - Selective Tree Trimming of these Specifications. Ensure that all trees designated to remain are protected from damage and are maintained during construction.

I. Damages

1. Promptly repair damages caused by demolition operations at no cost to HCCS or adjacent property owners.

J. Utility Services

1. Contractor shall comply with Section 01 50 00 – Construction Facilities and Temporary Controls of these Specifications. 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

1. Contractor shall comply with NFPA 241 and ANSI A 10.6 prior to and during commencement of demolition.

B. Pollution Control

1. Contractor shall comply with Section 01 50 00 – Construction Facilities and Temporary Controls of these Specifications. 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

1. Demolish building and structures completely and remove from Work Site. Use such methods as required to complete Work within limitations of governing regulations.
 - a) Proceed with demolition in systematic manner, from top of structure to ground.

- b) Demolish concrete and masonry in small sections.
- c) Break up and remove concrete and asphalt slabs–on–grade, unless otherwise shown to remain.

D. Below–Grade Construction

- 1. 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 31 11 00 – Clearing and Grubbing and 31 20 00 – Earthwork 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 31 20 00 – Earthwork 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

- 1. 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

- 1. 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

DIVISION 3 – CONCRETE

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

DIVISION 4 – MASONRY

04 20 00 – UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units (CMUs).

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315,
- C. Samples for each type and color of exposed masonry units and colored mortars.
- D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
 - 1. For masonry units include material test reports substantiating compliance with requirements.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner.
 - 1. Concrete Masonry Unit Test: For each type of unit required, per ASTM C 140.
 - 2. Mortar Test (Property Specification): For each mix required, per ASTM C 780
 - 3. Grout Test (Compressive Strength): For each mix required, per ASTM C 1019
- B. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects.
 - 1. Build sample panels for each type of exposed unit masonry construction and typical

exterior wall in sizes approximately 48" x 48" high.

1.4 PROJECT CONDITIONS

- A. Cold–Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold–weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- B. Hot–Weather Requirements: Comply with hot–weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Concrete masonry units:
 - 1. Angelus Block Co., Inc..
 - 2. Desert Block Co., Inc..
 - 3. Or approved equal.

2.2 COLORS, TEXTURES, AND PATTERNS

- A. Exposed Masonry Units: As per Angelus Block Co., Inc. – Hi–Lite Mark I. Color to be selected by Architect.

2.3 CONCRETE MASONRY UNITS (CMUS)

- A. Shapes: Shape as per Angelus Block Co., Inc. – Hi–Lite Mark I.
- B. Integral Water Repellent: Provide units made with liquid polymeric, integral water–repellent admixture that does not reduce flexural bond strength where indicated.
 - 1. Products:
 - a) Southwest Concrete Products
 - b) Or approved equal
- C. Concrete Masonry Units: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net–area compressive strength as indicated in structural details.
 - 2. Weight Classification: Mediumweight.

3. Pattern and Texture for Decorative Units:
 - a) Hi-Lite Mark I Wall Pattern, finish to be selected by Architect.

2.4 MASONRY LINTELS

- A. General: Provide masonry lintels complying with requirements below.
- B. Masonry Lintels: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- B. Mortar Pigments: Iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
 1. Products:
 - a) Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
 - b) Davis Colors; True Tone Mortar Colors.
 - c) Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- C. Aggregate for Mortar: ASTM C 144.
 1. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- D. Aggregate for Grout: ASTM C 404.
- E. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
 1. Products:
 - a) Addiment Incorporated; Mortar Tite.
 - b) Grace Construction Products, a unit of W. R. Grace & Co. – Conn.; Dry-Block Mortar Admixture.
 - c) Master Builders, Inc.;
- F. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.
 - 1. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.7 TIES AND ANCHORS

- A. Materials:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 07 Section "Sheet Metal Flashing and Trim."
 - 1. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 - 2. Metal Flashing Terminations: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 3/8 inch to form a stop for retaining sealant backer rod.
 - 3. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.
- B. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
 - 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
 - a) Products:
 - 1) Advanced Building Products Inc.; Peel-N-Seal.
 - 2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
 - 4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.;

Perm-A-Barrier Wall Flashing.

- 5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 6) Hohmann & Barnard, Inc.; Textroflash.
 - 7) Polyguard Products, Inc.; Polyguard 300.
 - 8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
 - 9) Williams Products, Inc.; Everlastic MF-40.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from [neoprene] [urethane] [or] [PVC].
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following, unless otherwise indicated:
1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.
 2. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - a) Products:
 - 1) Advanced Building Products Inc.; Mortar Maze weep vent.
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
 - 3) Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 4) Hohmann & Barnard, Inc.; Quadro-Vent.
 - 5) Wire-Bond; Cell Vent.
 3. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full

height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.

a) Products:

- 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains from new masonry without damaging masonry. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

- a) Proseco Sureclean 600 Colored Masonry and Stone Cleaner
- b) Diedrich Technologies, Inc.
- c) EaCo Chem, Inc.

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar for exterior[and reinforced] masonry to portland cement and lime.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

C. Pigmented Mortar: Use colored cement product select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 5 percent of masonry cement by weight.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.
- D. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
 - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet maximum.

3.2 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: As Indicated

3.3 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows, unless otherwise indicated:
 - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
 - 2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less

than 2 inches to form end dams.

3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products to form weep holes.
 2. Space weep holes 24 inches o.c., unless otherwise indicated.
 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

3.4 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602 .
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602] for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.5 FIELD QUALITY CONTROL

- A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
1. Place grout only after inspectors have verified compliance of grout spaces and

grades, sizes, and locations of reinforcement.

- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
 - 1. Payment for these services will be made by Owner.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.
- E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780 . compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019 .

3.6 CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Protect adjacent surfaces from contact with cleaner.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.7 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
 - 2. Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

04 70 00 – ADHERED MASONRY VENEER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope of work - Provide thin masonry veneer, veneer installation materials and accessories as indicated on drawings, as specified herein, and as needed for complete and proper installation.
- B. Related Documents - provisions within General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings apply to this Section.

1.2 SECTION INCLUDES

- A. Masonry/stone veneer units.
- B. Installation Products; adhesives, mortars, pointing mortars, and sealants.
- C. Air Barrier and Waterproofing membranes.
- D. Anti-fracture membranes.
- E. Cementitious backer units and other accessories specified herein.

1.3 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- A. Environmental Performance Criteria: The following criteria are required for products included in this section. Refer to Division 1 for additional requirements:
 - 1. Products manufactured regionally within a 500 mile radius of the Project site;
 - 2. Adhesive products must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 and Bay Area Resources Board Reg. 8, Rule 51.

1.4 RELATED SECTIONS

- A. 04 20 00 Unit Masonry

1.5 SYSTEM DESCRIPTION

- A. Thin adhered masonry veneer installed using latex-modified Portland cement mortar.

1.6 SUBMITTALS

- A. Submit shop drawings for anchor locations, types, engineering data for anchors and manufacturers' product data under provisions of Section 01 33 00.
 - 1. Shop drawings produced, signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Submit samples of each type/style/finish/size/color of stone and mortar samples under provisions of Section 01 33 00.
- C. Submit manufacturers' installation instructions under provisions of Section 01 33 00.
- D. Submit manufacturer's qualifications under provisions of Section 01 40 00 that the materials supplied conform to relevant standards.
- E. Submit proof of warranty under provisions of Section 01 60 00.
- F. Submit sample of installation system demonstrating compatibility/functional relationships between adhesives, mortars, membranes and other components under provision of Section 01 33 00. Submit proof from veneer manufacturer or supplier verifying suitability of veneer for specific application and use; including dimensional stability, water absorption, freeze/thaw resistance (if applicable), resistance to thermal cycling, and other characteristics that the may project may require. These characteristics must be reviewed and approved by the project design professionals.
- G. Submit list from manufacturer of installation system/adhesive/mortar/grout identifying a minimum of three (3) similar projects, each with a minimum of ten (10) years service.
- H. Submit Installer qualifications with at least 5 (five) examples of commercial experience with references.

1.7 QUALITY ASSURANCE

- A. Adhered Masonry Veneer or Thin Brick manufacturer (single source responsibility): Company specializing in manufactured masonry veneer or thin brick products with three (3) years minimum experience. Obtain veneer units from a single source with resources to provide products of consistent quality in appearance and physical properties.
- B. Installation System Manufacturer (single source responsibility): Company specializing in adhesives, mortars, membranes and other installation materials with ten (10) years minimum experience and ISO 9001-2008 certification. Obtain installation materials from single source manufacturer to insure consistent quality and full compatibility.
- C. Submit laboratory confirmation of adhesives, mortars, membranes and other installation materials:
 - 1. Identify proper usage of specified materials using positive analytical method.
 - 2. Identify compatibility of specified materials using positive analytical method.

3. Identify proper color matching of specified materials using a positive analytical method.
- D. Installer qualifications: company specializing in installation of adhered masonry veneer, thin stone/brick, and/or pavers with at least five (5) years documented commercial experience with installations of similar scope, materials and design.

1.8 MOCK-UPS

- A. Provide mock-up of each type/style/finish/size/color of adhered masonry veneer, thin brick, and pavers along with respective installation adhesives, mortars, pointing mortars, membranes and other installation materials, under provisions of Section 01 43 39.
1. Construct areas designated by Architect.
 2. Do not proceed with remaining work until material, details and workmanship are approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.
 4. As approved by Architect, mock-up may be incorporated into finished work.

1.9 PRE-INSTALLATION CONFERENCE

- A. Pre-installation conference: At least three weeks prior to commencing the work attend a meeting at the jobsite to discuss conformance with requirements of specification and job site conditions. Representatives of owner, architect, general contractor, subcontractor, adhered veneer manufacturer, installation system manufacturer and any other parties who are involved in the scope of this installation must attend the meeting.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Acceptance at Site: deliver and store packaged materials in original containers with seals unbroken and labels, including grade seal, intact until time of use, in accordance with manufacturer's instructions.
- B. Store installation system materials in a dry location; handle in a manner to prevent chipping, breakage, and contamination.
- C. Protect latex additives, organic adhesives, epoxy adhesives and sealants from freezing or overheating in accordance with manufacturer's instructions; store at room temperature when possible.
- D. Store Portland cement mortars in a dry location.

1.11 PROJECT/SITE CONDITIONS

- A. Provide ventilation and protection of environment as recommended by manufacturer.

- B. Prevent carbon dioxide damage to finishes as well as adhesives, mortars, membranes and other installation materials, by venting temporary heaters to the exterior.
- C. Maintain ambient temperatures not less than 40°F (10°C) or more than 100°F (38°C) during installation and for a minimum of seven (7) days after completion. Setting of Portland cement is retarded by low temperatures. Protect work for extended period of time and from damage by other trades. Installation with latex Portland cement mortars requires substrate, ambient and material temperatures at least 37°F (3°C). There should be no ice in slab. Freezing after installation will not damage latex Portland cement mortars. Protect Portland cement based mortars from direct sunlight, radiant heat, forced ventilation (heat & cold) and drafts until cured to prevent premature evaporation of moisture. Epoxy mortars require surface temperatures between 60°F (16°C) and 90°F (32°C) at time of installation. It is the General Contractor's responsibility to maintain temperature control.

1.12 SEQUENCING AND SCHEDULING

- A. Coordinate installation of veneer work with related work.

1.13 WARRANTY

- A. The Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of 15 years. The manufacturer of adhesives, mortars, pointing mortars, membranes and other installation materials shall provide a written twenty-five (25) year warranty, which covers materials and labor - reference LATICRETE Warranty Data Sheets 025.0SPD for complete details and requirements. For exterior facades over steel or wood framing, the manufacturer of adhesives, mortars, membranes and other installation materials shall provide a written fifteen (15) year warranty, which covers replacement of LATICRETE products only – reference LATICRETE Warranty Data Sheet 230.15SPD for complete details and requirements.

1.14 MAINTENANCE

- A. Submit maintenance data to include cleaning methods, cleaning solutions recommended and stain removal methods recommended.

1.15 EXTRA MATERIALS STOCK

- A. Upon completion of the work of this Section, deliver to the Owner 2% minimum additional veneer units in the shape of each type, color, pattern and size used in the Work, as well as extra stock of adhesives, mortars, pointing mortars and other installation materials for the Owner's use in replacement and maintenance. Extra stock is to be from same production run or batch as original veneer units and installation materials.

PART 2 - PRODUCTS

2.1 ADHERED MASONRY VENEER MATERIALS

- A. Limestone Building Stone Standard: ASTM C 568, classification as follows:
 - 1. Stone Type A: Upchurch Kimbrough Egyptian Limestone
- B. As supplied by Upchurch Kimbrough Company contact: Heather Tito 713-957-1520. Or approved equal.
- C. Egyptian Limestone
 - 1. Color: Palladian Grey
 - 2. Finish: Honed
 - 3. Thickness: $\frac{3}{4}$ "
 - 4. Size: 6"x12", 8"x16", 12"x24", 16"x24", 16"x16", 24"x24"
 - 5. Test Results:
 - a) Water Absorption, .0131%
 - b) Specific Gravity, 2.563 Kg/m³
 - c) Compressive Strength, 15,600 PSI
 - d) Abrasion Resistance: 26.5 (HA)
 - e) Modulus of Rupture: 1,600 PSI
 - f) Ultimate Tensile Strength: 1,400
- D. Egyptian Limestone:
 - 1. Color: Mystic Shore
 - 2. Finish: Honed
 - 3. Thickness: $\frac{3}{4}$ "
 - 4. Size: custom"
 - 5. Test Results:
 - a) Water Absorption, 1.42%
 - b) Density, kg/m³: 2.561
 - c) Compressive Strength, 10,300 PSI
 - d) Abrasion Index: 40.1
 - e) Tensile Strength: 1,200 PSI
 - f) Modulus of Rupture: 1,700 PSI

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
- D. Mortar Pigments: Natural or synthetic iron oxides, compounded for use in mortar mixes and with a record of satisfactory performance in stone masonry mortars.
 - 1. Products:
 - a) Chemsystems Mortar Color Mix
 - b) Spectrum Mortar Mix
 - c) Lafarge Corporation Mortar Mix
- E. Water: Potable.

2.3 VENEER ANCHORS

- A. Materials:
 - 1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 2. Stainless-Steel Sheet: ASTM A 666, Type 304.
- B. Adjustable Veneer Anchors: 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood or metal studs, and that are capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 - 1. Screw-Attached Veneer Anchors: Units with triangular wire tie and rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened end strap stamped into center to provide a slot for connection of wire tie.
 - a) Products:
 - 1) Dur-O-Wall, a Dayton Superior Company; D/A 210 with D/A 700-708].
 - 2) Heckmann Building Products, Inc.; 315-D with 316.

- 3) Hohmann & Barnard, Inc.; DW-10
- 4) Masonry Reinforcing Corporation of America; 1004, Type III.

2.4 EMBEDDED FLASHING MATERIALS

- A. Through Wall Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below.
 1. Material: Stainless steel, 0.0156 inch (0.4 mm) thick.
- B. Membrane Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the following, unless otherwise indicated:
 1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) sheet copper bonded with asphalt between 2 layers of glass-fiber cloth.
 - a) Products:
 - 1) Advanced Building Products, Inc.; Copper Fabric Flashing
 - 2) AFCP Products, Inc.; Copper Fabric.
 - 3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
 - 6) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 7) York Manufacturing, Inc.; York Copper Fabric Flashing.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Damp proofing for Limestone: Cementitious formulations that are recommended ILI and that are nonstaining to stone, compatible with joint sealants, and noncorrosive to veneer anchors and attachments.
- B. Cavity Drainage Material: Full thickness of cavity, free-draining mesh made from polyethylene strands.
 1. Products:
 - a) Mortar Net USA, Ltd.; Mortar Net
- C. Expanded Metal Lath: 3.4 lb/sq. yd. (1.8 kg/sq. m), self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60 (Z180).
- D. Welded-Wire Lath: ASTM C 933, fabricated into 2-by-2-inch (50-by-50-mm) mesh with minimum 0.0625-inch- (1.6-mm-) diameter, galvanized steel wire.

2.6 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by stone producer.
 - 1. Products:
 - a) Proseco Sureclean 600 Colored Masonry and Stone Cleaner

2.7 STONE FABRICATION

- A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, included details Drawings.
- B. Shape stone for type of masonry (pattern) as follows:
 - 1. Sawed-bed range mason cut chop with random heights and lengths, various edges to be clipped in field by stone mason as indicated on Drawings.
- C. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.
 - 1. Finish: Honed

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Limit cementitious materials in mortar to Portland cement and lime.
 - 2. Mortar for Setting Stone: Type N.
 - 3. Mortar for Pointing Stone: Type N.
- C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.

1. Pigments shall not exceed 10 percent of Portland cement by weight.
2. Pigments shall not exceed 5 percent of masonry cement by weight.

PART 3 - EXECUTION

3.1 SETTING OF STONE VENEER GENERAL

- A. Accurately mark stud centerlines on face of building wrap before beginning stone installation.
- B. Perform necessary field cutting as stone is set.
- C. Arrange stones for accurate fit in range and mason cut pattern with course heights as indicated, uniform lengths, and uniform joint widths, with offset between vertical joints as indicated.
- D. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any. Lay walls with joints not less than 3/8 " – 1/2" (10 mm – 13 mm) inch unless otherwise indicated.
- E. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 1. At cold-formed metal-framed walls, extend flashing for exterior face of veneer, through the veneer, up the face of sheathing at least 8 inches (200 mm), and behind building wrap.
 2. At lintels and shelf angles, extend flashing full length of angles but not less than 4 inches (100 mm) into masonry at each end.
 3. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn up not less than 2 inches (50 mm) to form a pan.
 4. Extend sheet metal flashing 1/2 inch (13 mm) beyond face of masonry at exterior and turn flashing down to form a drip.
 5. Install metal drip edges beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13mm) back from outside face of wall and adhere flashing to top of metal drip edge.
 6. Install metal flashing termination beneath flashing at exterior face of wall. Stop flashing 1/2 inch (13mm) back from outside face of wall and adhere flashing to top of metal flashing termination.
 7. Cut flashing flush with face of wall after masonry wall construction is completed.
- F. Coat limestone with damp proofing as follows:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches (300 mm) above finish-grade elevations.
- G. Place weep holes in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
1. Use open head joints to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c.
 3. Place cavity drainage material immediately above flashing in cavities.

3.2 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m or more).
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 in 40 feet (19 mm in 12 m) or more.

3.3 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

- A. Anchor stone veneer to cold-formed metal framing with adjustable, screw-attached veneer anchors as follows:
1. Fasten each anchor section through sheathing to framing with two screws.
 2. Embed wire tie section in mortar joints to within 1-1/2 inches (38 mm) of face.
- B. Space veneer anchors not more than 12 inches o.c. vertically and 16 inches o.c. horizontally. Install additional veneer anchors within 12 inches (300 mm) of openings, sealant joints, and perimeter at intervals not exceeding 12 inches (300 mm).
- C. Set stone in full bed of mortar with full head joints. Build veneer anchors into mortar joints as stone is set.
- D. Provide 2-inch (50-mm) air space between stone veneer assemblies and backup construction, unless otherwise indicated. Keep air space free of mortar droppings and debris.
1. Slope beds toward air space to minimize mortar protrusions into air space. As work progresses, trowel mortar fins protruding into air space flat against back of veneer.

- E. Rake out joints for pointing with mortar to depth of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides.
- F. Anchor stone veneer to soffit framing with adjustable, stainless steel anchors per shop drawings.

3.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: As indicated.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
 - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner.
 - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 - 5. Clean limestone veneer assemblies to comply with recommendations in ILI's "Indiana Limestone Handbook."

END OF SECTION 04 70 00

DIVISION 5 – METALS

05 12 00 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes structural steel shown.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Quality Control" for independent testing agency procedures and administrative requirements.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high–strength bolted tensioned shear/bearing connections.
- C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with

a record of successful in-service performance.

- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
- C. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Specification for Structural Steel Buildings—Allowable Stress Design and Plastic Design."
 - 2. ASTMA6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
 - 3. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code—Steel."
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 SEQUENCING

- A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars: As follows:
 - 1. Carbon Steel: ASTM A 36.
 - 2. High-Strength W-Shapes: ASTM A 992, Grade 50.
- B. Cold-Formed Hollow Structural Sections (HSS): ASTM A500, Grade B.
- C. Hot-Formed Hollow Structural Sections (HSS): ASTM A501.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 - 1. Weight Class: Standard.
 - 2. Finish: Black.
- E. Anchor Rods, Bolts, Nuts, and Washers: As follows:
 - 1. Anchor Rods: ASTM F 1554, Grade 55, weldable.
 - 2. Headed Bolts: ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.
 - 3. Washers: ASTM A 36.
- F. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated.
- G. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain, uncoated.
- H. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

- A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
 - 1. Camber structural steel members where indicated.
 - 2. Identify high–strength structural steel according to ASTM A 6 and maintain markings until steel has been erected.
 - 3. Mark and match–mark materials for field assembly.
 - 4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
 - 5. Complete structural steel assemblies, including welding of units, before starting shop–priming operations.
 - 6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded.
- C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- D. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
 - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame–cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.5 SHOP CONNECTIONS

- A. Shop install and tighten nonhigh–strength bolts, except where high–strength bolts are indicated.
- B. Shop install and tighten high–strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Assemble and weld built–up sections by methods that will maintain true alignment of axes without warp.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces as follows:
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base plates for structural members on wedges, shims, or setting nuts as required.

2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - a) Comply with manufacturer's instructions for proprietary grout materials.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection.
- F. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. Install and tighten nonhigh–strength bolts, except where high–strength bolts are indicated.
- B. Install and tighten high–strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Assemble and weld built–up sections by methods that will maintain true alignment of axes without warp.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E 164.

3.6 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

END OF SECTION 05 12 00

05 50 00 – METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
 - 1. Miscellaneous steel framing and supports.

1.2 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
 - 1. Steel Tubing: ASTM A 500, cold-formed steel tubing.
 - 2. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
 - 3. Steel Plates, Shapes & Bars: ASTM A36/A36M.

2.2 FASTENERS

- A. General: Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.
- B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

2. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 3. Carboline Company; Carbozinc 621.
 4. ICI Devoe Coatings; Catha-Coat 313.
 5. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 6. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 7. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 8. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- C. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- E. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.4 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.
- B. Steel Finishes:
 - 1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
 - 1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
 - 2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
 - 3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with nonshrink, nonmetallic grout.
- C. Touch up surfaces and finishes after erection. Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting

END OF SECTION 05 50 00

05 52 13 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Fabricate and install metal railing assemblies in accordance with the requirements set forth in this section.

1.2 ADDITIONAL WORK INCLUDED IN THIS SECTION

- A. Field measuring for weld plates, sleeves and insert locations

1.3 RELATED WORK

- A. 06 10 00 Rough Carpentry

1.4 STRUCTURAL REQUIREMENTS

- A. Railing assembly shall withstand a minimum concentrated load of 200 pounds applied vertically downward or horizontally in any direction, but not simultaneously, at any point on the top rail.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Furnish references listing projects of similar size and scope.
- B. Installer Qualifications: Furnish references listing projects of similar size and scope.
- C. Regulatory Requirements
 - 1. Components and installation are to be in accordance with state and local code authorities
 - 2. Components and installation are to follow current ADA and ICC/ANSI A117.1 guidelines.
- D. Certifications
 - 1. Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.
 - 2. Furnish certification that components were installed in accordance to the manufacturer's engineering data to meet the specified design loads.
- E. Pre-Installation Meeting

1. Prior to the beginning of work, conduct a pre-job conference at the job site.
2. Provide seven calendar days advance written notice ensuring the attendance by competent authorized representatives of the fabricator, building owner's representative, architect and subcontractors whose work interfaces with the work of this section.
3. Review the specifications to determine any potential problems, changes, scheduling, unique job site conditions, installation requirements and procedures and any other information pertinent to the installation.
4. Record the results of the conference and furnish copies to all participants.

1.6 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01 33 00.
 1. Show sections and plans of stairs, dimensions and assembly of components.
 - a) Railings
 - b) Handrail
 - c) Anchors
 - d) Welded and bolted connections
 2. Show all field connections
 3. Provide setting diagrams for installation of anchors, location of pockets, weld plates for attachment of rails to structure.
 4. Indicate all required field measurements.
 5. Submit one set of CAD files for approval.
- B. Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.
- C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.
- D. Samples:
 1. Submit duplicate samples of railing showing style and finish. One approved sample will be returned to contractor.
 2. Certificates:
 - a) Furnish certification and calculations by an engineer registered in the state where the project is located showing that safety requirements are met.
- E. Substitutions:
 1. Any changes in specified material must meet requirements of the General

Conditions “or equal” clause.

2. Changes in architectural details to fabricator’s standard procedures will be allowed when appearance and strength are not affected.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.
- B. Storage on site:
 1. Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.
 2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
 3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

PART 2 - PRODUCTS

2.1 MATERIALS AND FINISHES

- A. Stainless Steel Tubing: ASTM A, Grade:
 1. Type 304
 2. Type 316

2.2 RAILING SYSTEM

- A. Material shall conform to 2.1. and be finished in accordance with 2.1.
- B. Railing system shall be floor mounted.
- C. Rails and posts: Fabricate rails and posts from 1 1/2 inch outside diameter by 0.08 inch wall thickness stainless steel tubing - #3 brushed finish.

2.3 FASTENERS

- A. All mechanical fasteners used in the assembly of stainless steel railings shall be manufactured from stainless steel.

2.4 FABRICATION

- A. Form all changes in rail direction by bending.
- B. Cut material square and remove burrs from all exposed edges.
- C. Close exposed ends of pipe by use of appropriate end cap.
- D. Provide anchors and plates required for connecting railings to structure.
- E. Exposed Mechanical Fastenings: Provide flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- G. Exterior Components: Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
- H. Verify dimensions on site prior to shop fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2 INSTALLATION

- A. Install in accordance with shop drawings at locations indicated on the drawings.
- B. Erect work square and level, horizontal or parallel to rake of steps or ramp, rigid and free from distortion or defects detrimental to appearance or performance.
- C. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.3 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.4 CLEANING

- A. As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.
- B. Do not use acid solution, steel wool or other harsh abrasives.
- C. If stain remains after washing, remove finish and restore in accordance with NAAMM/ NOMMA Metal Finishes Manual.

3.5 REPAIR OF DEFECTIVE WORK

- A. Remove stained or otherwise defective work and replace with material that meets specification requirements.
- B. Repair damaged finish as directed by Architect
- C. Replace defective or damaged components as directed by Architect.

END OF SECTION 05 52 13

DIVISION 6 – WOOD AND PLASTICS

06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Framing with dimension lumber.
 2. Framing with engineered wood products.
 3. Wood blocking and nailers.
 4. Wood furring.
 5. Wood sleepers.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory–fabricated product.
1. Include data for wood–preservative and fire–retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Include statement indicating costs for each certified wood product.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Wood–preservative–treated wood.
 2. Fire–retardant–treated wood.
 3. Power–driven fasteners.
 4. Powder–actuated fasteners.

1.3 QUALITY ASSURANCE

- A. Forest Certification: For the following wood products, provide materials produced from

wood obtained from forests certified by an FSC–accredited certification body to comply with FSC STD–01–001, "FSC Principles and Criteria for Forest Stewardship":

1. Dimension lumber framing.
2. Miscellaneous lumber.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules–writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD–PRESERVATIVE–TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln–dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry, unless otherwise indicated.

2.3 FIRE–RETARDANT–TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C20 (lumber).
1. Use Exterior type for exterior locations and where indicated.

2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 3. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Application: Treat all rough carpentry, unless otherwise indicated.

2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
- B. Exposed Exterior Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
1. Species and Grade: As indicated above for load-bearing construction of same type.
 2. Species and Grade: Hem-fir (north), No. 1 grade; NLGA.
 3. Species and Grade: Southern pine, No. 2 grade; SPIB.
 4. Species and Grade: Douglas fir-larch; No. 1 grade; WCLIB, or WWPA.
 5. Species and Grade: Mixed southern pine, No. 2 grade; SPIB.
 6. Species and Grade: Spruce-pine-fir, No. 1 grade; NLGA.
 7. Species and Grade: Douglas fir-south; No. 1 grade; WWPA.
 8. Species and Grade: Hem-fir; No. 1 grade; WCLIB, or WWPA.
 9. Species and Grade: Douglas fir-larch (north); No. 1 grade; NLGA.
 10. Species and Grade: Spruce-pine-fir (south), No. 1 grade; NeLMA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Furring.

- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
 - 1. Mixed southern pine, No. 2 grade; SPIB.
 - 2. Eastern softwoods, No. 2 Common grade; NeLMA.
 - 3. Northern species, No. 2 Common grade; NLGA.
 - 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.7 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Do not splice structural members between supports, unless otherwise indicated.

- D. Comply with AWPAM4 for applying field treatment to cut surfaces of preservative-treated lumber.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NESNER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
 - 4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
 - 5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
 - 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.

3.2 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

06 20 13 – EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Exterior wood seating
 - 2. Solid-sawn wood patio decking.
 - 3. Stairs for elevated decks
 - 4. Support frame for elevated decks
- B. Related Sections: Refer to the following specification sections for coordination:
 - 1. Section 06 10 00 – Rough Carpentry.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated:
 - 1. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
- B. Samples: 24 inches long, showing the range of variation to be expected in appearance of wood seating and decking.

1.3 QUALITY ASSURANCE

- A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112.
- B. Forest Certification: Provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship.
- C. Installer qualifications: company specializing in installation of wood decking with at least five (5) years documented commercial experience with installations of similar scope, materials and design.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Schedule delivery of wood to avoid extended on-site storage and to avoid delaying the Work
- B. Material should be allowed to sit where it will be installed for 7 days prior to installation in

order to get acclimated to your local temperature and humidity levels. DO NOT store the decking directly on the ground, or directly on top of a concrete surface. DO NOT store the material for more than 30 days prior to use. The material should be elevated at least 12” off the ground during acclimation. To ensure the bottom boards are well ventilated, place the decking/lumber on top of blocks of wood. DO NOT cover decking material with plastic or a tarp during this acclimation period. Covering with a tarp/plastic will trap moisture in and cause stability issues. Covering the top of the pile with a sheet of plywood to shed the water is recommended. Keep material dry until installation. Also keep stickers (or wood shims) between layers of boards to allow proper air flow. DO NOT store the material in a garage or any other enclosed area.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
 - 1. Factory mark each item with grade stamp of grading agency.
 - 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
 - 1. Boards: 19 percent.
 - 2. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness.

3. Timber: 19 percent

2.2 DIMENSION LUMBER FRAMING

- A. Deck and Stair Framing: No. 2 grade and any of the following species:
 1. Southern pine; SPIB.
 2. Hem-fir; WCLIB or WWPA.

2.3 POSTS

- A. Dimension Lumber Posts: No. 2 grade and any of the following species:
 1. Mixed southern pine; SPIB.
 2. Western woods; WCLIB or WWPA.
- B. Timber Posts: Southern pine; No. 2; SPIB.

2.4 DECK BOARDS & SEATING

- A. Decking Species: Ipe or Cumaru.
 1. Density: 60-75 lbs/cu ft
 2. Hardness: 3650 PSI

2.5 PRESERVATIVE TREATMENT

- A. Pressure dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.
- C. Preservative Chemicals: Acceptable to authorities having jurisdiction.
 1. Do not use chemicals containing arsenic or chromium, except for timber posts.
- D. Use process that includes water-repellent treatment.
- E. After treatment, redry dimension lumber and timber to 19 percent maximum moisture content.
- F. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 1. For items indicated to receive a stained or natural finish, mark each piece on

surface that will not be exposed.

- G. Application: Treat all wood (except Ipe decking boards) unless otherwise indicated.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Use stainless steel unless otherwise indicated.
- B. Postinstalled Anchors: Stainless-steel, chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cleveland Steel Specialty Co.
 - 2. KC Metals Products, Inc.
 - 3. Phoenix Metal Products, Inc.
 - 4. Simpson Strong-Tie Co., Inc.
 - 5. USP Structural Connectors.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated on Drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304.

2.8 CONCEALED DECKING FASTENERS

- 1. Stainless Steel Ipe Clip® brand edge mount fastener or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Secure decking to framing with deck splines, deck clips, deck tracks, or screws.
- D. Install metal framing anchors to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Apply copper naphthenate field treatment to comply with AWWA M4, to cut surfaces of preservative-treated lumber.
- G. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.

3.2 ELEVATED DECK JOIST FRAMING INSTALLATION

- A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.
- B. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together.

3.3 STAIR INSTALLATION

- A. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
- B. Treads and Risers: Secure by gluing and screwing to carriages. Countersink fastener heads, fill flush, and sand filler. Extend treads over carriages.

3.4 RAILING INSTALLATION

- A. Balusters: Fit to railings, glue, and screw in place. Countersink fastener heads, fill flush, and sand filler.

- B. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts.

3.5 IPE OR CUMARU DECK & SEATING INSTALLATION

A. Deck Pitch

1. Ensure the deck substructure is pitched away from the seating to allow for adequate water runoff. We recommend a minimum pitch of a 1/4" per 10 ft. for proper drainage on Standard and Pregrooved decking. Framing material should be installed with the crown up (humps up) to aid in water draining off the surface material.

B. Gap Spacing

1. When installing decking, be sure to leave a 1/4" gap between deck boards. This gap spacing may be adequately achieved by selecting the appropriate Ipe Clip® brand edge mount fastener or approved equal which completes both functions of fastening and spacing the deck boards at the same time.

C. End Sealing

1. Fresh cuts should be sealed within 24hrs with end grain sealant. The end grain sealant is simply applied with a paintbrush and dries clear. DO NOT apply end seal to the surface of the decking. Any sealant that gets on the surface should be wiped off immediately

D. Fastening

1. Use only stainless steel fasteners to fasten hardwood decking and seating. When fastening boards pre-drilling is required. Pre-drill all your holes with the appropriate sized drill bit for your screw size. Failing to predrill can cause the wood to split which can cause irreversible damage to the boards and make the boards come loose over time.
2. The use of Ipe Clip® hidden deck fasteners or approved equal to fasten the deck boards is highly recommended. Prior to using Ipe Clip® hidden deck fasteners, please refer to and follow the installation included in the system's packaging. Ipe Clip® Method: The Ipe Clip® system uses high strength plastic clips that insert into slots cut into the edge of the deck board which then rests on top of a joist. A stainless steel screw (supplied with each Ipe Clip® fastener) is then screwed down into the joist. We recommend the Ipe Clip® system as many other fastener systems install from the bottom side of the deck, requiring screwing into the bottom of the deck board. With the Ipe Clip® system no screws or holes show from the surface.

E. Finishing

1. Apply a coat of Ipe Oil™ or approved equal initially after deck installation.

END OF SECTION 06 15 33

06 65 20 – PVC DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide PVC deck boards and rim joist covers and accessories.
- B. Related Sections: Refer to the following specification sections for coordination:
 - 1. Section 06 10 00 – Rough Carpentry.
 - 2. Section 06 65 30 – PVC Porch Flooring.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions. Submit manufacturer's Code Compliance Research Report CCRR-0101 by ATI Evaluation Service or equivalent.
- B. Samples: Submit sample of actual material in color selected, minimum 6 inches long.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
- B. Manufacturer: Minimum 5 years of experience producing similar products.
- C. Performance Characteristics: Provide products complying with the following:
 - 1. Coefficient of Friction: At 0 degrees, 0.48 dry/0.75 wet, at 90 degrees, 0.53 dry/0.82 wet, ASTM D 2394.
 - 2. Abrasion Resistance: 0.214 grams/5000 cycles, ASTM D4060.
 - 3. Flame Spread Index: 40, ASTM E 84.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in factory labeled packaging. Store materials in accordance with manufacturer's recommendations. Protect from damage.

1.5 WARRANTY

- A. Warranty: Provide manufacturer's standard material warranty, stating that the AZEK components will be free from defects in material that occur as a direct result of the

manufacturing process, occur under normal use and service, occur during the warranty period and result in blistering, peeling, flaking, cracking, splitting, cupping, rotting or structural defects from termites or fungal decay.

1. AZEK Decking Warranty: Lifetime for single-family residential applications.
2. AZEK Decking Warranty: 20 years for applications other than single-family residential.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. PVC Decking: AZEK Deck by AZEK Building Products Inc., 52 Glenmaura National Boulevard, Suite 201, Moosic, PA 18507, Toll Free 877-275-2935, Fax 570-504-1215, www.azek.com. Material shall have the following characteristics:

1. Material: Solid PVC.
2. Deck Board Size and Color: 1" x 3 1/2" x 16' Brownstone.
3. Deck Board Size and Color: 1" x 3 1/2" x 16' Slate Gray.
4. Deck Board Size and Color: 1" x 3 1/2" x 16' Clay.
5. Deck Board Size and Color: 1" x 3 1/2" x 16' Ivory.
6. Deck Board Size and Color: 1" x 3 1/2" x 16' White.
7. Deck Board Size and Color: 1" x 5 1/2" x 12' Brownstone.
8. Deck Board Size and Color: 1" x 5 1/2" x 16' Brownstone.
9. Deck Board Size and Color: 1" x 5 1/2" x 20' Brownstone.
10. Deck Board Size and Color: 1" x 5 1/2" x 12' Slate Gray.
11. Deck Board Size and Color: 1" x 5 1/2" x 16' Slate Gray.
12. Deck Board Size and Color: 1" x 5 1/2" x 20' Slate Gray.
13. Deck Board Size and Color: 1" x 5 1/2" x 12' Ivory.
14. Deck Board Size and Color: 1" x 5 1/2" x 16' Ivory.
15. Deck Board Size and Color: 1" x 5 1/2" x 20' Ivory.
16. Deck Board Size and Color: 1" x 5 1/2" x 12' Clay.
17. Deck Board Size and Color: 1" x 5 1/2" x 16' Clay.
18. Deck Board Size and Color: 1" x 5 1/2" x 20' Clay.

19. Deck Board Size and Color: 1" x 5 1/2" x 12' White.
 20. Deck Board Size and Color: 1" x 5 1/2" x 16' White.
 21. Deck Board Size and Color: 1" x 5 1/2" x 20' White.
 22. Deck Board Size and Color: 1" x 5 1/2" x 12' Fawn.
 23. Deck Board Size and Color: 1" x 5 1/2" x 16' Fawn.
 24. Deck Board Size and Color: 1" x 5 1/2" x 20' Fawn.
 25. Deck Board Size and Color: 1" x 5 1/2" x 12' Kona.
 26. Deck Board Size and Color: 1" x 5 1/2" x 16' Kona.
 27. Deck Board Size and Color: 1" x 5 1/2" x 20' Kona.
- B. Fasteners: Minimum #7 x 2 inch 305 stainless steel trim head screws with #17 drill point. For salt water coastal applications provide Type 316 stainless steel fasteners. For pneumatic flooring nailers, use barbed/serrated 2 inch stainless steel cleat 'T' nails or 'L' cleats.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of decking and that adequate structural support has been provided. Starting work indicate installers acceptance of existing conditions.
1. Standard Installation: Confirm that joists are spaced at 16 inches on center maximum, and are sloped at a minimum of 1/4 inch per foot away from the building.
 2. Forty-five Degree Angle Installation: Confirm that joists are spaced at 12 inches on center maximum, and are sloped at a minimum of 1/4 inch per foot away from the building.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions including the following:
1. Use manufacturer's recommended fasteners.
 2. Install with grain side up for the walking surface.
 3. Fasten tight to joists. Provide shims if there are variations in framing.

3.3 CLEANING AND PROTECTION

- A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.
- B. Clean using materials recommended by the manufacturer to remove stains, dirt and debris prior to final acceptance.

END OF SECTION 06 65 20

06 65 32 – PVC PORCH FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide PVC porch flooring with concealed fasteners and accessories.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions. Submit manufacturer's Code Compliance Research Report CCRR-0101 by ATI Evaluation Service or equivalent.
- B. Samples: Submit sample of actual material in color selected, minimum 6 inches long.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
- B. Manufacturer: Minimum 5 years of experience producing similar products.
- C. Performance Characteristics: Provide products complying with the following:
 - 1. Coefficient of Friction: At 0 degrees, 0.48 dry/0.75 wet, at 90 degrees, 0.53 dry/0.82 wet, ASTM D 2394.
 - 2. Abrasion Resistance: 0.214 grams/5000 cycles, ASTM D4060.
 - 3. Flame Spread Index: 40, ASTM E 84.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in factory labeled packaging. Store materials in accordance with manufacturer's recommendations. Protect from damage.

1.5 WARRANTY

- A. Warranty: Provide manufacturer's standard material warranty, stating that the AZEK components will be free from defects in material that occur as a direct result of the manufacturing process, occur under normal use and service, occur during the warranty period and result in blistering, peeling, flaking, cracking, splitting, cupping, rotting or structural defects from termites or fungal decay.
 - 1. AZEK Decking Warranty: Lifetime for single-family residential applications.

2. AZEK Decking Warranty: 20 years for applications other than single-family residential.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. PVC Porch Flooring: AZEK Porch by AZEK Building Products Inc., 52 Glenmaura National Boulevard, Suite 201, Moosic, PA 18507, Toll Free 877-275-2935, Fax 570-504-1215, www.azek.com. Material shall have the following characteristics:
 1. Material: Solid PVC planks.
 2. Size: 1 x 4 plank nominal size, 1 x 3-1/8 exposure width with 3-3/8 inch overall width actual size.
 3. Length: Provide manufacturer's standard 10, 12 and 16 foot lengths as required to minimize seams.
 4. Edge Profile: Tongue and groove.
 5. Surface Appearance: Wood grain.
 6. Color: Brownstone.
 7. Color: Slate gray.
 8. Fasteners: Minimum #7 x 2 inch 305 stainless steel trim head screws with #17 drill point. For salt water coastal applications provide Type 316 stainless steel fasteners. For pneumatic flooring nailers, use barbed/serrated 2 inch stainless steel cleat 'T' nails or 'L' cleats.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of porch flooring and that adequate structural support has been provided. Starting work indicate installers acceptance of existing conditions.
 1. Standard Installation: Confirm that joists are spaced at 16 inches on center maximum, and are sloped at a minimum of 1/4 inch per foot away from the building.
 2. Forty-five Degree Angle Installation: Confirm that joists are spaced at 12 inches on center maximum, and are sloped at a minimum of 1/4 inch per foot away from the building.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions including the following:
 - 1. Use manufacturer's recommended fasteners.
 - 2. Install with grain side up for the walking surface.
 - 3. Fasten tight to joists. Provide shims if there are variations in framing.

3.3 CLEANING AND PROTECTION

- A. Protect from damage during construction operations. Promptly repair any damaged surfaces. Remove and replace work which cannot be satisfactorily repaired.
- B. Clean using materials recommended by the manufacturer to remove stains, dirt and debris prior to final acceptance.

END OF SECTION 06 65 32

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07 61 00 – PREFORMED METAL ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

1.2 PREFORMED, PREFINISHED METAL ROOFING AND FLASHINGS.

1.3 MISCELLANEOUS TRIM, FLASHING, CLOSURES, DRIP FLASHING AND ACCESSORIES.

1.4 SEALANT

1.5 FASTENING DEVICES.

1.6 RELATED SECTIONS

- A. Section 051200: Structural Steel.
- B. Section 055000: Metal Fabrications.
- C. Section 061000: Rough Carpentry.
- D. Section 076310: Flashing and Sheet Metal Gutters.
- E. Section 079200: Sealants.

1.7 REFERENCES

- A. American Iron & Steel Institute (AISI) Specification for the Design of Coldformed Steel Structural Members.
- B. ASTM A-525 Steel Sheet, Zinc-Coated (Galvanized)
- C. ASTM E-1680
- D. ASTM E-1646
- E. ASTM E-1592
- F. Spec Data Sheet – Aluminum Zinc Alloy Coated Steel (Galvalume) Sheet Metal by Bethlehem Corp.

- G. SMACNA – Architectural Sheet Metal Manual.
- H. Building Materials Directory – Underwriter’s Laboratories, Test Procedure 580.

1.8 ASSEMBLY DESCRIPTION

- A. The roofing assembly includes preformed sheet metal panels, related accessories, valleys, hips, ridges, eaves, corners, rakes, miscellaneous flashing and attaching devices.

1.9 SUBMITTALS

- A. Submit detailed drawings showing layout of panels, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.
- B. Submit a sample of each type of roof panel, complete with factory finish.
- C. Submit results indicating compliance with minimum requirements of the following performance tests:
 - 1. Air Infiltration ASTM E 1680
 - 2. Water Infiltration ASTM E 1646
 - 3. Wind Uplift – U.L.90
- D. Submit calculations with registered engineer seal, verifying roof panel and attachment method resists wind pressures imposed on it pursuant to applicable building codes.

1.10 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in Architectural Sheet Metal Products with ten (10) years minimum experience.
- B. No product substitutions shall be permitted without meeting specifications.
- C. Substitutions shall be submitted 10 Days prior to Bid Date and acceptance put forth in an addendum.
- D. No substitutions shall be made after the Bid Date.

1.11 DELIVERY, STORAGE AND HANDLING

- A. Upon receipt of panels and other materials, installer shall examine the shipment for

damage and completeness.

- B. Panels should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.
- C. Panels with strippable film must not be stored in the open, exposed to the sun.
- D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.12 WARRANTY

- A. Paint finish shall have a twenty year guarantee against cracking, peeling and fade (not to exceed 5 N.B.S. units).
- B. Galvalume material shall have a twenty year guarantee against failure due to corrosion, rupture or perforation.
- C. Applicator shall furnish guarantee covering watertightness of the roofing system for the period of two (2) years from the date of substantial completion.

PART 2 - PRODUCT

2.1 ACCEPTABLE MANUFACTURERS

- A. Berridge Manufacturing Company, Houston, Texas.
- B. Substitutions shall fully comply with specified requirements.

2.2 SHEET MATERIALS

- A. Prefinished Metal shall be [prefinished Galvalume 24 Gauge core steel – ASTM 792–86 AZ–55].
- B. Unfinished Metal shall be Grade C Aluminum Zinc Alloy Coated Steel ASTM 792–86, AZ 55, "Satin Finish".
- C. Finish shall be [Preweathered Galvalume] coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.80 mil over 0.20 to 0.30 mil prime coat, to provide a total topside dry film thickness of 1.0 plus or minus 0.10 mil. Reverse side shall be coated with primer and wash coat of 0.30 mil plus or minus 0.05 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500® PVDF resin–based coating supplier.

- D. Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed immediately before installation.

2.3 ACCESSORY MATERIALS

- A. Fasteners: [Galvanized Steel] with washers where required.
- B. Sealant: Sealant must be a ultra low modulus, high performance, one-part, moisture curing silicone joint sealant. (do not use a clear sealant or sealants which release a solvent or acid during curing).
 - 1. Sealant must be resistant to environmental conditions such as wind loading, wind driven rain, snow, sleet, acid rain, ozone, ultraviolet light and extreme temperature variations.
 - 2. Features must include joint movement capabilities of +100% & -50% ASTM C-719, capable of taking expansion, compression, transverse and longitudinal movement, service temperature range -65°F to 300°F (-54°C to 149°C), Flow, sag or slump: ASTM C-639; Nil, Hardness (Shore A): ASTM C-661; 15, Tensile strength at maximum elongation: ASTM D-412; 200 psi, Tensile strength at 100% elongation: ASTM D-412; 35 psi, Tear strength, (die "C"); ASTM D-624; 40 pli, Peel strength (Aluminum, Glass, Concrete): ASTM C-794; 30 pli
- C. Vinyl Weatherseal Insert.

2.4 FABRICATION

- A. All exposed adjacent flashing shall be of the same material and finish as the roof panels.
- B. Hem all exposed edges of flashing on underside, 1/2 inch.

2.5 PREFORMED METAL PANELS, SHINGLES, ETC.

- A. BERRIDGE "S" DECK PANEL
 - 1. Overall panel width to be 35", with 32" nominal coverage.
 - 2. Panels shall be factory formed to 40' max. As an option, panels may be factory curved to a minimum radius of 5'-0".
 - 3. 7/8" Corrugations to be spaced 2-1/2" on center.
 - 4. Panel-to-panel and panel-to-purlin connections to be with No. 12-14 self-drilling fasteners, 1" min. for panel-to-purlin connections, 3/4" minimum for panel-to-

panel connections.

5. When used as a finish roof panel over open framing, compressible blanket insulation to be maximum 4–½" thickness before compression.
6. For roof applications, a line of tape sealant for weather tightness shall be used at panel side laps and end laps.

PART 3 - EXECUTION

3.1 INSPECTION

A. Substrate:

1. Examine metal deck to ensure proper attachment to framing.
2. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, level to ¼" in 20', and properly sloped to [valleys] (or) [eaves].
3. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
4. Verify deck is dry and free of snow or ice. [Flutes in steel deck to be clean and dry]

B. Underlayment:

1. One (1) layer of #30 asphalt roofing felt paper for roof slopes of 3:12 and up, two (2) layers for roof slopes of 1:12 – 3:12 in moderate climates (check with Berridge).
2. Berridge Ice & Water Shield underlayment to be used on all curved applications and on low (less than 1:12) slope or complex roofs per Berridge recommendation.
3. Ensure felt installed horizontally, starting at eave to ridge with a 6" minimum overlap and 18" endlaps.
4. Ensure that all nail heads are totally flush with the substrate. Nails shall be galvanized roofing nails with Berridge Coated Felt Caps.

3.2 INSTALLATION

- A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.
- B. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

- C. Install starter and edge trim before installing roof panels.
- D. Remove protective strippable film prior to installation of roof panels.
- E. Attach panels using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.
- F. Install sealants for preformed roofing panels as approved on shop drawings.
- G. Do not allow panels or trim to come into contact with dissimilar materials.
- H. Do not allow traffic on completed roof. If required, provide cushioned walk boards.
- I. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
- J. Remove and replace any panels or components which are damaged beyond successful repair.

3.3 CLEANING

- A. Clean any grease, finger marks or stains from the panels per manufacturer's recommendations.
- B. Remove all scrap and construction debris from the site.

3.4 FINAL INSPECTION

- A. Final inspection will be performed by a firm appointed and paid for by the owner in accordance with section 01 40 00.

END OF SECTION 07 61 00

07 65 26 - SELF-ADHERING SHEET FLASHING

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.
- B. Section 04 20 00 – Unit Masonry.

1.2 SUMMARY

- A. Section provides for flexible rubberized asphalt, self-sealing through-wall flashing and wall flashing accessories.

1.3 REFERENCES

- A. American Society for Testing and Materials
 1. ASTM E96 – Test Methods for Water Vapor Transmission of Materials
 2. ASTM D570 – Test Method for Water Absorption of Plastics
 3. ASTM E154 – Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover
 4. ASTM D1004 – Test Method for Initial Tear Resistance of Plastic Film and Sheeting
 5. ASTM D1938 – Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method
 6. ASTM D1876 – Test Method for Peel Resistance of Adhesives
 7. ASTM D1970 – Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
 8. D412 – Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension

1.4 SUBMITTALS

- A. Product Data and Shop Drawings: Submit for each product; Spec-Data®/Data Sheets, details and installation procedures.

- B. Test Reports: Indicating compliance with the performance requirements of this section.
- C. Samples of flashing.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's recommendations for storage and handling of each product.

1.6 WARRANTY

- A. Standard Product Warranty:
 - 1. Submit manufacturer's warranty that flashing and accessories are free of defects at time of delivery, and are manufactured to meet manufacturer's published physical properties and material specifications.
 - 2. Warranty Period: Five years from date of completion of the flashing installation.
 - 3. Installer to warrant that flashing and accessories have been installed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Flashing Description: 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mils) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- B. Performance Requirements:
 - 1. Water Vapor Transmission: ASTM E96, Method B – 2.9 ng/m²sPa (0.05 perms) maximum
 - 2. Water Absorption: ASTM D570 – Max. 0.1% by weight
 - 3. Puncture Resistance: ASTM E154 – 356 N (80 lbs)
 - 4. Tear Resistance:
 - a) Initiation – ASTM D1004 – min. 58 N (13.0 lbs) M.D.
 - b) Propagation – ASTM D1938 – min. 40 N (9.0 lbs) M.D.
 - 5. Lap Adhesion at -4°C (25°F): ASTM D1876 – 880 N/M (5.0 lbs/in.) of width
 - 6. Low Temperature Flexibility – ASTM D1970 – Unaffected to -43°C (-45°F)

7. Tensile Strength: ASTM D412, Die C Modified – Min. 5.5 MPa (800 psi)
 8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C – Min. 200%
- C. Product: Perm-A-Barrier® Wall Flashing manufactured by Grace Construction Products. Or approved equal.
- D. Wall Flashing Accessories:
1. Primer:
 - a) Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate.
 - 1) Flash Point: No flash to boiling point
 - 2) Solvent Type: Water
 - 3) VOC Content: Not to exceed 10 g/L
 - 4) Application Temperature: -4°C (25°F) and above
 - 5) Freezing point (as packaged): -7°C (21°F)
 - b) Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products. Or approved equal.
 2. Termination Mastic:
 - a) Description: Rubberized asphalt-based mastic with 200 g/L max. VOC Content.
 - b) Product: Bituthene® Mastic manufactured by Grace Construction Products. Or approved equal.
 3. Optional Primer:
 - a) Description: Water-based primer which imparts an aggressive, high tack finish on the treated substrate. 1 g/l max. VOC content.
 - b) Product: Perm-A-Barrier Primer Plus by Grace Construction Products. Or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with installer present, for compliance with requirements for installation, tolerances and other specific conditions affecting performance of flashing. Remove all deleterious materials from surfaces to be flashed.

3.2 INSTALLATION

- A. General: Install flashing to dry surfaces at air and surface temperatures of -4°C (25°F) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.
- B. Flexible Wall Flashing:
1. Precut pieces of flashing to easily handled lengths for each location.
 2. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
 3. When properly positioned, place against surface by pressing firmly into place by hand roller. Fully adhere flashing to substrate to prevent water from migrating under flashing.
 4. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a steel hand roller.
 5. Trim bottom edge 13 mm ($1/2$ in.) back from exposed face of the wall. Flashing shall not be permanently exposed to sunlight.
 6. At heads, sills and all flashing terminations turn up ends a minimum of 50 mm (2 in.) and make careful folds to form an end dam, with the seams sealed.
 7. Do not allow the rubberized asphalt surface of the flashing membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
 8. Do not expose flashing membrane to sunlight for more than thirty days prior to enclosure.
- C. Accessories:
1. When required by dirty or dusty site conditions or by surfaces having irregular or rough texture, apply Perm-A-Barrier Primer Plus (or approved equal) by air spray, brush or roller or apply Perm-A-Barrier WB Primer (or approved equal) by brush or roller at the rate recommended by manufacturer, prior to flashing installation. Allow the primer to dry completely before flashing application.
 2. Apply a bead or trowel coat of mastic along flashing top edge, seams, cuts, and penetrations.
 3. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to flashing installation. Allow primer to dry completely before flashing application.

END OF SECTION

07 92 00 – SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.

1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Field–Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field–Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.3 SUBMITTALS

- A. Product Data: For each joint–sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint–Sealant Schedule: Include the following information:
 - 1. Joint–sealant application, joint location, and designation.
 - 2. Joint–sealant manufacturer and product name.
 - 3. Joint–sealant formulation.
 - 4. Joint–sealant color.
- D. Product test reports.
- E. Preconstruction compatibility and adhesion test reports.
- F. Field–adhesion test reports.
- G. Warranties.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- B. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within 5 years from date of Substantial Completion
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint–sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within 5 years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Stain–Test–Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.2 SILICONE JOINT SEALANTS

- A. Type and Application: One–part nonacid–curing silicone sealant, ASTM C 920 Class 100/50, For vertical surface joints, Low modulus, exterior use; nonstaining to porous substrates according to ASTM C 1248.
 - 1. 1. GE Silicones; SilPruf LM SCS2700.
 - 2. 2. Dow Corning Corporation; 790.

2.3 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed–cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond–Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint–sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint–sealant–substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint–sealant manufacturer's written instructions.
 - 1. Remove laitance and form–release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint–sealant manufacturer or as indicated by preconstruction joint–sealant–substrate tests or prior experience. Apply primer to comply with joint–sealant manufacturer's written instructions. Confine primers to areas of joint–sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross–sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond–breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- F. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Test completed and cured sealant joints by performing 4 tests for each kind of sealant and joint substrate.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces, e.g., isolation and contraction joints in cast-in-place concrete.
1. Joint Sealant: Silicone.
 2. Joint Sealant Color: Indicated by Architect from manufacturer full range of colors.

- B. Joint–Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a) Joints between different materials.
 - b) Perimeter joints between materials and frames of doors, windows, and louvers.
 2. Joint Sealant: Silicone.
 3. Joint–Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

DIVISION 9 – FINISHES

09 91 13 – EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel.
2. Galvanized metal.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each finish and for each color and texture required.
- C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.3 QUALITY ASSURANCE

- A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a) Architect will designate items or areas required.
 2. Final approval of color selections will be based on benchmark samples.
 - a) If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.

2.2 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
 - 1. VOC Content: E Range of E2 if available.
- B. Waterborne Galvanized–Metal Primer: MPI #134.
 - 1. VOC Content: E Range of E2 if available.
 - 2. Environmental Performance Rating: EPR 2.

2.3 EXTERIOR ALKYD PAINTS

- A. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
 - 1. VOC Content: E Range of E2 if available.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with

requirements for maximum moisture content and other conditions affecting performance of work.

- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Alkyd System: MPI EXT 5.1D.
 - a) Prime Coat: Alkyd anticorrosive metal primer.
 - b) Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c) Topcoat: Exterior alkyd enamel (semigloss).
- B. Galvanized–Metal Substrates:
 - 1. Alkyd System: MPI EXT 5.3B.

- a) Prime Coat: Waterborne galvanized–metal primer.
- b) Intermediate Coat: Exterior alkyd enamel matching topcoat.
- c) Topcoat: Exterior alkyd enamel (semigloss).

END OF SECTION 09 91 13

DIVISION 10 – SPECIALTIES

10 35 00 – FLAGPOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aluminum flagpoles

1.2 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit 's product data, including installation instructions.
- C. Shop Drawings: Submit 's shop drawings, indicating materials, dimensions, tolerances, welding, fasteners, hardware, mounting, finish, and accessories. Include details of foundation system.
- D. Warranty: Submit 's standard warranty.

1.3 QUALITY ASSURANCE

- A. Obtain each flagpole as a complete unit from manufacturer, including fittings, accessories, bases and anchorage devices.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Keep flagpole and accessories covered and dry to prevent soiling or damage.
- D. Handle with protective gloves to prevent unwanted distortion.

1.5 PROJECT CONDITIONS

- A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001 for specified ground speed

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. American Flagpole & Flag Co.; Lake Elmo, MN 55042. ASD. Toll Free Tel: (800) 426-6235. Fax (651) 777-1925. Email: info@aflag.com . Web: www.aflag.com.

2.2 FLAGPOLES

- A. Aluminum Flagpole Construction:
 - 1. Fabricate from seamless, extruded tubing complying with ASTM B 221, alloy 6063-T6, having a tensile strength not less than 30,000 psi with yield point of 25000 psi. Heat treated after fabrication to comply with ASTM B 597, temper T-6
- B. Estate Series: Model EAF30040125
 - 1. External Halyard, ground set, cone-tapered, aluminum flagpole. Including ground sleeve, external halyard system, rope, ball to match flagpole base diameter, cleat, stationary truck, and two nylon snap hooks. Finish exposed metal surfaces to match flagpole.
 - a) Exposed Height: 30ft
 - b) Overall Length: 33ft
 - c) Diameter: 4" base and 2" top
 - d) Wall thickness: .125"
 - e) Wind Speed: 50 MPH flagged, 97 MPH un-flagged
 - f) Mounting Device: PVC Ground Sleeve
- C. Finish:
 - 1. Directional Sanded Satin Finish: Fine, directional, medium satin polish; buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax
 - a) Satin Brushed Aluminum finish
 - b) Clear Anodized finish
 - c) Dark Bronze Anodized finish
 - d) White Powder-coat
 - e) Other

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until final grades and elevations have been established
- B. If others determine final base elevation, confirm with Architect before proceeding

3.2 INSTALLATION

- A. Install flagpole where shown on drawings and in accordance with manufacturer's written instructions.
- B. Flagpole shall be plumbed with $\frac{1}{4}$ " for every 10 feet of pole height.

END OF SECTION 10 35 00

DIVISION 12 – FURNISHINGS

12 93 00 – REMOVABLE BOLLARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Removable Bollards.

1.2 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit 's product data, including installation instructions.
- C. Shop Drawings: Submit 's shop drawings, indicating materials, dimensions, tolerances, welding, fasteners, hardware, mounting, finish, and accessories.
- D. Samples: Submit 's standard color samples.
- E. Warranty: Submit 's standard warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in 's original, unopened containers and packaging, with labels clearly identifying product name, , and location of installation.
- B. Storage: Store materials in a clean, dry area indoors in accordance with 's instructions. Keep temporary protective coverings in place.
- C. Handling: Protect materials and finish from damage during handling and installation

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Creative Pipe, Inc., PO Box 2458, Rancho Mirage, California 92270–1087. Toll Free (800) 644–8467. Phone (760) 340–5555. Fax (760) 340–5883. Web Site www.creativepipe.com.

2.2 MATERIALS

- A. Stainless Steel:

1. Pipe: ASTM A 312, Type 304, Schedule 40.
2. Tubing: ASTM A 269.
3. Sheet: ASTM A 240.

2.3 STAINLESS STEEL BOLLARDS

- A. Model: ELBR-6-LRE-SS-SS-FRT-IH-HHC-SS
 1. Eliminator Bollard, 6" I.D. Schedule 40 Stainless Steel Pipe, Internally Locking Removable Embedded Mounting System, Brushed Satin Stainless Steel, Stainless Steel Finish on the Flange and Hinged Hole Cover, Removable Flat Cap, Internal Lifting Handle, Hinged Hole Cover.
- B. Fabrication:
 1. Material: 6-inch ID, 0.280-inch wall, Schedule 40 stainless steel pipe.
 2. Sidewall: Plain.
- C. Height: 36 inches
- D. Top: Flat stainless steel top
- E. Mounting: Embedded with an internal locking mechanism.
- F. Finish: Stainless steel, satin finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive bollards.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install site furnishings in accordance with 's instructions at locations indicated on the drawings.
- B. Install site furnishings level, plumb, square, accurately aligned, correctly located, and without warp.
- C. Embedded Mounting: Embed site furnishings by direct burying in accordance with 's

instructions.

- D. Use hardware and fasteners in accordance with 's instructions.
- E. Repair minor damages to finish in accordance with 's instructions and as approved by Architect.
- F. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.3 CLEANING

- A. Clean site furnishings in accordance with 's instructions.
- B. Remove temporary protective coverings.
- C. Do not use harsh cleaning materials or methods that would damage finish.

3.4 PROTECTION

- A. Protect installed site furnishings from damage during construction.

END OF SECTION 12 93 00

12 93 13 – BICYCLE RACKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Bicycle Rack.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.
- C. Samples: Submit manufacturer's samples of materials, finishes, and colors.
- D. Warranty: Manufacturer's standard warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. Website www.landscapeforms.com. E-mail: specify@landscapeforms.com.

2.2 BICYCLE RACKS

- A. "Bicilinea" Bicycle Rack
- B. Style:
 - 1. Embedded:
 - a) Depth: 59-3/4 inches.
 - b) Overall Height: 31-3/4 inches.
 - 2. Length of Bike Rack:
 - a) 119 inches
 - b) 238 inches

2.3 MATERIALS

- A. Horizontal tube: 3-5/16 inch dia x 0.08 inch wall thickness 304 stainless steel.
- B. Curved tube: 2 inch dia x 0.08 inch wall thickness 304 stainless steel.
- C. Vertical post: 3-1/8 inch x 5/8 inch 304 stainless steel flat bar.
- D. Collar for curved tube connection: Nylon
- E. Hardware: stainless steel

2.4 RECYCLED CONTENT

- A. Stainless Steel Rack:
 - 1. Recycled Material Content: Minimum 65 percent.
 - 2. Post-Consumer Material Content: Minimum 50 percent.
 - 3. Pre-Consumer Material Content: Minimum 15 percent.
 - 4. Recyclable: 100 percent.

2.5 FABRICATION

- A. Shop assembled bicycle rack.
 - 1. Vertical support post has welded on end cap.
 - 2. Curved tube has welded on end cap
 - 3. Curved tube assemblies are attached to horizontal tube with stainless steel hardware.

2.6 FINISHES

- A. Stainless Steel: Polished finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive racks.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install level.
- C. Anchor securely in place.

3.3 ADJUSTING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. Clean rack promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

- A. Protect installed racks to ensure that, except for normal weathering, racks will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 12 93 13

12 93 23.1 – TRASH AND LITTER RECEPTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Litter receptacles.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.
- C. Samples: Submit manufacturer's samples of materials, finishes, and colors.
- D. Warranty: Manufacturer's standard warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. Website www.landscapeforms.com. E-mail: specify@landscapeforms.com.

2.2 TRASH AND LITTER RECEPTORS

- A. "Gretchen" Litter Receptacles

B. Style:

1. Side-Opening Style:
 - a) Outer Diameter: 22 inches.
 - b) Height: 42 inches.
 - c) Capacity: 25 gallons.

C. Mounting: Surface Mounted

D. Litter Lid: Constructed of 14 gauge-spun metal, permanently attached to the unit with a pop-up mechanism.

E. Liners Color: Black

2.3 MATERIAL

A. Wood Body: Constructed of 1-1/4" x 1-1/2" solid stock boards. Boards have eased edges and ends and all sides are finished prior to assembly.

1. PolySite: For exterior or interior use. Constructed of 100% high-density polyethylene (HDPE) derived from recycled post-consumer packaging. Pigment and UV inhibitors are added to HDPE resulting in a product containing over 90% recycled content by weight.

B. Base: Constructed of 1-1/2" steel flat bar, hot rolled ASTM A36.

2.4 RECYCLED CONTENT

A. PolySite Litter Receptacle:

1. Recycled Material Content: Minimum 38 percent.
2. Post-Consumer Material Content: Minimum 20 percent.
3. Pre-Consumer Material Content: Minimum 18 percent.
4. Recyclable: 100 percent.

2.5 FABRICATION

A. Shop assembled litter receptacles.

2.6 FINISHES

A. Finish on Metal: Landscape Forms, Inc. "Pangard II".

1. Primer: Rust inhibitor on ferrous supports.
2. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake

resistant.

3. Test Results: "Pangard II".
 - a) Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
 - b) UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
 - c) Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
 - d) Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
 - e) Erichsen Cupping, ISO 1520: 8 mm.
 - f) Impression Hardness, Buchholz, ISO 2815: 95.
 - g) Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
 - h) Pencil Hardness, ASTM D 3363: 2H minimum.
 - i) Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max. undercutting 1 mm.
 - j) Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max. blisters 1 mm.
 4. Specifier Notes: Specify color of metal finish. Consult Landscape Forms, Inc. for selection of standard colors and availability of custom colors.
 - a) Color: Titanium
- B. Finish on Wood:
1. Wood for Exterior Use: Unfinished.
 2. Wood for Interior Use: Finished with "LF-80" catalyzed lacquer.
- C. Polysite:
1. Color: Bark

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive litter receptacles.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install litter receptacles in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install litter receptacles level and plumb.
- C. Anchor litter receptacles securely in place.

3.3 ADJUSTING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. Clean litter receptacles promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

- A. Protect installed litter receptacles to ensure that, except for normal weathering, receptacles will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 12 93 23.1

12 93 23.2 – WEATHER PROTECTED ASH URN

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Weather–Protected Ash Urn.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer’s product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop Drawings: Submit manufacturer’s shop drawings, including plans and elevations, indicating overall dimensions.
- C. Samples: Submit manufacturer’s samples of materials, finishes, and colors.
- D. Warranty: Manufacturer’s standard warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area in accordance with manufacturer’s instructions. Keep materials in manufacturer’s original, unopened containers and packaging until installation.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521–2546. Phone (269) 381–0396. Fax (269) 381–3455. Website www.landscapeforms.com. E–mail: specify@landscapeforms.com.

2.2 ASH URN

- A. “Grenadier” Weather–Protected Ash Urn

B. Style:

1. Surface Mount:
 - a) Depth: 10 inches.
 - b) Height: 35 inches.
 - c) Width: 10 inches.
 - d) Capacity: 1–3/4 gallons.
 - e) Bin: 4" x 4" x 0.100"

C. Mounting:

1. Surface Mounted

2.3 ACCESSORIES

- A. Anchor Bolts: Corrosion resistant recommended, not supplied by manufacturer.

2.4 MATERIAL

- A. Ash Bin: Made of 6063–T6 aluminum extrusion.

1. Top: Removable top casting is made of 319 aluminum.
 - a) a. Surface Mount: Base Casting: 319 Aluminum welded to the extrusion.

B. Mounting Assemblies:

1. Surface Mount: Consists of a 4" square, 7 gage, 304 stainless steel plate welded to a stainless steel latch housing tube (1" x 2" x 0.12" wall). Latch is made of UHMW–PE. All hardware is 18–8 stainless steel.

2.5 RECYCLED CONTENT

A. Ash Urn:

1. Recycled Material Content: Minimum 32 percent.
2. Post–Consumer Material Content: Minimum 16 percent.
3. Pre–Consumer Material Content: Minimum 16 percent.
4. Recyclable: 100 percent.

2.6 FABRICATION

- A. Shop assembled ash urns.

2.7 FINISHES

- A. Finish on Metal: Landscape Forms, Inc. “Pangard II”.
1. Primer: Rust inhibitor.
 2. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
 3. Test Results: “Pangard II”.
 - a) Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
 - b) UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
 - c) Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
 - d) Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
 - e) Erichsen Cupping, ISO 1520: 8 mm.
 - f) Impression Hardness, Buchholz, ISO 2815: 95.
 - g) Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
 - h) Pencil Hardness, ASTM D 3363: 2H minimum.
 - i) Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max. undercutting 1 mm.
 - j) Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max. blisters 1 mm.
 4. Color: Titanium

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive litter receptacles.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install in accordance with manufacturer’s instructions at locations indicated on the Drawings.

- B. Install level and plumb.
- C. Anchor securely in place.

3.3 ADJUSTING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. Clean promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

- A. Protect installed ash urns to ensure that, except for normal weathering, urns will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 12 93 23.2

12 93 43 – SITE SEATING AND TABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Tables.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.
- C. Samples: Submit manufacturer's samples of materials, finishes, and colors.
- D. Warranty: Manufacturer's standard warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. Website www.landscapeforms.com. E-mail: specify@landscapeforms.com.

2.2 SITE SEATING AND TABLES

- A. "Gretchen" Picnic Tables

B. Size:

1. Table Top:
 - a) Height: 30 inches.
 - b) Width: 29 inches.
 - c) Length: 54 inches.
2. Seating:
 - a) Height: 17–1/2 inches.
 - b) Width: 14 inches.
 - c) Length: 54 inches.
3. Overall:
 - a) Height: 30 inches.
 - b) Width: 58–1/4 inches.
 - c) Length: 54 inches.

C. Supports: 2 inch outside diameter, 0.120 inch wall thickness, tubing.

D. Options: Umbrella Hole – 1–5/8 inch I.D. Stainless steel hardware for securing the umbrella to the table support is included.

2.3 MATERIAL

A. Seat and Table Top:

1. Polysite™: For exterior or interior use. Constructed of 100% high-density polyethylene (HDPE) derived from recycled post-consumer packaging such as milk containers. Polysite timbers are extruded to size: 3" x 4" (nominal) molded face boards and 1–1/4" x 1–1/2" interior boards.

2.4 RECYCLED CONTENT

A. Polysite:

1. Recycled Material Content: Minimum 95 percent.
2. Post-Consumer Material Content: Minimum 69 percent.
3. Pre-Consumer Material Content: Minimum 26 percent.
4. Recyclable: 100 percent.

2.5 FINISHES

- A. Finish on Carbon Steel: Landscape Forms, Inc. "Pangard II".

1. Primer: Rust inhibitor.
 2. Topcoat: Thermosetting polyester powdercoat. UV, chip, and flake resistant.
 3. Test Results: "Pangard II".
 - a) Gloss, Garner 60 Degrees, ASTM D 523: Plus or minus 5.
 - b) UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
 - c) Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
 - d) Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
 - e) Erichsen Cupping, ISO 1520: 8 mm.
 - f) Impression Hardness, Buchholz, ISO 2815: 95.
 - g) Impact Test, ASTM D 2794: 60 inches/pound at 2.5 mils.
 - h) Pencil Hardness, ASTM D 3363: 2H minimum.
 - i) Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.
 - j) Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.
 4. Color: Titanium.
- B. Polysite:
1. Color: Bark.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive tables.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install tables in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install tables plumb and level.
- C. Anchor tables securely in place.

3.3 ADJUSTING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. Clean tables promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

- A. Protect installed tables to ensure that, except for normal weathering, tables will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 12 93 43

12 93 43.13 – BENCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Benches.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.
- C. Samples: Submit manufacturer's samples of materials, finishes, and colors.
- D. Warranty: Manufacturer's standard warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.
- C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 2.1 MANUFACTURER

- A. Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. Website www.landscapeforms.com. E-mail: specify@landscapeforms.com.
- B. **BENCHES**
- C. "Arcata" Benches

D. Style:

1. Backed with Arms
 - a) Depth: 24 inches.
 - b) Overall Height: 32 inches.
 - c) Arm Height: 25.5 inches.
 - d) Length: 75 inches.

E. Mounting:

1. Embedded

2.2 MATERIAL

A. Supports:

1. Tubular steel
2. Outside Diameter: 2–1/4 inches.
3. Wall Thickness: 0.188 inch.

B. Frame:

1. Tubular Steel Outer Frame: Surrounds steel angle and tee inner members.
2. Boards: Attached to inner members with black oxide finished stainless steel screws.

C. Seat and Back Panels:

1. Nominal Board Size: 1–1/4 inches by 3 inches.
2. Board Edges and Ends: Eased.
 - a) PolySite:
 - 1) 100 percent high–density polyethylene (HDPE) derived from recycled post–consumer packaging.
 - 2) Pigment and UV inhibitors added.

2.3 ACCESSORIES

- A. Anchor Bolts: Stainless steel anchoring hardware included. Six each 1/2–13 x 1–1/2 hex head cap screws, 1/2" flat washer, and drop–in anchor for 1/2–13 screw (Ø5/8 x 2" length). Setting tool for drop–in anchor included.

2.4 RECYCLED CONTENT

A. PolySite Benches:

1. Recycled Material Content: Minimum 92 percent.
2. Post-Consumer Material Content: Minimum 63 percent.
3. Pre-Consumer Material Content: Minimum 29 percent.
4. Recyclable: 100 percent.

2.5 FABRICATION

A. Shop assembled benches.

2.6 FINISHES

A. Finish on Metal: Landscape Forms, Inc. "Pangard II".

1. Primer: Rust inhibitor.
 2. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
 3. Test Results: "Pangard II".
 - a) Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
 - b) UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
 - c) Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
 - d) Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
 - e) Erichsen Cupping, ISO 1520: 8 mm.
 - f) Impression Hardness, Buchholz, ISO 2815: 95.
 - g) Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
 - h) Pencil Hardness, ASTM D 3363: 2H minimum.
 - i) Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.
 - j) Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.
 4. Color: Titanium.
- B. PolySite Color: Bark

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive benches.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install benches in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install benches level.
- C. Anchor benches securely in place.

3.3 ADJUSTING

- A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 CLEANING

- A. Clean benches promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

- A. Protect installed benches to ensure that, except for normal weathering, benches will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 12 93 43.13

DIVISION 26 – ELECTRICAL

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 33 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. Refer to Section 01 33 00.
10. Furnish copies of all test reports. Refer to Section 01 33 19.
11. Print copies of the "RECORD" drawings. Refer to Section 01 78 39.
12. Furnish all warranties and guarantees.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION 26 01 20

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", 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

1. National Fire Protection Agency (NFPA)
2. NFPA 70 (NEC)

3. Institute of Electrical and Electronic s Engineers (IEEE)
4. American Society Of Testing and Materials (ASTM)
5. National Electrical Manufacturers Association (NEMA)
6. International Electro–technical Commission(IE)
7. American National Standard Institute (ANSI)
8. Insulated Cable Engineers Association (ICEA)
9. National Electrical Contractor Association (NECA) – Standard of Installation.
10. 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

2.1 GENERAL

- A. Provide all materials and test equipment required for testing of specified electrical systems, including retesting until acceptable test results are obtained.

2.2 PRODUCTS

- A. 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 56 29, "Site Lighting."
 3. 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.
 4. 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

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

- 1. Section 26 01 26 – Maintenance Testing of Electrical System
- 2. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- 3. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- 4. 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

- 1. Wire and Cable
 - a) Carol.
 - b) Southwire.
 - c) Triangle PWC, Inc.
 - d) American Insulated Wire Corp.
 - e) BFCC Brand REX.
 - f) Senator Wire and Cable.
- 2. Connectors

- a) Burndy.
 - b) T & B.
 - c) 3M.
 - d) Amp Incorporated.
 - e) General Signal.
 - f) Square D.
 - g) Monogram.
3. Power Distribution Blocks
- A) IlSCO.
 - b) 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

- 1. Color code all distribution systems as follows:
 - a) 120/208V System

| Phase | Color |
|-------|-------|
| A | Black |
| B | Red |
| C | Blue |
| N | White |
| G | Green |

b) 277/480V System

| Phase | Color |
|--------------|--------------|
| A | Brown |
| B | Purple |
| C | Yellow |
| N | Gray/White |
| G | Green |

- c) For areas where local authority color coding differs from that specified, contact A/E for instructions.
2. 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

26 05 26 – GROUNDING AND BONDING

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. NETAATS – 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

3.1 GROUNDING AND BONDING INSTALLATION

- A. Install rod electrodes as indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- B. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.
- C. Provide bonding to meet Regulatory Requirements.
- D. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- E. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- F. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- G. Do not use spring steel clips and clamps.
- H. Do not use powder-actuated anchors.
- I. Do not drill or cut structural members.
- J. Do not use compression or mechanical connectors underground.

3.2 EQUIPMENT GROUND

- A. Coordinate with individual building contractors to ensure a continuous grounding system.
- B. 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.

1. Site lighting and fountains: bond every item of equipment served by the electrical system to the building equipment ground system. Coordinate with building contractor.
2. Ground each light pole.

C. FIELD QUALITY CONTROL

1. Grounding and Bonding: Perform inspections and tests listed in NETAATS, Section 7.13.

END OF SECTION 26 05 26

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, penthouse 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 26 05 29

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.
- E. PULL AND JUNCTION BOXES
- F. Provide galvanized sheet metal boxes conforming to NEMA OS 1. Provide hinged enclosures for any box larger than 12 inches in any dimension.
- G. 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.
- H. 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.
- I. Provide pre-cast reinforced concrete type pull/splice boxes with flush cover as manufactured by Brooks Products, for underground circuits. Size boxes as indicated.
- J. Provide separate pull boxes and junction boxes for electric power, control, and communication systems.
- K. 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.

2.2 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.
 - 1) Flexible Conduit and Fittings
 - d) Anamet, Inc.
 - e) Electri-Flex Co.
 - f) Triangle PWC, Inc.
 - 1) Nonmetallic Conduit and Fittings
 - g) Can-Tex Industries.
 - h) Carlon.
 - i) 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.

1. 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

2. 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.
 - 4) Provide weatherproof pull boxes or junction boxes where installed outdoors with watertight gasketed covers fastened by means of

corrosion resistant screws.

3.2 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

3.8 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

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.

1. 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.

2. 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.

3.2 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.

3.3 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

26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install specification grade wiring devices, including:
 - 1. Receptacles.
 - 2. 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. Receptacles
 - 1. Hubbell.
 - 2. Leviton.
 - 3. Pass & Seymour
- B. Cover Plates: Match device manufacturer.

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 RECEPTACLES

- A. 20A, 125V, 2P3W Duplex: Tamper resistant, NEMA 5-20R; "SC63H", Hubbell.

- B. 20A, 125V, 2P3W Simplex: NEMA 5-20R; "5361", Hubbell.
- C. 20A, 125V, 2P3W Duplex: NEMA 5-20R; "5362", Hubbell.
- D. 20A, 125V, 2P3W Duplex Ground Fault Interrupting: NEMA 5-20R; "GF5362", Hubbell.
- E. 20A, 125V, 2P3W Duplex Isolated Ground: NEMA IG5-20R; "IG5362", Hubbell.
- F. 20A, 250V, 2P3W Simplex: NEMA 6-20R; "5461", Hubbell.
- G. 30A, 125V, 2P3W Simplex: NEMA 5-30R; "9308", Hubbell.
- H. 30A, 250V, 2P3W Simplex: NEMA 6-30R; "9330", Hubbell.
- I. 50A, 125V, 2P3W Simplex: NEMA 5-50R; "9360", Hubbell.
- J. 50A, 250V, 2P3W Simplex: NEMA 6-50R; "9367", Hubbell.

2.4 COVER PLATES

- A. Provide stainless steel coverplates for all devices.
- B. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device covers. Provide "in-use" type covers for all outlets mounted outdoors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install receptacles only in electrical boxes which are clean and free from excess building materials, debris, etc.
- B. Install convenience receptacles in vertical position with grounding pole on bottom unless otherwise noted.
- C. Provide ground fault circuit interrupting type devices in all locations requiring weatherproof devices.
- D. Do not use feed through feature for ground fault interrupting devices. Install GFI device at each location. GFI circuit breaker will not be acceptable.

END OF SECTION 26 27 26

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

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. Ballasts:
 - 1. Advance.

2. Universal.
3. Valmont.

2.2 LAMPS

- A. LED lamps.
 1. For bollards, utilize LED lamps as scheduled in the light fixture schedule.
 2. CRI shall be 75 or higher, color temperature shall be 3500K or higher.

2.3 LUMINAIRES

- A. All fixtures shall meet "Cut-Off" or "Full Cut-Off" classification as defined by the IESNA.
- B. Luminaire construction must allow lamp to be replaced without tools unless mounted below 15'.
- C. Luminaires mounted below 15' must utilize tamper-proof stainless steel fasteners for access into fixture.
- D. All fixtures shall have a minimum UL ambient temperature rating of 40 degrees Celsius.
- E. Luminaire housings must be constructed of a non-corrosive material and/or cast low-copper aluminum. No sheet metal housings will be accepted.
- F. All fixture housings shall have polyester powder coat finish.
- G. All exterior hardware must be stainless steel.
- H. 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.
- I. These requirements shall apply to all luminaires including wall-mounted fixtures.

2.4 POLES

- A. All poles shall be rated for 110 mph sustained wind loading with all luminaires, mounting arms and accessories mounted with a 1.3 gust factor or 143mph wind gust. Deflection at 30 feet above grade less than 5 inches from vertical with 110 mph wind velocity and luminaires, brackets and related equipment mounted.
- B. All pole shafts shall be 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 and accent poles in the landscape area 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.

2.5 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. Designer must contact appropriate offices at time of work to insure a copy of the current information issue.

END OF SECTION 26 56 29

DIVISION 31 – EARTHWORK

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 013300 – Submittal Procedures 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 024117 – 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.
4. 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.
- C. 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.
- D. 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

31 13 16 – SELECTIVE TREE TRIMMING

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. Protecting and trimming trees indicated to be preserved.
- B. Related Work Specified Elsewhere:
 - 1. Division 31, Earthwork
 - 2. 32 90 00, Planting
 - 3. 32 92 13, Hydro–Mulching
 - 4. 32 91 19, Landscape Grading
 - 5. 32 01 90, Operations and Maintenance of Planting
 - 6. 32 80 00, Irrigation

1.3 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.
 - 2. AWPB: American Wood Preservers Bureau
 - 3. LP–22: Standard for Softwood Lumber, Timber and Plywood Pressure Treated with Water–borne Preservatives for Ground Contact Use.
- B. 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.

1.4 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

2.1 MATERIALS

- A. Provide Organic Pesticides and Herbicides only. Submit to Landscape Architect for approval prior to ordering. Refer to Section 32 90 00 for additional information.
- B. Deep Root Fertilizer – Commercial liquid fertilizer with a ratio of 3:1:1 (N:P:K). Nitrogen shall be slow release.
- C. 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.
- D. 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.
- E. Drainage Fill:

1. Selected stone or gravel, graded to pass a 3 inch sieve and retained on a 1 inch sieve.
- F. 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, 3/4 inch wide x 26 gauge.
- G. PVC Pipe ASTM D2665, 4 inch O.D nominal.
- H. All necessary tree replacements shall be approved by Owner's Representative.

PART 3 - EXECUTION

3.1 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.

3.2 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.

3.3 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 with the approval of certified arborist or urban forester.
- 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 32 90 00, Planting to achieve 2 inch layer of cover. Contractor shall work expeditiously to minimize time period that "forest floor" is bare.

3.4 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 zone within the drip line of tree.
- C. Fertilizer shall be as indicated in specifications 32 90 00.

3.5 CHEMICAL TREATMENT

- A. Borer treatment shall be provided if necessary.
- B. Ninety (90) days after start of construction (that disturbs trees) spray trees that are to remain as follows: Spray Oaks for Borers.
- C. Should it rain within six (6) hours after application, trees shall be re-sprayed at Contractor's expense.
- D. Repeat spray of Oaks upon completion of construction.

3.6 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 of root system caused by damage or cutting.

3.7 GRADING AND FILLING AROUND EXISTING TREES

- A. Maintain existing grade within the drip line of the trees, unless otherwise indicated. Where work is to be provided under the drip line of trees, consult with certified arborist or urban forester to determine proper pruning (if any) required to maintain the health of the existing trees.
- 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.

3.8 REPAIR AND REPLACEMENT OF DAMAGED 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.

3.9 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 31 13 16

31 20 00 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 2. Excavating and backfilling for construction of foundations.

1.3 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- C. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- D. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- E. Subgrade: Surface or elevation remaining after completing excavation, or top surface of

a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

- F. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

- A. Samples: For the following:
 - 1. 30-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Provide soil having a Liquid Limit of 37 or less and a Plasticity Index of less than 18.

- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

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

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.7 APPROVAL OF SUBGRADE

- A. Notify Independent Testing Laboratory when excavations have reached required subgrade.
- B. If Independent Testing Laboratory determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Inspecting and testing underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.

3.11 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use satisfactory soil material.
 - 4. Under building slabs, use satisfactory soil material.

3.12 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 92 percent.
 - 3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Construction Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed

at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.16 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 31 20 00

31 23 00 – GRADING EXCAVATION 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.
 - 4. City of Houston
 - a) Standard Construction Specifications for Wastewater Collection Systems, Water Lines, Storm Drainage, Street Paving, and Traffic-latest edition.

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. Select Fill: Imported lean clay with a narrow Plasticity Index (PI) range of 10 to 15.
- C. 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.
- D. 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.
- E. Lime: Material conforming to SDHPT Item 264, "Hydrated Lime and Lime Slurry".
- F. Soil Filter Fabric: Mirafi "1405" is specified; DuPont "Tygar" 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 AND COMPACTION BELOW GRADE BEAMS AND SLABS-ON-GRADE

- A. Excavate sub grade for the building footprint to allow a minimum of 4 feet of thickness below the bottom of the slabs-on-grade in accordance with lines and grades required for construction of the work, including space for placing and removal of forms, bracing and shoring, for inspection and a minimum of 5 feet beyond the building line.
- B. Maintain excavations free of loose earth, debris, and keep dry until placement of concrete.
- C. Proof roll the soil at the base of the excavation using a rubber-tired vehicle weighing about 20 tons, such as a loaded dump or water truck.
- D. Remove and replace any soft or weak soils identified. Disking, drying and recompaction during dry weather or treatment with a chemical additive may be used as needed as remedial options.
- E. Place a minimum 4 feet thickness of lime treated structural fill and select, fill as indicated, in consecutive 8 inch maximum loose lifts. Compact lime treated clay and select fill to at least 95 percent of the standard Proctor maximum density according to ASTM D 698.
- F. If high moisture content is determined by ASTM D698, compare the in-place density of lime-treated clays with 90 percent of the maximum density determined by modified effort according to ASTM D 1557, if required. The actual range of moisture within which

specified compaction can be achieved may be adjusted once the moisture–density relationship for the structural fill has been developed.

- G. Protect open excavations with coverings as necessary to maintain existing soil moisture content.

3.4 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate using ladder–type trenching machine or backhoe unless indicated otherwise.
- A. Cut trench sides vertical from trench bottom to one foot above top of pipe; slope back on stable slope above that point.
- B. Extend trench width minimum 6 inches and maximum 18 inches each side of pipe.
- C. Excavate trench to a minimum depth of 4 inches below bottom elevation of proposed pipelines.
- D. Leave no more than 500 feet of trench open at one time.
- E. Where augured hole is indicated, provide opening no larger than one inch greater than outside diameter of pipe bell.

3.5 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.

3.6 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.

3.7 UTILITY TRENCH BACKFILL

- A. Pipe bedding and backfill requirements for sanitary sewers shall be as specified in City of Houston Standard Construction Specifications Section 02317 Excavation and Backfill for Utilities.
- B. Pipe bedding and backfill requirements for storm sewers shall be as specified in City of Houston Standard Construction Specifications Section 02317 Excavation and Backfill for Utilities.
- C. Pipe bedding and backfill for water distribution system piping shall be in accordance with City of Houston "Specifications for Water Main Construction and Materials" and "Specifications for Water Taps and Service Lines", 3/4-inch through 2-inch, with latest addenda and amendments thereto.
- D. Backfill trench as soon as possible after pipe has been laid, jointed, and inspected; complete backfilling at end of each day.
- E. Within Pipe Zone: Place backfill material and hand tamp in 6 inch layers to one foot above top of pipe.
- F. Use of bulldozer or similar tracked equipment is unacceptable for compaction.

3.8 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.

3.9 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.

3.10 SURPLUS MATERIALS

- A. Remove surplus subsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

3.11 CLEAN-UP

- A. Remove temporary structures, rubbish, and waste materials from work site daily.

END OF SECTION 31 23 00

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

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
 - 1. 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
 - 1. 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

- a) 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

- a) 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:

- | | |
|------------------------------------|-------------|
| a) Minimum Passing 1–3/4 in. sieve | 100 percent |
| b) 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

DIVISION 32 – EXTERIOR IMPROVEMENTS

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 FOR THE AREA OF CAMPUS WITHIN THE SCOPE OF WORK including:
1. Maintenance of lawn areas and hydro-mulch areas (existing and contractor provided).
 2. Maintenance of trees and planting bed areas (existing and contractor provided).
 3. Removal of weeds from tree saucers, lawn areas, planting beds, walkways, and paved areas.
 4. Application of organic fertilizers, insecticides and herbicides and soil amendments.
 5. Maintenance of entire (existing and contractor provided) irrigation system and watering requirements of campus vegetation.
 6. General site cleanup, removal of trash and by-products of maintenance in landscape areas, sidewalks, parking lots and interior campus roadways.

1.2 INTENT OF ESTABLISHING LANDSCAPE /360 DAY SCHEDULED MAINTENANCE

- A. The intent of this section shall begin when the Contractor begins work on the site for maintenance of existing trees, lawn and planting bed areas and shall continue when Contractor provided plant materials are installed, however, the 360 day scheduled maintenance period shall only begin when a date is established based upon written acceptance of the plant materials provided by the Landscape Architect.
- B. At the completion of the 360 day maintenance period, the Contractor shall provide the Owner with an established landscape. During the construction period and the one year establishment period the Contractor shall care for and provide a project site that is attractive in appearance and shall keep the irrigation system operational and plant materials and lawns in a healthy and vigorous condition using accepted horticultural standards.
- C. Contractor shall be responsible for establishing the landscape for a period of 360 calendar days beginning on the written date of acceptance for the plant materials provided by the Landscape Architect.

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.

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 by the Contractor at no cost to the Owner.
- B. Structures that are damaged due to the Contractor's operations shall be replaced by the Contractor at no cost to the Owner.
- C. Damage to or thefts of landscaping installations not caused by the Contractor shall be corrected at the Owner's expense upon receipt of the Owner's written authorization to proceed. Contractor shall be responsible for bringing such areas to the attention of the Owner's Representative in a timely manner. Upon notifying Owner of damaged or impacted areas due to theft, Contractor shall be responsible for providing a cost proposal to restore the impacted areas. Contractor shall only proceed with repairs upon written approval of the Owner.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 00 –Submittal Procedures and 01 78 39 Project Record Documents of these specifications, the following shall be submitted:
 - 1. Manufacturer's data including product specifications, application instructions and precautions if any are necessary.

PART 2 - PRODUCTS

2.1 SOIL PRODUCTS

- A. Mulch: As specified in Section 32 90 00 – Planting of these specifications.
- B. Compost: As specified in Section 32 90 00 – Planting of these specifications.
- C. Weed Control: Post-emergent weed control as specified in Section 32 90 00 – Planting of these specifications. Pre-emergent weed control shall be Corn Gluten Crumbs at a rate of 20lbs per 1,000sf.

2.2 COMMERCIAL ORGANIC FERTILIZER PRODUCTS

- A. Super Seaweed at manufacturer recommended rates mixed with ½ oz. garlic oil, ½ oz. soybean oil per gallon of water.
- B. MicroLife 6–2–4 Biological Fertilizer, MicroLife Humates Plus and MicroGro Granular Inoculant.
- C. Organic Fertilizers are available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713–957–0909.

2.3 ORGANIC INSECT AND DISEASE CONTROL PRODUCTS

- A. Fire Ant Control: As per Section 32 90 00 for Trees, Shrubs and Groundcover. Refer to 32 92 13 for these materials for hydro–mulch areas.
- B. MicroLife (5–1–3) Brown Patch with “Anti–Disease”, Neem Oil Organic Fungicide, MicroGro AF W.P., and MicroGro Granular.
- C. Fungicide (Not for Lawn or hydromulched 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. Organic Insect and Disease control products are available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713–957–0909.

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. 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. Remove any existing above ground stakes and guys from all existing trees at start of Work.
- B. Remove any excess mulch from existing tree saucers. Mulch shall only be 2 inches in depth within the tree saucer. Remove any mulch from within a 12 inch distance from the base of tree trunks to expose root flare of trees. Relocate excess mulch if present to areas that may be lacking a mulch cover.
- C. Hand-turn all existing tree saucer soil areas to aerate the soils around the base of the existing trees only (not required for Contractor provided and installed trees). Do not injure any tree roots. Perform work when the trees are scheduled for their first fertilization.
- D. Check installations of Contractor provided tree staples and adjust as necessary to ensure that trees are properly positioned and secured throughout the maintenance period. (Tree staples are only for Contractor provided trees and transplanted trees and are not to be installed on existing trees)
- E. Remove suckers from trees in accordance with the Schedule of Article 3.9.
- F. Edge, weed, fertilize, mulch, and aerate tree saucers in accordance with the Schedule of Article 3.9.
- G. Prune and shape trees in accordance with the Schedule of Article 3.9. Do NOT prune trees for purposes not listed below without Owner approval. See paragraph H for Crape Myrtle Tree Pruning. Prune trees in order to:
 - 1. Remove diseased or storm-damaged branches
 - 2. To thin out the crown to permit new growth and better air circulation.
 - 3. To reduce remove obstructing lower branches where the branches overhang walkways. A clear height of 7 ft. shall be maintained.
- H. **CRAPE MYRTLE TREE PRUNING:** Prune only those stems that are no more round than a human's index finger and only prune to approximately 6 inches above the intersection of the stem that meets a branch. Prune suckers that have grown at the base of the trunk and any twiggy growth that has emerged up and along the main trunk(s). **DO NOT PRUNE CRAPE MYRTLE TREES WHEN OTHER TREES ON SITE ARE BEING PRUNED.** Contractor shall be responsible for replacing any damaged crape myrtle trees due to poor pruning practices. Only prune one time during the year, the first week of March in accordance with the Schedule of Article 3.9.
- I. Control trees insects.
- J. Control disease in accordance with the Schedule of Article 3.9 by spraying, either pruning or removing or both, disease damaged plant material.
- K. Fertilize trees as indicated below in paragraph 3.3D, in accordance with the Schedule of Article 3.9.

3.2 TREE SAUCERS

- A. Maintain tree saucers at existing size of circumference in a neat circle. Mulch depth shall be two inches. Mulch will not be accepted if mounded around tree. Mulch 3 – 6 inches away from base of trunk. Do NOT mulch against the tree trunk. Apply mulch in accordance with the Schedule of Article 3.9.

3.3 OVERALL PLANTING MAINTENANCE

- A. Mowing:
 - 1. Mowing for existing remaining Sod: Existing sod areas and provided sod areas after the 6 month installation shall have mowing height set to 3 inches. Never cut more than 1/3 of the total length of the blade at any one mowing. Do not bag clippings during June through September.
 - 2. Mowing for Hydro-mulched areas shall have the mowers set to accommodate a 1.5" 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 these clippings. Do not allow clippings to remain on lawn surface more than four hours.
- B. Watering: The Contractor shall monitor the irrigation system to ensure adequate water is being applied to the site. Watering should begin immediately after installation. The general contractor shall designate the party responsible to ensure adequate water supply and application. The 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. Watering shall be provided according to the guidelines provided on the Drawings with an effort to provide a one -hour deep in accordance with the Schedule of Article 3.9. Once established, Contractor shall reduce watering of turf thus allowing the turf to acclimatize to Houston's natural rainfall following the schedule for deep watering.
- C. Hand-turn all existing planting bed soil areas to aerate the soils around the base of existing plant materials within planting beds only (not required for Contractor provided and installed planting bed areas). Do not injure any existing tree and/or shrub roots. Perform work when the planting bed areas are scheduled for their first fertilization.
- D. Fertilizing for Trees and Planting bed areas: Fertilize in accordance with the Schedule of Article 3.9, at manufacturer's recommended rate with products noted above and as follows:
 - 1. Spring through Fall (March through November): Apply foliar spray Super Seaweed at recommended rates. Add ½ oz. garlic oil, ½ oz. Soybean Oil per gallon of water to the mix and spray to the point of dripping off leaves.

- E. Fertilizing for Lawn areas: Fertilize in accordance with the Schedule of Article 3.9, at manufacturer's recommended rate with products noted above and as follows:
1. Spring (March, April, May): Apply MicroLife 6–2–4 Biological Fertilizer and MicroLife Humates Plus at rates specified by the manufacturer.
 2. Summer (June, July, August, September): Apply MicroLife Humates Plus at rates specified by the manufacturer.
 3. Fall (October, November): Apply MicroLife 6–2–4 Biological Fertilizer and MicroGro Granular Inoculant on the same day at rates specified by the manufacturer.
 4. Spray with SuperSeaweed 3 times per year just prior to start of spring, summer and fall.
 5. One month prior to end of first year of maintenance contractor shall have soil pH tested and make recommendations for any adjustments to fertilization materials.
- F. Insects: Control insects with applications of organic insecticides at the manufacturer's recommended rates. Contractor shall ensure that the insects are detrimental to the plant habitat prior to treating for insect removal. Contractor shall be responsible for notifying Owner's Representative of problem areas and presenting a cost proposal for applying the appropriate organic pesticides in a timely manner. Allowing the insects to continue without taking advance steps resulting in the death of the plant materials will become the Contractor's responsibility to cover all costs to repair and replace damaged areas and materials.
- G. Diseases: Where they first appear, spray for diseases with a commercial organic fungicides including but not limited to (depending upon the disease): MicroLife (5–1–3) Brown Patch with "Anti-Disease", Neem Oil Organic Fungicide, MicroGro AF W.P., and MicroGro Granular. Provide in accordance with the manufacturer's recommendations. Contractor shall be responsible for notifying Owner's Representative of problem areas and presenting a cost proposal for applying the appropriate organic fungicide in a timely manner. Allowing the disease to continue without taking advance steps resulting in the death of the plant materials will become the Contractor's responsibility to cover all costs to repair and replace damaged areas and materials.

3.4 WEED CONTROL

- A. Weeds shall be removed from lawn areas, tree saucers, planting beds, vegetation growing through pavements, expansion joints, TemPark fabric, beach pebble and black star gravel areas using organic products noted above. Weed removal shall be in accordance with the Schedule of Article 3.9.
- B. Apply organic pre-emergent weed killer in accordance with manufacturer's recommendation and in accordance with the Schedule of Article 3.9.

3.5 IRRIGATION SYSTEM MAINTENANCE

- A. 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.
- B. 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.
- C. Contractor will coordinate ANY CHANGES IN watering times due to local climate conditions with Owner Representative in order to avoid any conflicts and to monitor the setting of the Irrigation Controller.

3.6 GENERAL CLEAN UP

- A. Contractor shall dispose of any waste materials or refuse from contractor operations off-site except where separate agreement is reached with Owner.
- B. Plant growth shall be prevented in cracks in decomposed granite walks and paved areas, expansion joints, curb joints, TemPark fabric, beach pebble areas and black star gravel.
- C. Leaves, papers, grass clippings (not during summer months), or other debris shall be removed in accordance with the Schedule of Article 3.9 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 3.9, 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.

3.7 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 based upon the provided schedule of this section.
- B. All work under this Section shall be performed in accordance with the attached Schedule of Article 3.9.

3.8 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 that is under guarantee period shall be replaced within 2 weeks of Owner's Representative request at no additional cost to Owner. 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 or are dead at time of start of Work, 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.

3.9 SCHEDULE

| OPERATION | FREQUENCY | | | | | | | | | | | | |
|---|-----------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|--------|
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEPT | OCT | NOV | DEC | TOTAL |
| Prune Trees (NOT CRAPE MYRTLES) | | | | | | | | | | | 1 | | 1 |
| Prune Crape Myrtle Trees | | 1 | | | | | | | | | | | 1 |
| Weed all Site Areas (Pre–Emergent application) | | 1 | | | | | | | | | | | 1 |
| Lawn Fertilization | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 9 |
| Lawn SuperSeaweed Application | | | 1 | | | 1 | | | 1 | | | | 3 |
| Lawn Mowing (St. Augustine and Hydro–mulch areas) | 1 | | 1 | 1 | 4 | 4 | 4 | 4 | 1 | | 1 | | 22 |
| Tree and Planting Bed Fertilization | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 9 |
| Weed all Site Areas (Post–emergent application and by hand if needed) | 1 | | 1 | 1 | 4 | 4 | 4 | 4 | 1 | | 1 | | 22 |
| Mulch/Aerate all Site Areas | 1 | | | 1 | 1 | | | | 1 | | | | 3 |
| Tree Sucker Removal | | | | 1 | 1 | 1 | 1 | 1 | | | | | 5 |
| Insect Control (Inspect) | | | 1 | | 1 | | 1 | | 1 | | 1 | | 5 |
| Litter Pickup (General Clean up) | 2 | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 2 | 40 |
| Disease Control (Inspect) | | | 1 | | 1 | | 1 | | 1 | | 1 | | 5 |
| Edging saucers, planting beds, walks | 1 | | 1 | 1 | 4 | 4 | 4 | 4 | 1 | | 1 | 1 | 22 |
| 1 hr. Deep Watering | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 4 | 4 | 1 | 1 | 1 | 128hrs |
| Irrigation System Maintenance | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 |

END OF SECTION 32 01 90

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 01 33 00- Submittal Procedures.
- B. Submit product data for proposed tack coat.
- C. Submit report of recent calibration of distributor.

PART 2 - RODUCTS

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.
1. 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

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 01 33 00 – Submittal Procedures.
- 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:
 - 1. 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 |

2. 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 | — |

3. 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 | | | |

* 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

- A. 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 determine 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 (°F)</u> | <u>Maximum (°F)</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

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:

| <u>Percent Min.</u> | <u>Density Max.</u> | <u>Percent Optimum</u> | <u>HVEEM Stability Percent 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

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. CI: 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

1. Formwork tolerances shall be as specified in ACI 316 R, Chapter 5.

C. Finishing Tolerance

1. 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.

1. 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 013300 – Submittal Procedures 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

1. Metal forms, as indicated in ACI 316 R, Chapter 5.
- B. Welded Steel Wire Fabric
1. Plain wire fabric, as specified in Section 032100 – Concrete Reinforcement of these Specifications.
- C. Reinforcing Steel Bars
1. As specified in Section 032100 – Concrete Reinforcement of these Specifications.
- D. Dowel Bars
1. Smooth, ASTM A615 + 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
1. 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
1. Class 3000, as specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.
- G. Membrane Forming Curing Compound
1. 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
1. 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
1. 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
 - 1. 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, as specified in Section 032100 – Concrete Reinforcement of these Specifications, and in Section 321319 – Concrete Pavement Joints.
- 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, and as specified in Section 321373.19 – Cast-in-Place Concrete of these Specifications.

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

- 1. 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

- 1. 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 |

- 2. 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

32 13 13.26 – CONCRETE WALKS AND RAMPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies the requirements for providing, placing, curing and protecting Portland cement concrete walks (both Light Broom Finish and Sand Blasted Finish), wheelchair and driveway ramps, 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) C 150: Specification for Portland Cement Type I or Type II.
 - b) C 309: Specification for Liquid Membrane – Forming Compounds for Curing Concrete.
 - c) D 1565: Specifications for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Open–Cell Foam).
 - d) D 1751: Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - e) D 1752: Specifications for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - f) D 3405: Specification for Joint Sealants, Hot–Poured, for Portland Cement Concrete Pavement.
 - g) C 920: Standard Specification for Elastomeric Joint Sealants.

1.3 SUBMITTALS

- A. 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, and 321313 – Portland Cement Concrete of these Specifications.

B. Field Sample Panel (Mockup) for Abrasive-Blast Finish Concrete: Prepare concrete paving sample to indicate range of sandblast finish textures (See Depth of Cut types below on page 385) for preliminary selection by Architect. Upon approval, produce final 6'x6' sample for final approval by Architect.

1. Use sample panels approved by Architect for standard of workmanship for new paving work.
2. Use sample panel to test cleaning methods.
3. Approved mockups may not become part of the completed Work.

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 rights or remedies as may otherwise be afforded under law or statute.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms

1. Either wood or metal, straight and free of warp.

B. Reinforcing Steel Bars

1. As specified in Section 032100 – Concrete Reinforcement of these Specifications.

C. Welded Steel Wire Fabric

1. Plain wire fabric, as specified in Section 032100 – Concrete Reinforcement of these Specifications.

D. Concrete

1. Class 3000, as specified in Section 321313 – Portland Cement Concrete of these Specifications.

E. Membrane Forming Curing Compound

1. ASTM C 309, Type 2, unless otherwise directed.

F. Joint Materials

1. Preformed Expansion Joint Filler: ASTM 1565, ASTM D 1751, and ASTM 1752.
2. Joint Sealing Material: See Section 321319 – Joint Sealants of these Specifications.

G. Form Coating

1. Commercial formulation form–coating compound that will neither 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. Do not begin walk or ramp 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.
- 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.
- B. Walks shall be constructed in sections, of the length indicated on the Drawings, with sections a minimum of 8 ft. long and a maximum of 20 ft. long. Sections shall be separated by joint fillers placed vertically and at right angles to the longitudinal axis of the walk. Transverse scored control joints shall be spaced at a dimension no greater than the width of the sidewalk.

- C. Expansion joint fillers shall be installed for the full length and depth of joints, where walks or ramps abut rigid construction, and where obstructions protrude through walks or ramps.
- D. 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 301, Chapter 11.9 and ACI 316R, Chapters 10 and 12.5.
- B. Concrete shall be consolidated in accordance with Section 321373.19 – Cast-In-Place Concrete of these Specifications.
- C. Light Broom Finish
 - 1. The top surface shall be wood floated to a uniform gritty texture. 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.
 - 2. The edges and joints shall be rounded using an edging tool having a radius of 1/8 in. Scored joints shall be placed in a regular pattern, as indicated on the Drawings.
- D. Abrasive-Blast Finish
 - 1. Provide abrasive-blast finish where indicated on the Drawings. Abrasive-blast finish is noted as “sandblast” or “sandblasted” on the Drawings.
 - a) Perform abrasive blasting 24 to 72 hours after pouring when concrete strength ranges between 1000 and 1500 psi (6.9 and 10.3 MPa).
 - b) Coordinate with formwork construction, concrete placement schedule, and formwork removal to ensure that surfaces to be abrasive blasted are treated at the same age for uniform results.
 - 2. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
 - 3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows:
 - a) Brush: Remove cement matrix to eliminate surface sheen and expose face of fine aggregate. No reveal.

- b) Light: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color. Maximum reveal 1/16-inch (1.5 mm).
 - c) Medium: Generally expose coarse aggregate with slight reveal. Maximum reveal 1/4-inch (6 mm).
 - d) Heavy: Expose and reveal coarse aggregate to a maximum projection of one-third of its diameter; reveal 1/4- to 1/2-inch (6 to 12 mm).
4. Abrasive Blasting: Abrasive blast surfaces of patterns carefully, using back-up boards, to maintain uniform finish. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
5. Concrete Cleaning (Acid cleaning): After abrasive blasting to required depth is completed, clean surface with commercial concrete cleaner, according to the manufacturer's instructions and recommendations.
- a) Thoroughly neutralize and flush cleaning solution from finished surfaces with water under pressure.
 - b) Protect adjacent materials and finishes from washing and run-off.

3.5 WALKS AND RAMPS

A. Thickness

- 1. Walk and ramp thickness shall be as indicated on Drawings.

B. Deficient Thickness

- 1. Thickness shall be determined in accordance with Item 360, Paragraph 360.13 of the TxDOT Standard Specifications.
- 2. Price adjustments for thickness deficiencies will be determined in accordance with Item 360, ARTICLE 360.13, SUBARTICLE of the TxDOT Standard Specifications.

C. Color

- 1. All Ramps to be colored as per 321316 Dry-Shake Colored Hardener of these Specifications.

3.6 CURING AND PROTECTING

- 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.

END OF SECTION 321313.26

32 13 16 – DRY–SHAKE COLORED HARDENER

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to Work of this Section.
- B. Section Includes:
 - 1. Dry–shake colored hardener applied to concrete ramps.
 - 2. Curing of colored concrete.
- C. Related Sections:
 - 1. Division 32 Section "Cast–In–Place Concrete" for general applications of concrete.
 - 2. Division 07 Section "Sealants" for colored sealants for joints.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 303.1 "Standard Specification for Cast–In–Place Architectural Concrete."
 - 2. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete."
 - 3. ACI 305R "Recommended Practice for Hot Weather Concreting."
 - 4. ACI 306R "Recommended Practice for Cold Weather Concreting."
- B. American Society of Testing and Materials (ASTM):
 - 1. ASTM C309 "Standard Specifications for Liquid Membrane–Forming Compounds for Curing Concrete."
 - 2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete."

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's complete technical data sheets for the following:
 - 1. Dry–shake colored hardener.
 - 2. Curing compound.

- B. Design Mixes: For each type of concrete.
- C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.
- D. Qualification Data: For firms indicated in "Quality Assurance" Article, including list of completed projects.

1.4 QUALITY ASSURANCE

- A. Comply with the requirements of ACI 301.
- B. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration data as applicable.
- B. Store the product in a location protected from damage, construction activity, and precipitation in strict accordance with the manufacturer's recommendations.

1.6 PROJECT CONDITIONS

- A. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
- B. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.
- C. Comply with professional practices described in ACI 305R and ACI 306R.

1.7 PRE-JOB CONFERENCE

- A. One week prior to placement of concrete, a meeting shall be held to discuss the Project and application methods.
- B. It is suggested that the Architect, General Contractor, Subcontractor, Ready-Mix Concrete Representative, and a Manufacturer's Representative be present.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Dry-shake Colored Hardener: LITHOCHROME® Color Hardener; L. M. SCOFIELD

COMPANY, factory proportioned, mixed, and packaged, ready-to-use surface hardener. Or approved equal.

- B. Curing and Sealing Compound: SCOFIELD® Cureseal-W™ [Semi Gloss] and Cureseal-S™ [Gloss]; L. M. SCOFIELD COMPANY. Curing and sealing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete. Or approved equal.
- C. SUBSTITUTIONS: The use of products other than those specified will be considered providing that Contractor requests its use in writing within 14-days prior to bid date. This request shall be accompanied by the following:
 - 1. A certificate of compliance from material manufacturer stating that proposed products meet or exceed requirements of this Section.
 - 2. Documented proof that proposed materials have a 10-year proven record of performance confirmed by at least 5 local projects that Architect can examine.

2.2 COLORS

- A. Colors: Deep Charcoal.

2.3 CONCRETE MIX DESIGN

- A. Comply with requirements of Division 32 Section "Cast-in-Place Concrete" and the following:
 - 1. Do not add calcium chloride to mix as it causes mottling and surface discoloration.
 - 2. Supplemental admixtures shall not be used unless approved by manufacturer.
 - 3. Do not add water to the mix in the field.
 - 4. Maximum air content shall not exceed 5 percent.

PART 3 - EXECUTION

3.1 CONCRETE PLACEMENT

- A. Move concrete into place with square-tipped shovels or concrete rakes.
- B. Vibrators, when used, shall be inserted and withdrawn vertically.
- C. Concrete shall be struck to specified level with wood or magnesium straight edge or mechanical vibrating screed.
- D. The concrete surface shall be further leveled and consolidated with highway magnesium

straight edge and/or magnesium bull float.

- E. Mechanically float concrete surfaces as soon as concrete surface has taken its initial set and will support weight of a power float machine equipped with float shoes or combination blades and operator.

3.2 INSTALLATION

- A. Apply 2/3 of specified application rate to freshly floated concrete surface. Bleed water shall not be present during or following application of first and second shake.
- B. Do not throw dry-shake; distribute evenly by hand or mechanical spreader designed to apply floor hardeners. Consult L. M. Scofield Company for recommended manufacturers of mechanical spreaders.
- C. As soon as dry-shake material has absorbed moisture, indicated by uniform darkening of surface, mechanically float concrete surface a second time, just enough to bring moisture from base slab through dry-shake color hardener.
- D. Immediately following second floating, apply remaining 1/3 of specified application rate. If applied by hand, broadcast in opposite direction of first application for a more uniform coverage. If a mechanical spreader is used, apply the same manner as previously described.
- E. As soon as dry-shake material has absorbed moisture, mechanically float concrete surface a third time.
- F. Do not add water to the surface.
- G. Begin imprinting operations immediately after applying dry-shake colored hardener, according to manufacturer's written instructions, including application of powder antiquing release agent.

3.3 CURING

- A. Imprinted concrete shall be cured with liquid membrane curing and sealing compound as recommended by manufacturer.
- B. As soon as possible after antiquing release has been removed and after moisture content of concrete is low enough that alkali and other salts do not become trapped beneath sealer, normally a minimum of 14 to 28 days after placement, apply 2-coats of specified curing and sealing compound according to manufacturer's written instructions.
- C. There should be no free water on the surface at time of application.

3.4 PROTECTION OF FINISHED WORK

- A. Protect finish work under provisions of Division 01 Section "Construction Facilities and

Temporary Controls."

- B. Prohibit foot or vehicular traffic on the newly imprinted concrete surface.
- C. Barricade area to protect newly imprinted concrete.
- D. Protect floor surface from damage until final inspection and acceptance by Owner.

END OF SECTION 32 13 16

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 013300 – Submittal Procedures.
- 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

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) 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
1. Formwork tolerances shall be as specified in ACI 301, Chapter 4 and as required herein for specified finishing tolerances.
- C. 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.

D. Extended Warranty

- 1. 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.

E. Architecturally Treated Columns

- 1. 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
 - 1. ASTM C 150
- B. Admixture
 - 1. ASTM C 494.
- C. Concrete Reinforcement
 - 1. As specified in Section 032100 – Concrete Reinforcement of these Specifications.
- D. Membrane Forming Curing Compound
 - 1. 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
 - 1. ASTM C 171, waterproof paper or polyethylene film.
- F. Burlap Sheet
 - 1. AASHTO M 182, Class 3 or 4.
- G. Tarpaulins
 - 1. FS K–P–146.
- H. Blanket Insulation

1. 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

1. 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

1. Polyethylene sheet, 0.01 in. thick, FS L-P-512, Type I, Class H, Grade 5.

L. Abrasive Aggregate

1. 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

1. 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. All coarse aggregates shall conform to Section 321313 – Portland Cement Concrete of these Specifications.
- P. Fine Aggregates
1. All fine aggregates shall conform to Section 321313 – Portland Cement Concrete of these Specifications.
- Q. Coloring Admixture
1. Coloring of all Accessible Ramps per Section 32 13 16 of these Specifications

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

1. 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

1. 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
 - a) Scratched finish shall be in accordance with ACI 301, Chapter 11.
2. Floated Finish, F7
 - a) Floated finish shall be in accordance with ACI 301, Chapter 11.
3. Troweled Finish, F8
 - a) Troweled finish shall be in accordance with ACI 301, Chapter 11.
4. Broom or Belt Finish, F9
 - a) 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
 - a) 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

- a) 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 latence, 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 latence 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

32 14 00 – UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes brick(fly ash) paver, concrete paver and stone paver assemblies.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for unit pavers, joint materials and edge restraints.
 - 1. Samples for initial selection:
 - a) For all pavers, provide sample panel showing full color range and texture of pavers
 - 2. Samples for verification:
 - a) Custom color pavers
 - b) Custom color blends for pavers
- C. Product Certificates:
 - 1. Signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
 - 2. Indicating that the following items meet specified requirements:
 - a) Brick pavers
 - b) Concrete pavers
 - c) Stone pavers
 - 3. Indicating testing laboratory's facilities and qualifications of its principals and key personnel to perform tests specified.
- D. Shop Drawings: Drawings with details including but not limited to relationship to adjoining materials and assemblies, indication of perimeter conditions, expansion and control joints, paver layout, patterns, color arrangement, installation, and setting details.
- E. Test Reports:
 - 1. Sieve analysis for grading of bedding and joint opening aggregates.
 - 2. Test results from an independent testing laboratory for compliance of concrete

pavers with ASTM C 936.

1.3 QUALITY ASSURANCE

- A. Source Limitations for Fly Ash, Concrete, and Stone Pavers: For each color required, provide fly ash, concrete, and stone pavers of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single manufacturer
 - 1. Extra Materials: Furnish extra units amounting to 2 percent of installed materials, for each color or color blend of pavers installed
- B. Product Certificates:
 - 1. Signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
 - 2. Indicating that pavers meet specified requirements.
 - 3. Indicating testing laboratory's facilities and qualifications of its principals and key personnel to perform tests specified.
- C. Field Sample Panel (Mockup): Lay up a sample panel in accordance with Brick Industry Association (BIA) Technical Note 11A, Guide Specifications for Brick Masonry, Part 2, except provide horizontal panel approximately 6 feet by 6 feet (1.8 m by 1.8 m) over the specified paving base. Build mockups for each form and pattern of unit paver.
 - 1. Use masonry units from random pallets of units delivered on site.
 - 2. Include sand joints specified.
 - 3. Use sample panels approved by Architect for standard of workmanship for new paving work.
 - 4. Use sample panel to test cleaning methods.
 - 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion
- D. Installer qualifications: company specializing in installation of stone/brick pavers with at least five (5) years documented commercial experience with installations of similar scope, materials and design.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened labeled packaging.
- B. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.
 - 1. Coordinate delivery and paving schedule to minimize interference with normal use

of buildings adjacent to paving.

2. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload pavers at job site in such a manner that no damage occurs to the product.
- C. Storage and Protection: Store materials protected such that they are kept free from mud, dirt, and other foreign materials.
1. Cover bedding sand and joint sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
1. Do not install sand or pavers during heavy rain or snowfall.
 2. Do not install sand and pavers over frozen base materials.
 3. Do not install frozen sand or saturated sand.
 4. Do not install concrete pavers on frozen or saturated sand.

PART 2 - PRODUCTS

2.1 BRICK PAVERS

- A. Fly Ash Pavers: Non-fired pavers composed of Class C fly ash and fine aggregates.
1. Basis-of-Design Product: CalStar Products, Inc; 6851 Mowry Ave., Newark, CA 94560. ASD. Toll Free: 877-700-9501. Phone: 510-793-9500. Fax: 510-793-9501 Email: info@calstarproducts.com. Web: <http://www.calstarproducts.com>; CalStar® Fly Ash Pavers. Subject to compliance with requirements, provide the named product or approved equal.
 2. Structural and Weathering Performance: Complying with performance requirements of ASTM C902, Grade SX, and ASTM C936.
 3. Dimensional Tolerance: Complying with tolerance requirements of ASTM C902, Application PX.
 4. Efflorescence: Classified "not effloresced" when tested in accordance with ASTM C67.
 5. Size (Actual Dimensions): 4 inches (98.5 mm) wide by 2-3/8 inches (60 mm) high

by 8 inches (198.5 mm) long.

- a) Spacers: Integral spacers for 1/16 inches (1.5 mm) gaps
6. Color: Provide fly ash pavers colored with pigments conforming to ASTM C979.
 - a) Natural
 - b) Dark Gray
 - c) Light Gray
 7. Finish: Tumbled and regular
 8. Solar Reflectance Index: For the following paver types, provide pavers with Solar Reflectance Index (SRI) of 29 or greater, calculated according to ASTM E 1980.
 - a) Natural
 9. Regional Materials: Provide pavers that have been manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
 10. Recycled Content: Not less than 37 percent preconsumer and postconsumer recycled content by weight.
 11. Embodied Energy: Not to exceed 1000 BTUs per paver, as certified by manufacturer.
 12. Carbon Footprint: Not to exceed 0.1 lb of carbon dioxide per paver, as certified by manufacturer.

2.2 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
 2. Thickness: 2-3/8 inches.
 3. Rectangular, Face Size and Shape: 3-7/8 inches x 7-13/16 inches.
 4. Square, Face Size and Shape: 7-13/16 x 7-13/16 inches.
 5. Color: As selected by Architect from manufacturer's full range.

2.3 STONE PAVERS

- A. Stone to meet or exceed the requirements of ASTM C73-97 and ASTM C99.
- B. Egyptian Limestone Palladian Grey. As supplied by Upchurch Kimbrough Company contact: Heather Tito 713-957-1520. Or approved equal.
 - 1. Finish: Tumbled
 - 2. Thickness: 1 1/4" paver, 2" paver
 - 3. Size: 8"x16", 16"x16", 12"x12", 12"x24", 12"x36"
 - 4. Test Results:
 - 1) Water Absorption, .0131%
 - 2) Specific Gravity, 2.563 Kg/m³
 - 3) Compressive Strength, 15,600 PSI
 - 4) Abrasion Resistance: 26.5 (HA)
 - 5) Modulus of Rupture: 1,600 PSI
 - 6) Ultimate Tensile Strength: 1,400
- C. Sugari Sandstone: As supplied by Upchurch Kimbrough Company contact: Heather Tito 713-957-1520. Or approved equal.
 - 1. Finish: Honed
 - 2. Thickness: 2" paver
 - 3. Size: 12"x36"
 - 4. Test Results:
 - 1) Water Absorption, 2.24%
 - 2) Specific Gravity, 2.119
 - 3) Density, 147 lbs/ft.
 - 4) Compressive Strength, 8180-12,940 PSI
 - 5) Abrasion Index: 4.22
 - 6) Flexural Strength: 752 PSI

2.4 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.

2.5 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 sieve and no more than 10 percent passing No. 200 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 sieve, maximum; ASTM D 4751.
 2. Permittivity: 0.5 per second, minimum; ASTM D 4491.

2.6 PAVING CLEANER

- A. Paving Cleaner: Comply with CalStar Technical Note on "Cleaning Fly Ash Pavers".
 1. Detergent type cleaner selected for each type of paver used and recommended in writing by paver manufacturer.
 2. Muriatic acid cleaners are not acceptable.

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 unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet 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.
- C. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, 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 and a maximum of 1/8 inch, 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 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 14 00

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 013300 – Submittal Procedures 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 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

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 672, RAISED PAVEMENT MARKERS.

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

32 80 00 – IRRIGATION

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 SCOPE OF WORK

- A. Provide shop drawings 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.

1.3 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 3, Concrete.
- E. Division 26, Electrical

1.4 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. 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.

1.5 SUBMITTALS

- A. Submit shop drawings to Landscape Architect for review and approval prior to installation of system. Shop drawings are to indicate verification of available psi and gpm for irrigation system use as well as indicate final location of controller(s), backflow preventer(s), rain sensor and meter(s). Any required modifications to the issued design drawings shall be clouded on the shop drawings. The clouded portions of work are to be noted as to what is being sealed and signed by the issuer of the shop drawings. The shop drawings shall be issued by a Texas Certified Irrigator. Shop drawings shall be used during construction in accordance with the most current rules and regulations issued by the Texas Commission on Environmental Quality (TCEQ). TCEQ governs and regulate the work of all Texas Certified Irrigators. Installation of the irrigation system shall not proceed until the Shop Drawings and other submittal items have been reviewed and approved by the Landscape Architect.
- B. Shop drawings shall confirm coverage for proposed layout; confirm existing irrigation system is operational and provides adequate coverage for existing landscaping. Modifications for existing system may require Change Order approval as a hidden condition. Modifications to the existing system must be included on the Shop Drawings. Proceeding with providing Shop Drawings without review of the existing system indicates Contractor's acceptance of the existing system and conditions.
- C. Show manufacturer's name and catalog number for each item of the proposed system (does not include the existing system information). 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.

- D. 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.
- E. Submit maintenance instructions on all items requiring manufacturer's standard detail submittal.

1.6 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.

1.7 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.

1.8 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 hours' 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.

1.9 ONE YEAR MAINTENANCE

- A. Refer to Section 32 01 90, Operation and Maintenance of Planting for start of maintenance period.
- B. 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.
- C. 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.
- D. Contractor will closely monitor the irrigation system throughout the 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.
- E. 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.
 - F. 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.
 - G. 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.
 - H. The Contractor shall service the system at the Owner's request during the guarantee period.
 - I. 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.
 - J. 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.
 - K. 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

2.1 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.

2.2 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, Netafim Flow Kit (or pre-approved equal) as noted on the 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.

2.3 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. Provide a covered lockable box for the PVB as manufactured by V.I.T. Products, Inc., San Diego, CA. 1-800-729-1312 or equal. Contractor to install backflow preventer and box in accordance with manufacturer's instructions.

2.4 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.
5. Drip irrigation shall be Netafim Techline or approved equal, model number as shown on the drawings.

2.5 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 Rainbird 1402 or equal on 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.

2.6 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.

2.7 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.

2.8 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.
- B. Coordinate location of Automatic Controller with Architect and Landscape Architect prior to installation.

2.9 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 Solar Sync 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 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

3.1 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.

3.2 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.

3.3 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 31 23 00 – Grading Excavation and Fill.
- 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.

3.4 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.

3.5 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.

3.6 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 locations(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 furthest 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.

3.7 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.

3.8 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.

3.9 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 32 80 00

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. Soil amendments and mulch over existing planting and lawn areas.
 - 2. Soil preparation and planting backfill, for Contractor provided planting and sod areas.
 - 3. Plants and planting operations including trees, groundcover and associated plant materials.
 - 4. Decomposed crushed granite for walkways.
 - 5. Protection and maintenance of existing plant materials during construction operations.
- B. Related Work Specified Elsewhere:
 - 1. Division 31, Earthwork
 - 2. 32 92 13, Hydro–Mulching
 - 3. 32 91 19, Landscape Grading
 - 4. 32 01 90, Operations and Maintenance of Planting
 - 5. 32 80 00, Irrigation

1.3 SUBMITTALS

- A. Submittals required for the Contractor to provide 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. Purchase Orders of plant materials must be presented at time of installation to

Landscape Architect prior to installation of materials.

4. 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.
5. PDF copies of photographs of representative sample of each plant material type to be provided for the project are to be submitted for review prior to ordering materials. Each photograph is to be labeled to identify the material and its source nursery. Review and approval of photographs does not preclude rejection of materials once arrived at site if found to not meet specifications. Plant materials will not be accepted on site without this initial photograph submittal.
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 once delivered to the site and work by Owner's representative must be received ten (10) days prior to the anticipated review.
- B. Review: All materials shall be reviewed and approved by the Owner's representative by photograph labeled indicating species, size, form and representation of the quality of the above ground growth. 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. On site rejected materials shall be immediately removed from the site. For the site review of plant materials:
 - 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. Plants are also subject to inspection by the Owner's representative upon delivery and during the progress of work.
- D. Owner's representative shall review the work after planting operations are complete for establishing the maintenance period covered under this contract.
- E. Owner's representative shall review the work for final acceptance.
- F. 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.
 - a) 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 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 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 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.
 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.

1.7 IN THE EVENT OF A DROUGHT

- A. In the event that the City of Houston is experiencing a drought and watering restrictions have been set in place by the City of Houston, the Contractor shall NOT proceed with providing and/or installing plant materials including trees, shrubs, groundcover and sod without FIRST contacting the Architect to request additional information on how to proceed. Proceeding without first obtaining direction from the Architect indicates that the Contractor assumes all liability and responsibility for the plant materials installed and replacement of dead materials due to lack of watering will be the sole responsibility of the Contractor.

1.8 ONE YEAR MAINTENANCE

- A. Maintenance covered under this contract shall begin immediately after each plant is

planted and shall be continue to be maintained for 360 calendar days after Substantial Completion for the landscaping and irrigation system is determined and plants are accepted in vigorous thriving condition. Contractor's work will be accepted only when it is in a fully completed, in undamaged condition with ALL of the Architect's and Consultants' final review punch list items completed. Until such time the Contractor will not be considered to have begun the 360 days of maintenance and the Contractor shall have full responsibility and ownership of all materials, workmanship and maintenance related to the Work.

- B. 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 including but not limited to:
 - 1. Water all planting as necessary; quantity applied at any one time shall be sufficient to penetrate the soil to a minimum depth of three inches.
 - 2. 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 and maintenance schedule.

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 sod and plant materials, 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. Tree Source Wholesale Nursery, 6220 Elm Street, Tel. no. 713-667-5700.
 - 2. Newton Nurseries, Inc., 1261 Brittmore Rd., Tel. no. 713-365-9917.
 - 3. Magnolia Gardens Nursery, 1980 Bowler Road, Waller, TX, Tel. no. 800-931-9555.
 - 4. Murff Turf Farm, Inc., 15204 Bohemian Hall Rd., Tel. no. 281-328-2812.
 - 5. Montellaro's Nursery, Tel. no. 210-655-2192.
 - 6. Native Texas Nursery, Tel. no. 877-962-8483.
 - 7. Treeseach Farms, Tel. no. 713-937-9811.

- 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. GC shall provide a recommendation for the specified material in either the same size, but different similar material, or the same material but in the next smaller size with a credit proposed for the smaller material. Recommendation will be reviewed and GC shall proceed upon written approval from the Landscape Architect. Materials may be requested to be provided in the specified size in a B&B or Box condition only upon Landscape Architect approval.
- D. 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, 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.

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. Submit a one-quart sample indicating source in writing on label for approval.
 2. Existing soil: Existing soil shall be tested and modified 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 Albrecht Soil Test and provide results and recommendations to correct imbalances 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 – 8.0. 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 and Root Stimulant: All commercial fertilizer and root stimulant shall be organic and conform to all state fertilizer laws, delivered in original, unopened containers, each bearing the manufacturer's guaranteed analysis. Materials are available from but not limited to San Jacinto Environmental Supplies, Tel.no. 713-957-0909. Use the following fertilizers in the different areas noted below:
1. Tree installations:
 - a) 4 oz. of Rhizanova Tree Transplant material blended with 32 oz of MicroLife Ultimate 8-4-6 Plant Fertilizer for each tree.

2. Groundcover Areas:
 - a) MicroLife 6–2–4 Plant Fertilizer applied at 40 lbs. per 1,000sf.
 3. Existing Sod Areas – NO FERTILIZER FOR HYDRO–MULCHED AREAS:
 - a) Granular Humates Plus Soil Amendment to be applied at a rate of 10lbs per 1,000sf.
 - b) MicroLife 6–2–4 Plant Fertilizer to be applied at a rate of 20 lbs. per 1,000sf.
 4. Plant stimulant for All provided sod, hydro–mulch areas, trees and shrub planting areas – including on–site transplanted materials: Water all plants in well with Super Seaweed Biostimulate and thoroughly drench root mass at time of installation of plants and sod.
 5. Compost tea for all landscape planting bed areas must be made after the hydro–mulch and planting beds are installed, a maximum of three (3) days after a rain event in order to be most effective. It is recommended that spraying be provided by Bill Wyatt with Grace Outdoor, tel. no. 281–543–9814. Other installers may be available if they are submitted by the Contractor for approval prior to their acceptance.
- D. Plant Pit Backfill Mix:
1. For trees and shrub planting beds:
 - a) Nature’s Way Resources blended compost/top soil/washed sand mix (called Landscaper Mix) or pre–approved equal. Nature’s Way telephone number is 1–936–321–6990.
 - b) Granular Humates Plus Soil Amendment applied 10lbs per 1,000sf. Granular Humates Plus is available from but not limited to San Jacinto Environmental Supplies, Tel.no. 713–957–0909.
- E. Existing Plant Material Soil Amendments and Fertilizer are to be applied as follows:
1. For Existing shrub planting beds:
 - a) Provide Granular Humates Plus Soil Amendment applied at a rate of 10lbs per 1,000sf. Granular Humates Plus is available from but not limited to San Jacinto Environmental Supplies, Tel.no. 713–957–0909.
 2. For Existing lawn areas: Provide Microlife 6–2–4 at 20 lbs. per 1,000sf and Humates Plus at a rate of 10 lbs. per 1,000sf.
- F. Weed Control: Provide Organic Post– emergent Herbicide during Preparations of all planting beds, tree wells and sod areas: Use Black Jack 21 or pre–approved equal to remove existing weeds prior to preparing planting beds and tree wells. 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.

1. Black Jack 21 is available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713-957-0909
- G. Disease and Insect Control: Organic Insecticides and Pesticides are 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.
1. 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.
- H. Water: Water for all necessary operations of the contractor at the site will be furnished by the Owner except for the hydro-mulch area indicated on Drawings that is to be hand watered. For all areas except for the noted hydro-mulch area, the contractor shall provide the facilities needed to make connections and convey the water to the places where it will be needed.
- I. Mulch for general planting shall be Native Double Shredded Cedar Mulch: A 2" coverage depth is to be applied on all planting beds and tree rings. DO NOT MOUND THE MULCH IN THE TREE RING AND DO NOT APPLY MULCH AT THE BASE OF THE TREE TRUNKS. Mulch shall not cover tree root flairs or leaves and branches of shrubs. 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.
- J. 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.
- K. 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. Sharp sand may be used in backfill operations for decomposed granite pathways and at edging locations for Tempark, but NOT in planting bed backfill mix.
- L. Edging:
1. At Decomposed Granite (DG) Pathway edge locations where abutts sod:
 - a) Permaloc Asphaltedge Aluminum Restraint 4"x3" Black Duraflex Electrostatically applied baked on paint by Permaloc Corporation or pre-approved equal. Install according to detail shown on Drawings and

Manufacturer installation instructions.

- b) Permaloc is available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713-957-0909
- M. 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. 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. Provide tree staples for transplanted trees. Field verify the caliper sizes of the trees to ensure appropriate tree staples are provided for transplanted trees. Tree Staple, Inc. telephone number is 1-877-TREES-49. Submit manufacturer installation instructions for approval prior to ordering.
- 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. Decomposed Granite at tree areas and pathways:
- 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 Brimstone (pinkish red), Contractor to submit sample for AE approval before ordering.
 - 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.

2.4 SOD

- A. For all areas noted for receiving sod and to repair areas affected by construction activities where sod or specific areas of 'HM' are not indicated, provide: Celebration Bermuda Sod. See below for requirements.
- B. Provide strongly rooted sod, not less than two years old with a heavy top and strong well-knit root system. Free of weeds and undesirable native grasses. Sod shall have been grown in a sod nursery certified by the Department of Agriculture on topsoil.
 - 1. Provide Premium Grade sod composed of 100% Celebration Bermuda, free of

- noxious weeds, undesirable grasses, stones, roots, thatch and extraneous material, having uniform color and leaf texture.
2. Sod shall be machine cut in 24 inch x 16 inch pieces with a full 3/4 inch of heavy clay soil covering the roots excluding top growth and thatch or rolled sod in uniform lengths and widths.
 3. Provide only sod capable of vigorous growth and development when planted (viable, not dormant). Broken pads or pads with uneven ends will not be accepted. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected.
- C. Fall and Winter Application for Bermuda Sod areas: Provide 'BWI Five Star Dwarf Fescue Seed' at manufacturer's recommended application rate. For areas that ARE NOT BERMUDA: Add Cereal Rye Grain at a 40lbs / acre application rate. Both types of Fall and Winter applications are in addition to the sod installation. DO NOT use cereal rye in areas of Bermuda.
- D. Sod Maintenance under this contract: Refer to Section 32 01 90, Operations and Maintenance of Planting. Sod Maintenance includes mowing, weeding, watering and fertilizing of entire campus – both existing and Contractor provided areas.
1. Contractor provided sod areas: Mow within 7 – 10 days of installation. Bag clippings for the first few mowing to remove debris and encourage new top growth. If installation is during warm months, mow once a week, maintaining a 2.5" mow height only within the first 6 months and 3.5" thereafter. If installation is within winter months, mow one time every 6 weeks, maintaining a 3" mow height within the first 6 months and 3.5" thereafter. Once established maintain Palmetto at 3.5"; Never cut more than 1/3 of the total length of the blade at any one mowing.
 2. Existing sod areas: Mow in accordance with the schedule provided in Section 32 01 90. Maintain Palmetto at 3.5"; Never cut more than 1/3 of the total length of the blade at any one mowing. Do not bag clippings.
- E. Sod Guarantees:
1. For Contractor provided sod areas: The contractor shall guarantee growth and coverage of Contractor provided sod under this section to the effect that a minimum 95% of the areas planted will be covered with specified planting after sixty (60) days with no bare spots greater than six (6) square inches.
 2. For existing lawn areas: Contractor shall provide maintenance during construction and for the one year maintenance period. Refer to Section 32 01 90 for requirements and guarantees.

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.
 - 2. It is required that commencement of planting operations be started only when irrigation system is completely functioning (automatically or manually).

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, shrubs, groundcover and lawn areas designated to remain on project site.
- B. Contractor shall provide maintenance during construction for existing lawn areas and plant materials. Refer to Section 32 01 90 for maintenance requirements.

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.

3.4 LAYOUT AND EXCAVATION OF TREES AND PLANTING BED AREAS

- A. Layout trees and planting beds in locations shown on drawings. Use wire stakes color-coded for each species of plant material. Stake location of each tree and outline of shrub beds prior to excavation for planting is begun. Notify Architect 3 business days in advance of date for desired review to obtain approval of tree locations and planting bed layouts. **Do not proceed without obtaining written approval of locations and bed layouts. Proceeding without obtaining the required approval will likely result in requirements to relocate plants and trees; project delays resulting from requirements to relocate materials will be at the Contractor's expense.**
- 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.

3.5 SOIL PREPARATION OF PLANTING AREAS AND TREE PITS

- A. Spray the planting bed areas and tree pits with BlackJack 21 weed killer to eliminate any

established and/or encroaching grasses or weeds. Follow label instructions. **Allow two weeks for complete results.**

- B. Spray for Fire Ants or detrimental insects with ONLY organic pesticides/insecticides ONLY if necessary. NOTIFY OWNER prior to proceeding with any applications in order to obtain approval for additional costs. Proceeding without obtaining approval in advance indicates that the Contractor is paying for these materials at NO ADDITIONAL COST TO OWNER.
- C. Remove rocks, roots and debris and confirm weeds are dead and removed prior to proceeding with planting bed and tree installation.

3.6 EXCAVATION

- A. Contact utility companies for locations of lines prior to start of excavation.
- B. Do not excavate tree pits more than 24 hours in advance of planting operations.
- C. Test drainage of plant beds and tree pits by filling with water twice in succession. Conditions permitting the retention of water for more than 24 hours shall be brought to the attention of the Owner's representative.
- D. 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 depth of not less than 12" below the required pit or bed depth or for cost to provide under drains that shall connect to nearest storm drain.

3.7 PLANT MATERIALS HANDLING FOR PLANTING

- A. Canned stock shall be removed carefully after cans have cut on two sides with approved cutter. Do not use spade to cut cans. Do not lift or handle container plants by tops, stems or trunk at any time.
 - 1. Do not bind or handle any plant with wire or rope at any time so as damage bark or break branches. Lift and handle plants only from bottom of ball.

3.8 PLANTING BED AND TREE PIT BACKFILL INSTALLATION

- A. Provide a 3" – 4" layer of well-rotted compost over the bed area and incorporate into the beds. Add a one to two inch layer of green sand to help loosen soil and promote good drainage.
- B. 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.

- C. Rototill planting backfill mix all together to a depth of 8 to 12 inches below original grade until all particles are golf ball size or smaller.
- D. Fill all shrub beds and tree pits with plant bed mix to finished grade (compacted) plus two inches.
- E. 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.
- F. Top of shrub rootballs shall be a maximum of two inches above finished grade and a minimum of 1 inch above finished grade. NO PLANT ROOT BALLS SHALL BE LOCATED AT GRADE OR BELOW GRADE.
- G. Smooth planting areas to conform to specified grade after full settlement has occurred. Contractor shall bear final responsibility for proper drainage of planted areas.
- H. Mulch all shrub beds with specified mulch, two inches in depth for top dressing. . Do not cover leaves or branches of shrubs. Do not cover tree root flares where trees are located within planting bed areas.
- I. Water all plants immediately after planting. Spray with compost tea after planting installation is complete.

3.9 SETTING AND STAKING OF TREES

- A. Gradually straighten the tree as the backfill is added.
- B. Slice a shovel or spade around the backfill to settle the soil and remove air pockets. Break up heavy clay sods. Do not step firmly on the backfill which may cause excessive compaction.
- C. Trees shall be set plumb and braced in position with Tree Staples. Tree Staples shall be installed (3) per tree and in accordance with the Installation Specifications as provided by the manufacturer.
- D. The Contractor shall be responsible for materials remaining plumb and straight for all given conditions through the guarantee period.

3.10 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.
- 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.

- 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.

3.11 SOD INSTALLATION

- A. Prior to planting, the designated areas shall be prepared a minimum of one week prior to the scheduled date for installation of the sod. Preparation shall include:
1. Prior to installation of St. Augustine Palmetto, the surface shall be cleared, to a depth of 4 inches (100 mm), of all trash, debris, stones larger than 1.0 inches (25mm) in diameter, and of all roots, brush, wire, grade stakes and other objects that would interfere with planting or maintenance operations.
 2. Spray the planting areas with BlackJack 21 weed killer to eliminate any established and/or encroaching grasses or weeds. Follow label instructions. **Allow two weeks for complete results.**
 3. Soil amendments and fertilizer shall be uniformly incorporated into the top 4 inches (100 mm) of soil in accordance with manufacturer installation instructions.
 4. Any undulations or irregularities in the surface, shall be smoothed prior to sod installation. Flooded, washed out areas, damaged or otherwise, shall be reconstructed and all grades re-established by the grading contractor in accordance with the drawings and/or other applicable specifications. Refer to Specification Section 32 91 19, Landscape Grading for final grading of new topsoil to meet elevations shown on Drawings.
 5. Moisten areas before planting to depth of 1 inch but do not create a muddy soil condition. Water thoroughly upon installation, ensuring that both the Palmetto is wet and the soil is moist to a depth of 3".
- B. All sod shall be laid in place within 24 hours of delivery to site. No St. Augustine Palmetto shall be placed on soil which has been chemically treated until sufficient time has elapsed to permit dissipation of all harmful materials (see manufacturers recommendations for re-entry date calculation). The general contractor shall assume full responsibility for any loss or damage to St. Augustine Palmetto arising from improper use of chemicals or due to his failure to allow sufficient time to permit dissipation of chemical residues, whether or not such materials are specified herein.
- C. The first row of St. Augustine Palmetto shall be laid in a straight line, with subsequent

rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to insure that the pieces are not stretched or overlapped and that all joints are butted tightly to prevent voids that would cause air drying of the roots.

- D. Roll smooth, rolling once in each direction to eliminate undulations and unevenness.
- E. Water sod thoroughly after planting.
- F. Acceptance: Acceptance shall be given by the architect upon satisfactory completion of each section or area(s) as indicated on the drawings.
- G. Resod areas that do not take.

3.12 PRUNING OF PLANT MATERIALS

- A. Pruning containerized plants shall be done at the nurseries supplying the material, prior to shipping to the site and only after obtaining Landscape Architect's written approval for proceeding with pruning procedures.
- B. Pruning of trees once delivered to the site 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 (Prepared over Subgrade) 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 or edging in lieu of forms, the full depth of decomposed granite area, and secure in place to hold firmly and grade as required.
 - 3. Base Course: Construct a crushed 1/4" to 1/2" limestone base course (available from but not limited to Natural Earth Products Company, tel. no. 281-568-0800) layer to a depth of 2 inches (compacted). Do not haul over completed or partially completed work when subgrade is soft or there is tendency for Base Course to work down into existing subgrade.
 - 4. Compact Base Course with aid of water. Provide sufficient moisture to prevent segregation into pockets of fine and coarse material.
 - 5. Cover Base Course with Soil Separator Fabric.
- B. Decomposed Granite (DG):

1. Place the DG on the soil separator fabric.
2. Place DG in one layer of 3 inches thickness and rake smooth using a steel tine rake to desired grade and cross section. DO NOT APPLY DG DEEPER THAN 3 INCHES.
3. Water to achieve full depth moisture penetration. Watering is best accomplished using a garden hose with spray nozzle set to a coarse spray; pressure should not disturb leveled surface.
4. While DG is still moist, roll with a heavy lawn roller (minimum 225 pounds and maximum 30–inch width), to achieve 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.
5. 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.
6. 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 PLANT MATERIAL REVIEWS AND ACCEPTANCE

- A. Clean-up: Clean up all areas as required for complete and acceptable inspection. All areas of project must be free of any debris from the planting operations.
- B. As planting operations are underway; all ropes, wires, empty containers, rocks, clods and all other debris shall be removed daily and the project site shall be kept neat at all times.
- C. Reviews: Contractor shall notify the Landscape Architect by written request for review of planting operations. This request shall be made to the Landscape Architect at least three business days prior to the anticipated review date.
- D. Contractor shall receive written acceptance from the Landscape Architect in order to establish the start of the 360 calendar maintenance period.

END OF SECTION 32 90 00

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 AND compacted base material.
 - 3. Subgrade preparations and spreading of topsoil.
 - 4. Finished grading for planting beds and for edges of decomposed granite pathways where Permaloc Asphalt Edging is being provided.
 - 5. Prevention of excessive weed growth in lawns.
- B. Related Work Specified Elsewhere:
 - 1. Division 31, Earthwork
 - 2. 32 90 00, Planting
 - 3. 32 92 13, Hydro–Mulching

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, shrubs, groundcover beds, and below decomposed granite pathway edges where Permaloc Asphalt Edging is being provided.
- 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, sods, 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. Sharp sand is NOT to be used as backfill for planting bed or tree installation locations.

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. For Compacted Base locations required to be provided below edging material (at decomposed granite pathways edge locations) comply with the general notes for DG installation provided on the drawings.
- D. On all sod 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 sod, 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 sod upon the completed and acceptable finished grade.

END OF SECTION 32 91 19

32 92 13 – HYDRO–MULCHING

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.
- B. Related Work Specified Elsewhere:
 - 1. Division 31, Earthwork Section
 - 2. 32 90 00, Planting
 - 3. Section 32 01 90, Operation and Maintenance of Planting

1.2 DESCRIPTION

- A. This section specifies the requirements for preparing ground and providing seed, topsoil, erosion control and water.

1.3 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.

1.4 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.

1.5 MAINTENANCE AND GUARANTEES

- A. Refer to Sections 32 90 00 Planting and 32 01 90 Operation and Maintenance of Planting for information for lawn area maintenance and guarantee requirements.

1.6 GUARANTEE

- 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

2.1 QUANTITIES

- A. The Contractor shall supply materials in the quantities necessary to complete the Work as shown on the drawings. Quantities of hydro-mulch areas, as indicated on plans and in the plant list are approximate only. These materials shall be provided in quantities sufficient to properly hydro-mulch 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

2.2 SEED TYPE

- A. "HM": Provide blend of the Lady Bird Legacy Mix and Native Sun Turfgrass. Provide Mix at supplier recommended rates.
- B. "NS": Provide Native Sun Turfgrass. Provide at supplier recommended rates.
- C. Fall and Winter Application ONLY: Add Cereal Rye Grain at a 40lbs / acre application in addition to seed mixes.
- D. 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.

2.3 TOPSOIL

- A. Top dressing areas to receive hydro mulching shall be 2" topsoil. Refer to Specification 32 90 00 for Topsoil information.

2.4 COMPOST TEA

- A. Provide Spraying of Compost tea for all hydro-mulch areas. Compost tea may be blended in with the hydro-mulch with the approval of the Compost tea supplier and

Hydro-mulch installer. Spraying must be made a maximum of three (3) days after a rain event in order to be most effective. It is recommended that spraying be provided by Bill Wyatt with Grace Outdoor, tel. no. 281-543-9814. Other installers may be available if they are submitted by the Contractor for approval prior to their acceptance.

2.5 FERTILIZER

- A. NOT REQUIRED.

2.6 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.

2.7 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 and Black Jack 21 are available from but not limited to: San Jacinto Environmental Supplies, 2221 West 34th St., Tel.no. 713-957-0909.

2.8 WOOD CELLULOSE FIBER MULCH

- A. 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.

2.9 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.

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. Seeding shall not start until all preparatory work has been completed.
 - 1. The Contractor shall notify the Owner's representative of any discrepancies between the plans and actual site condition.

3.2 TIME OF HYDRO-MULCHING

- A. Lawn 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.
- 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 65 degrees or anticipated to be below 65 degrees during establishment period.

3.3 PREPARATION

- A. Preparation work shall be completed one month in advance of hydro-mulching operations.
- B. Treat miscellaneous weeds prior to stripping with organic Black Jack 21 herbicide for

all areas to receive seed. Strip vegetation. 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.

- C. 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.
- D. Contractor shall be responsible for coordinating installation procedures with seed supplier and hydro–mulch installer to ensure proper seed germination. Any conflicts with specified preparation procedures and the seed supplier and/or hydro–mulch installer shall be brought to the attention of the Landscape Architect PRIOR TO PROCEEDING with installation.

3.4 APPLICATION

- A. Seed shall be uniformly distributed over the designated area at the rate specified.
- B. Mechanical equipment shall be used.
- 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 the Owner.

3.5 WATERING

- A. Comply with watering schedule guidelines provided on Drawings. Do not allow puddles to form or run off. If these conditions occur shut the water off. Water newly planted seeds lightly and frequently to prevent the top of the soil from drying out. When the grass is about an inch tall, decrease the frequency and increase the depth of watering. Reduce and possibly stop adding water once the grass is established depending upon the frequency of natural rain.

3.6 MAINTENANCE

- A. Contractor shall correctly maintain the hydro-mulched work throughout the installation process.
- B. Refer to Section 32 01 90, Operation and Maintenance of Planting for maintenance period information and requirements.

END OF SECTION 32 92 13

32 94 43 – TREE GRATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Tree grates as shown on drawings and as specified herein.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.
- B. Shop Drawings: Submit manufacturer's shop drawings, indicating overall dimensions.
- C. Samples: Submit manufacturer's samples of materials, finishes, and colors.
- D. Warranty: Manufacturer's standard warranty.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 15 years tree grate manufacturing experience
- B. Installer qualifications: 2 years minimum experience installing tree grates and support frames

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store product in manufacturer's packaging until ready to install

1.5 WARRANTY

- A. Tree grates and frames shall be warranted by the Manufacture against defects in materials and workmanship for a minimum of five (5) years.

PART 2 - PRODUCTS

2.1 TREE GRATES AND FRAMES:

- A. Manufacturer: Tree grates shall be supplied by Urban Accessories, <http://www.urbanaccessories.com>; (p) 877-487-0488.
- B. Tree grates shall be: KIVA, 4' square.

- C. Tree grates material shall be Cast Aluminum per ASTM B26. All tree grate castings shall be manufactured true to pattern and component parts, and shall fit together in a satisfactory manner. The castings shall be of uniform pattern and quality, free from blowholes, hard spots, shrinkage, distortion or other defects. Castings shall be cleaned by shot blasting.
- D. Finish: Grates are to be finished with a color and finish to be selected by Architect from manufacturer's full range.
- E. Matching steel angle frames provided by tree grate manufacturer model 6001F shall be provided with installation detail(s) per plans
 - 1. Frames to be supplied galvanized
- F. Pilfer proof Screws: provide pilfer proof screws per manufacturer's standard

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until site is properly prepared
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions

3.3 INSTALLATION

- A. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.
- B. Install grates and frames where indicated on plans flush and leveled with surrounding decking surface.
- C. Install steel angle frame
 - 1. Flush and leveled with surrounding decking surface, maintain flush and leveled at all times. Frames MUST NOT slope in more than one direction.
 - 2. Install frames per details on plans and manufacturer's recommendations.

- D. Clean concrete and debris from frame prior to tree grate installation.
- E. If needed, grind pads on underside of tree grates to level and prevent rocking in frame

3.4 PILFER PROOF BOLTING

- A. Position tree grates to meet in the center of tree well and have uniform spacing around outside edges of castings. Drill through counter bored holes in the grates and install pilfer proof bolts per manufacturer's instructions.
- B. Use 1" thick wood or foam block out under the frame to allow pilfer proof screw to extend below angle.

3.5 CLEAN-UP AND PROTECTION

- A. Protect installed product until completion of project
- B. Touch up, repair or replace damaged products

END OF SECTION 32 94 13

DIVISION 33 – UTILITIES

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.
- n) D 2447: Specifications for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.
- o) D 2466: Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- p) D 2467: Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- q) D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- r) D 2665: Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
- s) D 2729: Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- t) D 2855: Making Solvent–Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- u) D 3035: Specifications for Polyethylene (PE) Plastic Pipe (SDR–PR) Based on Controlled Outside Diameter.
- v) D 3212: Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- w) D 3261: Specification for Butt Heat Fusion of Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- x) D 3350: Specification for Polyethylene Plastics Pipe and Fittings Material.
- y) F 402: Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.
- z) F 405: Specification for Corrugated Polyethylene (PE) Tubing and Fittings.
- aa) F 412: Standard Terminology Relating to Plastic Piping Systems.
- ab) F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- ac) F 656: Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Pipes and Fittings.
- ad) F 714: Specification for Polyethylene (PE) Plastic Pipe (SDR–PR) Based on Outside Diameter.
- ae) F 913: Standard Specification for Thermoplastic Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

- af) 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, Street Paving and Traffic-latest edition.
- 5. Harris County Flood Control District (HCFCD)
 - a) Standard Specifications
 - b) Policy Criteria and Procedure Manual

1.3 SUBMITTALS

- A. In accordance with Section 013300 – Submittal Procedures 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
 - 1. 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

1. 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

1. As specified in Section 032100 – Concrete Reinforcement of these Specifications.

D. Cast-in-Place Concrete (Class 3000)

1. 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

1. 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 |

2. 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 |

3. Color test per ASTM C 40, color not darker than standard color.

B. Cement

1. ASTM C 150, Type I or II.

C. Water

1. Potable, from municipal supplies approved by the State or City Health Department.

D. Mixture

1. 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 City of Houston Standard Construction Specifications Section 02260 Trench Safety System.
- 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

**INSIDE
BACK COVER**

