

9/11/2026

PROJECT MANUAL

Texas Workforce Commission CCRC Parking Lot Resurfacing

4800 N. Lamar Blvd.
Austin, TX 78756
TWC RFP: 3202600121

September 11, 2025

ELEMENTS PROJECT NO. 24-1039.00

OWNER

TEXAS WORKFORCE COMMISSION
101 East 15th Street
Austin, Texas 78778
512.463.7486

ARCHITECT

ELEMENTS OF ARCHITECTURE, INC.
1201 6th Avenue, Suite 100
Fort Worth, TX 76104
P 817.333.2880

CIVIL

GATEWAY ENGINEERING, INC.
6017 Reef Point Ln. #105
Fort Worth, TX 76135
866.936.8302

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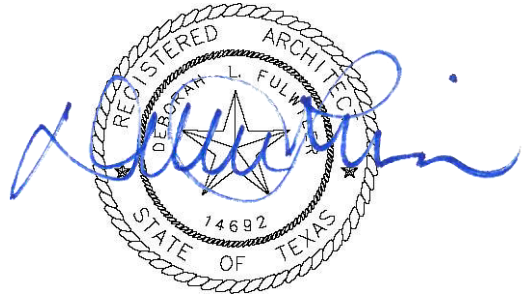
PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

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SECTION 01 1000

SUMMARY

PART 1 - GENERAL

1.01 PROJECT

- A. Project Name: Texas Workforce Commission – CCRC Parking Resurfacing
- B. Owner's Name: Texas Workforce Commission, Procurement and HUB Services
101 East 15th Street, Room 316T
Austin, Texas 78778-001
- C. Architect's Name: Elements of Architecture, Inc.
1201 6th Avenue, Suite 100
Fort Worth, Texas 76104

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on the total bid price plus the allowance if any as noted in the TWC solicitation.

1.03 DESCRIPTION OF WORK

- A. Scope of work to include the repaving and restriping of the parking lot areas at the TWC Criss Cole Rehabilitation Center in Austin, TX in three separate phases.

1.04 COMPLIANCE WITH ACCESSIBILITY STANDARDS

- A. The renovations shall be fully accessible to the disabled and handicapped in compliance with the State and Federal accessibility standards.
 - 1. The Elimination of Architectural Barriers, Texas Department of Licensing and Regulation.
 - 2. The American with Disabilities Act, U.S. Department of Transportation.

1.05 OWNER OCCUPANCY

- A. Texas Workforce Commission intends to continue to occupy all portions of the existing building during the entire construction period.
- B. All work shall be limited normal business hours (7:00am-5:00pm) unless previous arrangements are made with the Architect and with the Texas Workforce Commission.
- C. Texas Workforce Commission intends to occupy the Project upon Substantial Completion.
- D. Cooperate with Texas Workforce Commission to minimize conflict and to facilitate Texas Workforce Commission's operations.
- E. Schedule the Work to accommodate Texas Workforce Commission occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: The contractor shall confine his operations and personnel to the area within the limits of construction as shown on the drawings and the direct route from the construction area to the exterior or the designated staging area.
- B. The contractor shall be allowed to use the Owner's restroom facilities.
- C. Staging: Texas Workforce Commission may designate an area for staging of the contractor's material and equipment. The same staging area may be utilized by other contractors on the project. Contractors are to coordinate the storage of their materials and equipment with each other and cooperate in the use of the staging area. The shall confine their staging and storage to the area designed by Texas Workforce Commission. The staging area shall be kept clean and orderly at all times.
- D. Arrange use of site and premises to allow:
 - 1. Texas Workforce Commission occupancy.
 - 2. Work by other contractors.
 - 3. Work by Texas Workforce Commission.
- E. Provide access to and from site as required by law and by Texas Workforce Commission:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- F. Existing building spaces may not be used for storage unless owner allows otherwise.
- G. Time Restrictions:
1. All work shall be limited to between 7AM and 5PM.
- H. Utility Outages and Shutdown:
1. Limit disruption of utility services to hours the building is unoccupied.
 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Texas Workforce Commission and authorities having jurisdiction.
 3. Limit shutdown of utility services to 10 hours at a time, arranged at least 24 hours in advance with Texas Workforce Commission.
 4. Prevent accidental disruption of utility services to other facilities.
 5. At the end of the construction project, the contractor shall leave the building and grounds in the same condition as before the work began.

1.07 WORK SEQUENCE

- A. Contractor will establish work sequence for Texas Workforce Commission's approval. Work sequence shall provide for full occupancy during normal work hours such that building systems are operational and do not disrupt business operations.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Describes the form for the Contractor's Schedule of Values.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Contract Documents defined in Division 0
- B. Section 01 2100 – Allowances: Payment procedures related to allowances.
- C. Section 01 3000 – Administrative Requirements related to progress schedule.
- D. Section 01 7000 – Execution and Closeout Requirements related to close out procedures.

1.03 SCHEDULE OF VALUES

- A. Forms filled out by hand will not be accepted.
- B. Submit a printed schedule on AIA Form G703 – Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- C. Submit Schedule of Values in duplicate within 7 days after date of Notice to Proceed.
- D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Once each calendar month based on the work performed the prior calendar month.
- B. Forms filled out by hand will not be accepted.
- C. Present required information in typewritten form.
- D. Form: AIA G702 Application and Certificate for Payment and AIA G703 Continuation Sheet, including continuation sheets when required.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- I. Submit three copies of each Application for Payment to Architect.

- J. Each Application for Payment shall be accompanied by an Invoice on Company Letterhead, and Affidavit of Bills Paid (except the first application) and a Texas Workforce Commission HUB Progress Assessment Report.
- K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- L. Each Application for Payment shall be accompanied with the construction progress schedule, revised and current.
- M. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

- A. Refer to solicitation for instructions on changes to the contract.
- B. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.
- C. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- D. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 7000.
 - 2. All items noted on the Final In section Report have been completed to the satisfaction of Texas Workforce Commission and the Architect.
 - 3. Submittal of Certificate of Substantial Completion, AIA Document G704
 - 4. Submittal of Contractor's Affidavit of Payment of Debts and Claims, AIA Document G706
 - 5. Submittal of Affidavit of Release of Liens, AIA Document G707
 - 6. Submittal of final HUB Progress Report
 - 7. Submittal of all warrantied/guaranties as required by other sections
 - 8. Submittal of Consent of Surety to Final Payment
 - 9. Operations and Maintenance manuals for all equipment as required by other sections
 - 10. Execution and submittal of Texas Workforce Commission's Statement of Non-Inclusion of Asbestos Containing Materials (ACM)
 - 11. Submittal of rebates as defined within each section as applicable for the project. If undefined, provide documentation of applicable rebates that Texas Workforce Commission may qualify for.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

**SECTION 01 2100
ALLOWANCES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Contingency allowance.
- B. Related Sections
 - 1. Section 01 2000 – Price and Payment Procedures.

1.02 CONTINGENCY ALLOWANCE

- A. A Contingency Allowance as noted and defined within the TWC solicitation shall be included in the bid price for the use by Texas Workforce Commission at their discretion for items, labor or assemblies that they may want to incorporate into the project.
- B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.
- C. Funds will be drawn from Contingency Allowance only by Change Order and at the direction of Texas Workforce Commission.
- D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Texas Workforce Commission by Change Order.

1.03 ALLOWANCE SCHEDULE

- A. Contingency Allowance: Include the stipulated sum/price of as noted in the solicitation for use upon Owner's instructions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Construction progress schedule.
- D. Submittals for review, information, and project closeout.
- E. Number of copies of submittals
- F. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Stages of the Work.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Project Manager as designated by Texas Workforce Commission.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for interpretation.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Manufacturer's instructions and field reports.
 - 6. Applications for payment and change order requests.
 - 7. Progress schedules.
 - 8. Coordination drawings.
 - 9. Closeout submittals.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Texas Workforce Commission will schedule a meeting after Notice of Intent to Award.
- B. Attendance Required:
 - 1. Texas Workforce Commission
 - 2. Architect.
 - 3. All contractors and subcontractors on the project.
 - 4. Any other major sub Contractors.
- C. Agenda:

1. Execution and distribution of Texas Workforce Commission Purchase Order and Notice to Proceed to Contractor.
 2. Distribution of Contract Documents.
 3. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 4. Designation of personnel representing the parties to Contract, Owner, Contractor and Architect.
 5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 6. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Texas Workforce Commission, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Attendance Required: Job superintendent, major Subcontractors and suppliers, Texas Workforce Commission, Architect, as appropriate to agenda topics for each meeting.
- C. Agenda:
1. Review minutes of previous meetings.
 2. Review of Work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of off-site fabrication and delivery schedules.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to Work.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Texas Workforce Commission, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

- A. The contract period is established by the Owner as an outside limit for completion of the work, however time is of the essence in the completion of this work and the contractor should make every reasonable effort to expedite the work in order to complete the work before the scheduled contract date.
- B. A complete construction progress schedule must be submitted within seven days after the Notice to Proceed is issued for the project.
- C. Submit an updated schedule with each new Application for Payment.

3.04 PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of Work produced by a competent photographer, acceptable to Architect.
- D. Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
 2. Consult with Architect for instructions on views required.
 3. Provide factual presentation.
 4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

- E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
 - 1. Delivery Medium: Via email.
 - 2. File Naming: Include project identification, date and time of view, and view identification.
 - 3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
 - 4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.05 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - CLOSEOUT SUBMITTALS.
- E. Submittals which require color selections or substitutions shall be submitted as early as possible to prevent delays in the work.

3.06 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Texas Workforce Commission. No action will be taken.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Documents for Final Payment as listed in Section 01 2000 Price and Payment Procedures.
 - 6. Other types as indicated.
- B. Submit for Texas Workforce Commission's benefit during and after project completion.
- C. Submit the following to Architect for transmittal to Texas Workforce Commission:
 - 1. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work for which Texas Workforce Commission or his property might in any way be responsible, have been paid or otherwise satisfied.
 - 2. Consent of surety to Final Payment.
 - 3. Data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of claims arising out of the Contract, to the extent and in such form as may be designated by Texas Work Force Commission.

3.08 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:

1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
 2. Larger Sheets, Not Larger Than 24x36 inches: Submit the number of copies that the Contractor requires, plus two copies that will be retained by the Architect.
- B. Documents for Information: Submit two copies.
- C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
- D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 LOGGING AND NUMBERING

- A. The Contractor shall keep a "submittal log" detailed enough for tracking and identifying each Submittal and indicating the dates of submission and returns.
- B. Identify all submittals according to the CSI Division format and number consecutively in the order submitted. Accompany each with a letter of transmittal containing all pertinent information required for identification.

3.10 SUBMITTAL PROCEDURES

- A. The Contractor shall review submittals for Conformation to the Contract Documents in quality, quantity, design and dimension before sending to the Architect for review.
- B. Transmit each submittal with AIA Form G810.
- C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- D. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- E. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- F. Deliver submittal to Architect at business address.
- G. Schedule submittals to expedite the Project, and coordinate submission of related items.
- H. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- J. Provide space for Contractor and Architect review stamps.
- K. When revised for resubmission, identify all changes made since previous submission.
- L. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- M. Submittals not requested will not be recognized or processed.

3.11 OPERATING AND MAINTENANCE MANUALS

- A. On or before the date of Substantial Completion, the Contractor shall submit two (2) copies of the Operating and Maintenance Manuals for Texas Workforce Commission's use. The manuals are to include all approved submittals, operating instructions on all equipment, and maintenance information including parts lists, services manuals (if furnished), and relevant schematic or control diagrams and cleaning instructions for installed finishes.
- B. Include as-built drawings with O&M manuals for Architect's review.

END OF SECTION

SECTION 01 3553
SECURITY PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Security measures including entry control, personnel identification, guard service, and miscellaneous restrictions.
- B. Fire safety measures during construction.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Use of premises and occupancy.
- B. Section 01 5000 – Temporary Facilities and Controls: Temporary lighting.

1.03 SECURITY PROGRAM

- A. Protect work, existing premises and Texas Workforce Commission's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with Texas Workforce Commission's existing security system at project mobilization.
- C. Maintain program throughout construction period until Texas Workforce Commission acceptance precludes the need for Contractor security.
- D. Background checks and badging requirements apply to all personnel entering Texas Workforce Commission facilities.

1.04 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Texas workforce Commission on request.
- D. Texas Workforce Commission will control entrance of persons and vehicles related to Texas Workforce Commission's operations.
- E. Contractor personnel or subcontract personnel building access is restricted to the designated limits of construction. Workers found outside of the designated limits of construction will be subject to dismissal from the building.

1.05 PERSONNEL IDENTIFICATION

- A. Refer to solicitation for specific requirements for personnel.
- B. Badge will be provided to the project superintendent. Other personnel are not required to be badged.
- C. Badge to Include: Personal photograph, name, expiration date and employer.
- D. Maintain a list of accredited persons, submit copy to Texas Workforce Commission on request.
- E. Require return of badges at expiration of their employment on the Work.

1.06 RESTRICTIONS

- A. Do not allow cameras on site or photographs taken except by written approval of Texas Workforce Commission.
- B. Contractor personnel or subcontract personnel will not be allowed access to the building or the work area unless the designated contractor superintendent is on-site.

1.07 SAFETY MEASURES

- A. Contractor shall maintain a two hour "Fire Watch" during and after work utilizing welding, torch cutting, brazing or work where open flame or spark is present.

B. Contractor shall furnish fire extinguishers as required by OSHA.

PART 2 - PRODUCTS - NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Control of installation.
- B. Tolerances.
- C. Testing and inspection services.
- D. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008.
- B. ASTM E329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2011.
- C. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2009.

1.04 SUBMITTALS

- A. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Conformance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
- C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificated maybe recent or previous test results on material or product, but must be acceptable to Architect.
- D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Texas Workforce Commission's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Texas Workforce Commission.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.

2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.05 TESTING AND INSPECTION AGENCIES

- A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01 2100; see Section 01 2100 and applicable sections for description of services included in allowance.
- B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:
 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, and ASTM C1093.
 2. Laboratory: Authorized to operate in Texas.

PART 2 - MATERIALS - NOT USED

PART 3 - EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in the sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing required.
- B. Testing Agency Duties:
 1. Test samples submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.
 4. Ascertain compliance of materials with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Submit reports of all tests/inspections specified.

- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barrier, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 01 5500 – Vehicular Access and Parking
- B. Section 01 3553 – Security Procedures

1.03 TEMPORARY UTILITIES

- A. The contractor may use the existing facility utilities and existing restrooms assigned for such use.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.04 TEMPORARY SANITARY FACILITIES

- A. Contractor will be allowed to use the Owner's restroom facilities during the renovations.
- B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provide protection for plants designated to remain or in areas impacted by work. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.07 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceiling as indicated to separate work areas from Texas Workforce Commission's occupied areas to prevent penetration of dust and moisture into Texas Workforce Commission's occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces.

1.08 SECURITY (reference Section 01 3553)

- A. Provide security and facilities to protect Work, existing facilities, and Texas Workforce Commission's

operations from unauthorized entry, vandalism, or theft.

- B. Coordinate with Texas Workforce Commission's security program.
- C. At the request of TWC, provide web-connected security cameras, minimum of 2 locations to be selected by Owner. Cameras to be web accessible for viewing online 24 hours per day, during the duration of the project.
- D. Cameras to have recording capability; data to be archived and available to Owner.

1.09 VEHICULAR ACCESS PARKING (reference Section 01 5500)

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Texas Workforce Commission.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- F. Existing parking areas located at the site and as designated by Texas Workforce Commission may be used for construction parking during hours when building is unoccupied.

1.10 WASTE REMOVAL (reference Section 01 7419)

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
- E. Coordinate waste containers and waste removal with other projects to limit encumbering site with multiple containers and removal times.

1.11 SITE EXAMINATION

- A. Location: The location of the proposed work is within the building. Confine the work area to those rooms, except as required by the Contract Documents to do work outside of that area.
- B. Clean and repair damage caused by installation or use of temporary work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Parking
- B. Existing pavements and parking areas.
- C. Maintenance
- D. Mud from site vehicles

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 – Summary; access to site, work sequence and occupancy.
- B. Section 01 5000 – Temporary Facilities and Controls

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 ACCESS ROADS

- A. Use of designated existing on-site streets and driveways for construction traffic is permitted during hours when work is permitted.
- B. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.
- C. Provide and maintain access to fire hydrants free of obstructions.

3.02 PARKING

- A. Use of designated areas of existing parking facilities by construction personnel is permitted during hours when building is unoccupied.
- B. Vehicular traffic and parking on the surrounding surface parking deck is permitted only after 6:00 PM on weekdays and any time on weekends and holidays.
- C. When site space is not adequate, provide additional off-site parking.
- D. Designated parking areas will be determined as needed.

3.03 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Texas Workforce Commission'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.

3.04 HAUL ROUTES

- A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

3.05 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow and ice.

- B. Maintain existing paved areas used for construction: promptly repair breaks, potholes, low areas, standing water, and other deficiencies to maintain paving and drainage in original, or specified, condition.

3.06 MUD FROM SITE VEHICLES

- A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 01 1100 – Summary: Lists of products to be removed from existing building.
- B. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.03 REFERENCE STANDARDS

- A. 16 CFR 260.13 – Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- B. CAN/CSA Z809 – National Standard for Sustainable Forest Management; CSA International Inc.; 2008
- C. NFPA 70 – National Electric Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. SCAQMD 1168 – South Coast Air Quality Management District Rule No. 1168; Current Editions; www.aqmd.gov

1.04 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 - PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use material and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to Texas Workforce Commission, or otherwise indicated as to remain the property of the Texas Workforce Commission, shall become the property of the Contractor and shall be removed from the site.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Provide interchangeable components of the same manufacturer for components being replaced.
- C. Do not use products having any of the following characteristics:
 - 1. Made outside of the United States.

2. Made using or containing CFC's or HCFC's.
3. Made of wood from newly cut old growth timber.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 - EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Architect will consider requests for substitutions only within seven days after the date of the Pre-Bid Conference.
- B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. A request for substitution constitutes a representation that the submitter:
 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 2. Will provide the same warranty for the substitution as for the specified product.
 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 3. Architect will notify Contractor in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations to work, including selective demolition, except removal, disposal, and/or remediation of hazardous material and toxic substances.
- C. Cutting and patching.
- D. Cleaning and protection.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Texas Workforce Commission personnel.
- G. Closeout procedures, except payment procedures.
- H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 – Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 – Administrative Requirements; Submittal procedures.
- C. Section 01 500 – Temporary Facilities and Controls; Temporary exterior enclosures; temporary interior partitions.
- D. Section 01 7419 – Construction Waste Management and Disposal; Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- E. Section 01 7800 – Closeout Submittals; Project record documents, operation and maintenance data, warranties and bonds.
- F. Section 02 4100 Demolitions; Demolition of whole structures and parts thereof; site utility demolition.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Texas Workforce Commission or separate Contractor.
 - 6. Include in request:
 - a. Identification of Project.
 - b. Location and description of affected work.
 - c. Necessity for cutting or alteration.
 - d. Description of proposed work and products to be used.
 - e. Effect on work of Texas Workforce Commission or separate Contractor.
 - f. Written permission of affected separate Contractor.
 - g. Date and time work will be executed.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 PROJECT CONDITIONS

- A. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building from 6:00 AM to 6:00 PM on weekdays; excessively noisy includes jackhammers.
- E. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work and entering existing facilities.
- F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
- G. Fumes and Odor Controls: Every precaution should be taken to control and prevent odors and fumes from entering the building even when building is not occupied.

1.06 COORDINATION

- A. See Section 01 1000 for occupancy-related requirements.
- B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- C. Notify affected utility companies and comply with their requirements.
- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Texas Workforce Commission occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Texas Workforce Commission's activities. Contractor to attend an 11 month walk after substantial completion of the work with Texas Workforce Commission and the Architect/Engineer.

PART 2 - PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Promptly notify Architect of any discrepancies discovered.
- B. Contractor shall locate and protect survey control and reference points.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
- H. Periodically verify layouts by same means.
- I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.
- G. All work on the roof will be performed as required and stipulated within the warranty requirements of the building. Contractor is responsible for thoroughly reviewing the warranty requirements for compliance with installation, sequencing, and processes.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions or construction specified in Section 01 5000 in locations indicated on drawings.
- C. Maintain weatherproof exterior building enclosures except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (including but not limited to HVAC, plumbing, and electrical); Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connection; minimize duration of outages.
 - b. See Section 01 1000 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction or to match existing conditions.

- F. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch as specified for patching new work.
- G. Adapt existing work to fit new work. Make as neat and smooth transition as possible.
 - 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 - 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls and ceilings to a smooth plane without breaks, steps, or bulkheads.
 - 3. Where a change of plane of ¼ inch or more occurs in existing work, submit recommendation of providing a smooth transition for Architects review and request instructions.
 - 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- H. Patching; Where the existing surface is note indicated to be refinished, patch to match the surface finish that exists prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical with is exposed accidentally during the work, re-cover and refinish to match.
 - 3. Patch as specified for patching new work.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.
- D. Execute cutting and patching to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
- E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- F. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

- H. Restore work with new products in accordance with requirements of Contract Documents.
- I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.
- K. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.
- L. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- M. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.
- N. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Texas Workforce Commission seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate operation and maintenance of products to Texas Workforce Commission's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Texas Workforce Commission's personnel.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Texas Workforce Commission's personnel in detail to explain all aspects of operation and maintenance.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

- A. Execute final cleaning after Substantial Completion but before making final application for payment.
 - 1. Clean areas to be occupied by Texas Workforce Commission prior to final completion before Texas Workforce Commission occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Replace filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
- B. Notify Architect when work is considered ready for Substantial Completion.

- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- E. Accompany Project Coordinator on preliminary final inspection.
- F. Notify Architect when work is considered finally complete.
- G. Complete items of work determined by Architect's final inspection.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Furnish services and maintenance of components indicated in specification sections for one year from date of Substantial Completion.
- D. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- E. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- F. An 11-month walk of the work following substantial completion to be executed with Texas Workforce Commission and the Architect/Engineer for review of conditions. Any items identified as warranty work are to be corrected within a reasonable timeframe agreeable by all parties.
- G. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Texas Workforce Commission.

END OF SECTION

SECTION 01 7329
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Requirements and limitations for cutting and patching of work.
- B. Related sections:
 - 1. Section 01 2500 - Substitution Procedures.

1.02 SUBMITTALS

- A. Submit written request in advance of executing cutting or alteration that affects:
 - 1. Work of Owner or separate contractor.
 - 2. Structural integrity of project.
 - 3. Integrity or effectiveness of weather exposed or moisture resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight exposed elements.
- B. Include in Request:
 - 1. Identification of project.
 - 2. Description of work affected.
 - 3. Necessity for cutting or patching.
 - 4. Effect of cutting or patching on work of Owner or separate contractor, or on structural, weatherproof, or visual integrity of project.
 - 5. Description of proposed work:
 - a. Scope of cutting and patching.
 - b. Subcontractor and trades to execute work.
 - c. Products proposed to be used.
 - d. Extent of refinishing.
 - 6. Alternate to cutting and patching.
 - 7. Cost proposal, if applicable.
 - 8. Written permission of any separate contractor whose work will be affected.
- C. If conditions of work or schedule necessitate a change of material from that originally installed, submit substitution request in accordance with Section 01 2500.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine existing conditions of work, including elements subject to movement or damage during cutting and patching.
- B. After uncovering work, examine conditions affecting installation of new products or performance of work.
- C. Provide protection for other portions of project.
- D. Provide protection from elements.

3.02 CUTTING AND PATCHING

- A. Execute cutting to include excavating, fitting, and patching of Work required to:
 - 1. Make several parts fit properly.
 - 2. Uncover work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Provide routine penetrations of nonstructural surfaces for installation of piping and electrical conduit.
- B. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, and finishes.

- C. Execute cutting and demolition by methods that will prevent damage to other work, and will provide proper surfaces to receive installation of repairs and new work.
- D. Execute excavating and backfilling by methods that will prevent damage to other Work, and will prevent settlement.
- E. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather exposed or moisture resistant elements.
 - 2. Sight exposed finished surfaces.
- F. Restore work that has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- G. Refinish entire surfaces as necessary to provide an even finish:
 - 1. Continuous surfaces: To nearest intersections.
 - 2. Assembly: Refinish entirely.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Construction waste management goals, plan, and records.

1.02 WASTE MANAGEMENT REQUIREMENTS

- A. Texas Workforce Commission requires that this project generate the least amount of trash and waste as possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and Local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.03 RELATED REQUIREMENTS

- A. Section 01 1000 – Summary; List of items to be salvaged from the existing building for relocation in project or for Texas Workforce Commission.
- B. Section 01 3000 – Administrative Requirements; Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 01 5000 – Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- D. Section 01 6000 – Product Requirements; Waste prevention requirement related to delivery, storage and handling.
- E. Section 01 7000 – Execution and Closeout Requirements; Trash/waste preventions procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.04 DEFINITIONS

- A. Clean: Untreated and unpainted: not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair, and demolitions operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic; Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 2 - PRODUCTS – NOT USED.

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collections and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Texas Workforce Commission and Architect.
- C. Instruction: Provide on-site instruction for appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goal and issues at the project meetings.
 - 1. Pre-Bid Meeting
 - 2. Pre-Construction Meeting
 - 3. Regular job-site meetings
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous waste management procedures must be submitted prior to disposal to Texas Workforce Commission Construction and Facilities Management Department 512-463-2531 or CMD@twc.state.tx.us.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely

pickups from the site or deliveries to recycling facility in order to prevent contamination or recyclable materials.

- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.
- J. Use of Texas Workforce Commission dumpsters is not allowed.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties and bonds
 - 4. Spare parts and maintenance materials.
 - 5. Starting of systems.
 - 6. Demonstration and instructions.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 – Administrative Requirements: Submittal procedures.
- B. Section 01 7000 – Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data, Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into services during construction and operated by Texas Workforce Commission, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architects comments. Revise content of all document sets as required prior to final submission.
 - a. Submit two sets of revised final documents in final form within ten days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Texas Workforce Commission's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

1.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents (as-builts); record actual revisions to the Work:
 - 1. Drawings
 - 2. Addenda
 - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Texas Workforce Commission and Architect.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

1.02 OPERATION AND MAINTENANCE DATA

- A. For each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Types Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

1.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For each Product, Applied Material, and Finish:
 - 1. Product data, with catalog number, size, composition, and color and texture designations.
 - 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Providing a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replacement parts.
- B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- D. Provide servicing and lubrication schedule, and list of lubricants required.
- E. Include manufacturer's printed operation and maintenance instructions.
- F. Include sequence of operation by controls manufacturer.
- G. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- H. Provide control diagrams by controls manufacturer as installed.
- I. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- J. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- K. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- L. Include test and balance reports.
- M. Additional Requirements: As specified in individual product specification sections.

1.05 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
- I. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria
 - b. List of equipment
 - c. Parts list for each component
 - d. Operating instructions
 - e. Maintenance instructions for equipment and systems
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
- J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion data.
- K. Table of Contents: Provide title of Project; names, addresses, and telephone number of Architect, Consultants, and Contractor with name or responsible parties; schedule of products and systems, indexed to content of the volume.

1.06 WARRANTY AND BONDS

- A. Obtain warrantied and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Texas Workforce Commission's permission, leave date of beginning or time of warranty until the Date of Substantial Completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warrantied and bonds until time specified for submittal.
- E. Include originals of each in operation and maintenance manual, indexed separately on Table of Contents.

END OF SECTION

SECTION 02 41 13
SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing sidewalks and steps
 - 2. Removing ADA ramps and landings
 - 3. Removing driveways
 - 4. Removing fences
 - 5. Removing guardrail
 - 6. Removing retaining walls (less than 4 feet tall)
 - 7. Removing miscellaneous concrete structures including porches and foundations
 - 8. Disposal of removed materials
- B. Deviations this from City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 1 – General Requirements
 - 3. Section 31 23 23 – Borrow

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. Remove Sidewalk: Measure by square foot.
 - b. Remove ADA Ramp: measure by each.
 - c. Remove Driveway: measure by the square foot by type.
 - d. Remove Miscellaneous Concrete Structure: measure by the lump sum.
 - 2. Payment
 - a. Remove Sidewalk: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work. Sidewalk adjacent to or attached to retaining wall (including sidewalk that acts as a wall footing) shall be paid as sidewalk removal. For utility projects, this Item shall be considered subsidiary to the trench and no other compensation will be allowed.
 - b. Remove ADA Ramp and landing: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work. Work includes ramp landing removal. For utility projects, this Item shall be considered subsidiary to the trench and no other compensation will be allowed.
 - c. Remove Miscellaneous Concrete Structure: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work. For utility projects, this Item shall be considered subsidiary to the trench and no other compensation will be allowed.

1.3 REFERENCES

- A. Definitions
 - 1. Improved Driveway: Driveway constructed of concrete, asphalt paving or brick unit pavers.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fill Material: See Section 31 23 23.

PART 3 - EXECUTION

3.4 REMOVAL

- A. Remove Sidewalk
 - 1. Remove sidewalk to nearest existing dummy, expansion or construction joint.
 - 2. Sawcut when removing to nearest joint is not practical. See 3.4.D.
- B. Remove ADA Ramp
 - 1. Sawcut existing curb and gutter and pavement prior to wheel chair ramp removal. See 3.4.D.
 - 2. Remove ramp to nearest existing dummy, expansion or construction joint on existing sidewalk.
- C. Remove Miscellaneous Concrete Structure
 - 1. Remove portions of miscellaneous concrete structures including foundations and slabs that do not interfere with proposed construction to 2 feet below the finished ground line.
 - 2. Cut reinforcement close to the portion of the concrete to remain in place.
 - 3. Break or perforate the bottom of structures to remain to prevent the entrapment of water.
- D. Sawcut
 - 1. Sawing Equipment
 - a. Power-driven
 - b. Manufactured for the purpose of sawing pavement
 - c. In good operating condition
 - d. Shall not spall or fracture the pavement to the removal area
 - 2. Sawcut perpendicular to the surface completely through existing pavement.

END OF SECTION

SECTION 02 41 15
PAVING REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing concrete paving, asphalt paving and brick paving
 - 2. Removing concrete curb and gutter
 - 3. Removing concrete valley gutter
 - 4. Milling roadway paving
 - 5. Disposal of removed materials
- B. Deviations from this City of Austin Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 1 - General Requirements
 - 3. Section 32 11 33 - Cement Treated Base Courses

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. Remove Concrete Paving: measure by the square yard from back-to-back of curbs.
 - b. Remove Asphalt Paving: measure by the square yard between the lips of gutters.
 - c. Remove Concrete Curb and Gutter: measure by the linear foot.
 - d. Remove Concrete Valley Gutter: measure by the square yard
 - e. Wedge Milling: measure by the square yard for varying thickness.
 - f. Surface Milling: measure by the square yard for varying thickness.
 - g. Butt Milling: measured by the linear foot.
 - 2. Payment
 - a. Remove Concrete Paving: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work. For utility projects, this Item shall be considered subsidiary to the trench and no other compensation will be allowed.
 - b. Remove Asphalt Paving: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work. For utility projects, this Item shall be considered subsidiary to the trench and no other compensation will be allowed.
 - c. Remove Concrete Curb and Gutter: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work. For utility projects, this Item shall be considered subsidiary to the trench and no other compensation will be allowed.
 - d. Remove Concrete Valley Gutter: full compensation for saw cutting, removal, hauling, disposal, tools, equipment, labor and incidentals needed to execute work.
 - e. Wedge Milling: full compensation for all milling, hauling milled material to salvage stockpile or disposal, tools, labor, equipment and incidentals necessary to execute the work.
 - f. Surface Milling: full compensation for all milling, hauling milled material to salvage stockpile or disposal, tools, labor, equipment and incidentals necessary to execute the work.
 - g. Butt Milling: full compensation for all milling, hauling milled material to salvage stockpile or disposal, tools, labor, equipment and incidentals necessary to execute the work.
 - h. No payment for saw cutting of pavement or curbs and gutters will be made under this section. Include cost of such work in unit prices for items listed in bid form requiring saw cutting.

- i. No payment will be made for work outside maximum payment limits indicated on plans, or for pavements or structures removed for CONTRACTOR's convenience.

1.3 REFERENCES

- A. ASTM International (ASTM):
 - a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.1 PREPARATION

- A. General:
 - 1. Mark paving removal limits for approval prior to beginning removal.
 - 2. Identify known utilities below grade - Stake and flag locations.

3.2 PAVEMENT REMOVAL

- A. General.
 - 1. Exercise caution to minimize damage to underground utilities.
 - 2. Minimize amount of earth removed.
 - 3. Remove paving to neatly sawed joints.
 - 4. Use care to prevent fracturing adjacent, existing pavement.
- B. Sawing
 - 1. Sawing Equipment.
 - a. Power-driven.
 - b. Manufactured for the purpose of sawing pavement.
 - c. In good operating condition.
 - d. Shall not spall or fracture the pavement structure adjacent to the removal area.
 - 2. Sawcut perpendicular to the surface to full pavement depth, parallel and perpendicular to existing joint.
 - 3. Sawcut parallel to the original sawcut in square or rectangular fashion.
 - 4. If a sawcut falls within 5 feet of an existing dummy joint, construction joint, saw joint, cold joint, expansion joint, edge of paving or gutter lip, remove paving to that joint, edge or lip.
 - 5. If a pavement edge of a cut is damaged subsequent to saw cutting, saw to a new, neat, straight line for the purpose of removing the damaged area.
- C. Remove Concrete Paving and Concrete Valley Gutter
 - 1. Sawcut: See 3.4.B.
 - 2. Remove concrete to the nearest expansion joint or vertical saw cut.
- D. Remove Concrete Curb and Gutter
 - 1. Sawcut: See 3.4.B.
 - 2. Minimum limits of removal: 30 inches in length.
- E. Remove Asphalt Paving
 - 1. Sawcut: See 3.4.B.
 - 2. Remove pavement without disturbing the base material.
 - 3. When shown on the plans or as directed, stockpile materials designated as salvageable at designated sites.
 - 4. Prepare stockpile area by removing vegetation and trash and by providing for proper drainage.

F. Milling

1. General
 - a. Mill surfaces to the depth shown in the plans or as directed.
 - b. Do not damage or disfigure adjacent work or existing surface improvements.
 - c. If milling exposes smooth underlying pavement surfaces, mill the smooth surface to make rough.
 - d. Provide safe temporary transition where vehicles or pedestrians must pass over the milled edges.
 - e. Remove excess material and clean milled surfaces.
 - f. Stockpiling of planed material will not be permitted within the right of way unless approved by the Owner.
 - g. If the existing base is brick and cannot be milled, remove a 5 foot width of the existing brick base. See 3.3.G. for brick paving removal.
2. Milling Equipment
 - a. Power operated milling machine capable of removing, in one pass or two passes, the necessary pavement thickness in a five-foot minimum width.
 - b. Self-propelled with sufficient power, traction and stability to maintain accurate depth of cut and slope.
 - c. Equipped with an integral loading and reclaiming means to immediately remove material cut from the surface of the roadway and discharge the cuttings into a truck, all in one operation.
 - d. Equipped with means to control dust created by the cutting action.
 - e. Equipped with a manual system providing for uniformly varying the depth of cut while the machine is in motion making it possible to cut flush to all inlets, manholes, or other obstructions within the paved area.
 - f. Variable Speed in order to leave the specified grid pattern.
 - g. Equipped to minimize air pollution.
3. Wedge Milling and Surface Milling
 - a. Wedge Mill existing asphalt, concrete or brick pavement from the lip of gutter at a depth of 2 inches and transitioning to match the existing pavement (0-inch cut) at a minimum width of 5 feet.
 - b. Surface Mill existing asphalt pavement to the depth specified,
 - c. Provide a milled surface that provides a uniform surface free from gouges, ridges, oil film, and other imperfections of workmanship with a uniform textured appearance.
 - d. In all situations where the existing H.M.A.C. surface contacts the curb face, the wedge milling includes the removal of the existing asphalt covering the gutter up to and along the face of curb.
 - e. Perform wedge or surface milling operation in a continuous manner along both sides of the street or as directed.
4. Butt Joint Milling
 - a. Mill butt joints into the existing surface, in association with the wedge milling operation.
 - b. Butt joint will provide a full width transition section and a constant depth at the point where the new overlay is terminated.
 - c. Typical locations for butt joints are at all beginning and ending points of streets where paving material is removed. Prior to the milling of the butt joints, consult with the Owner for proper location and limits of these joints.
 - d. Butt Milled joints are required on both sides of all railroad tracks and concrete valley gutters, bridge decks and culverts and all other items which transverse the street and end the continuity of the asphalt surface.
 - e. Make each butt joint 20 feet long and milled out across the full width of the street section to a tapered depth of 2 inch.
 - f. Taper the milled area within the 20-feet to a depth from 0-inch to 2-inch at a line adjacent to the beginning and ending points or intermediate transverse items.
 - g. Provide a temporary wedge of asphalt at all butt joints to provide a smooth ride over the bump.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Constructing a pavement layer composed of a compacted, dense-graded mixture of aggregate and asphalt binder for surface or base courses
- B. Deviations from this City of Austin Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 1 - General Requirements
 - 3. Section 32 01 17 - Permanent Asphalt Paving Repair

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Asphalt Pavement
 - a. Measurement
 - 1) Measurement for this Item shall be by the square yard of completed and accepted asphalt pavement in its final position for various:
 - a) Thicknesses
 - b) Types
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per
 - c. The price bid shall include:
 - 1) Shaping and fine grading the placement area
 - 2) Furnishing, loading, unloading, storing, hauling and handling all materials including freight and royalty
 - 3) Traffic control for all testing
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches
 - 7) Tack coat
 - 8) Removal and/or sweeping excess material
 - 2. H.M.A.C. Transition
 - a. Measurement
 - 1) Measurement for this Item shall be by the ton of composite Hot Mix Asphalt required for H.M.A.C. Transition.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per ton of Hot Mix Asphalt.
 - c. The price bid shall include:
 - 1) Shaping and fine grading the roadbed
 - 2) Furnishing, loading, unloading, storing, hauling and handling all materials including freight and royalty
 - 3) Traffic control for all testing
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches
 - 7) Tack coat
 - 8) Removal and/or sweeping excess material

3. Asphalt Base Course
 - a. Measurement
 - 1) Measurement for this Item shall be by the square yard of Asphalt Base Course completed and accepted in its final position for:
 - a) Various thicknesses
 - b) Various types
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per square yard of Asphalt Base Course.
 - c. The price bid shall include:
 - 1) Shaping and fine grading the roadbed
 - 2) Furnishing, loading, unloading, storing, hauling and handling all materials including freight and royalty
 - 3) Traffic control for all testing
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches
 - 7) Tack coat
 - 8) Removal and/or sweeping excess material
4. H.M.A.C. Speed Cushion
 - a. Measurement
 - 1) Measurement for this Item shall be per each H.M.A.C. Speed Cushion installed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per each H.M.A.C. Speed Cushion installed and accepted in its final position.
 - c. The price bid shall include:
 - 1) Shaping and fine grading the roadbed
 - 2) Furnishing, loading, unloading, storing, hauling and handling all materials including freight and royalty
 - 3) Traffic control for all testing
 - 4) Asphalt, aggregate, and additive
 - 5) Materials and work needed for corrective action
 - 6) Trial batches
 - 7) Tack coat
 - 8) Removal and/or sweeping excess material

1.3 REFERENCES

- A. Abbreviations and Acronyms
 1. RAP (reclaimed asphalt pavement)
 2. SAC (surface aggregate classification)
 3. BRSQC (Bituminous Rated Source Quality Catalog)
 4. AQMP (Aggregate Quality Monitoring Program)
 5. H.M.A.C. (Hot Mix Asphalt Concrete)
 6. WMA (Warm Mix Asphalt)
- B. Reference Standards
 1. Reference standards cited in this specification refer to the current reference standard published at the time of the latest revision date logged at the end of this specification, unless a date is specifically cited.
 2. National Institute of Standards and Technology (NIST)
 - a. Handbook 44 - 2007 Edition: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices
 3. ASTM International (ASTM):
 - a. ASTM D6084 - 06 Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
 4. American Association of State Highway and Transportation Officials

- a. MP2 Standard Specification for Superpave Volumetric Mix Design
 - b. PP28 Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt (HMA)
 - c. T 201, Kinematic Viscosity of Asphalts (Bitumens)
 - d. T 202 Standard Method of Test for Viscosity of Asphalts by Vacuum Capillary Viscometer
 - e. T 316 Standard Method of Test for Viscosity Determination of Asphalt Binder Using Rotational Viscometer
 - f. TP 1-93 Test Method for Determining the Flexural Creep Stiffness of Asphalt Binder Using the Bending Beam Rheometer (BBR)
5. Texas Department of Transportation
- a. Bituminous Rated Source Quality Catalog (BRSQC)
 - b. TEX 100-E, Surveying and Sampling Soils for Highways
 - c. Tex 106-E, Calculating the Plasticity Index of Soils
 - d. Tex 107-E, Determining the Bar Linear Shrinkage of Soils
 - e. Tex 200-F, Sieve Analysis of Fine and Coarse Aggregates
 - f. Tex 203-F, Sand Equivalent Test
 - g. Tex-204-F, Design of Bituminous Mixtures
 - h. Tex-207-F, Determining Density of Compacted Bituminous Mixtures
 - i. Tex 217-F, Determining Deleterious Material and Decantation Test for Coarse Aggregates
 - j. Tex-226-F, Indirect Tensile Strength Test
 - k. Tex-227-F, Theoretical Maximum Specific Gravity of Bituminous Mixtures
 - l. Tex-243-F, Tack Coat Adhesion
 - m. Tex-244-F, Thermal profile of Hot Mix Asphalt
 - n. Tex 280-F, Determination of Flat and Elongated Particles
 - o. Tex 406-A, Material Finer Than 75 μm (No. 200) Sieve in Mineral Aggregates (Decantation Test for Concrete Aggregates)
 - p. Tex 408-A, Organic Impurities in Fine Aggregate for Concrete
 - q. Tex 410-A, Abrasion of Coarse Aggregate using the Los Angeles Machine
 - r. Tex 411-A, Soundness of Aggregate by Using Sodium Sulfate or Magnesium
 - s. Tex 460-A, Determining Crushed Face Particle Count
 - t. Tex 461-A, Degradation of Coarse Aggregate by Micro-Deval Abrasion
 - u. Sulfate
 - v. Tex-530-C, Effect of Water on Bituminous Paving Mixtures
 - w. Tex-540-C, Measurement of Polymer Separation on Heating in Modified Asphalt Systems
 - x. Tex-541-C, Rolling Thin Film Oven Test for Asphalt Binders
 - y. Tex-920-K, Verifying the Accuracy of Drum Mix Plant Belt Scales
 - z. Tex-921-K, Verifying the Accuracy of Hot Mix Plant Asphalt Meters
 - aa. Tex 923-K, Verifying the Accuracy of Liquid Additive Metering Systems

1.4 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Asphalt Paving Mix Design: Submit for approval. See 2.2.B.1.

1.5 DELIVERY, STORAGE, AND HANDLING

1.11 FIELD CONDITIONS

- A. Weather Conditions
 - 1. Place mixture when the roadway surface temperature is equal to or higher than the temperatures listed in Table 1.

Table 1
Minimum Pavement Surface Temperatures

Originally Specified High Temperature Binder Grade	Minimum Pavement Surface Temperatures in Degrees Fahrenheit	
	Subsurface Layers or Night Paving Operations	Surface Layers Placed in Daylight Operations
PG64 or lower	45	50
PG 70	55 ¹	60 ¹
PG 76 or higher	60 ¹	60 ¹

¹Contractors may pave at temperatures 10°F lower than the values shown in Table 1 when utilizing a paving process including WMA or equipment that eliminates thermal segregation. In such cases, the contractor must use either a hand held thermal camera or a hand held infrared thermometer operated in accordance with Tex-244-F to demonstrate to the satisfaction of the City that the uncompacted mat has no more than 10° F of thermal segregation.

2. Unless otherwise shown on the Drawings, place mixtures only when weather conditions and moisture conditions of the roadway surface are suitable in the opinion of the City.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General

1. Furnish uncontaminated materials of uniform quality that meet the requirements of the Drawings and specifications.
2. Notify the Owner of all material sources.
3. Notify the Owner before changing any material source or formulation.
4. When the Contractor makes a source or formulation change, the Owner will verify that the requirements of this specification are met and may require a new laboratory mixture design, trial batch, or both.
5. The Owner may sample and test project materials at any time during the project to verify compliance.
6. The depth of the compacted lift should be at least 2 times the nominal maximum aggregate size.

B. Aggregate

1. General

- a. Furnish aggregates from sources that conform to the requirements shown in Table 1, and as specified in this Section, unless otherwise shown on the Drawings.
- b. Provide aggregate stockpiles that meet the definition in this Section for either coarse aggregate or fine aggregate.
- c. When reclaimed asphalt pavement (RAP) is allowed by Drawing note, provide RAP stockpiles in accordance with this Section.
- d. Aggregate from RAP is not required to meet Table 2 requirements unless otherwise shown on the Drawings.
- e. Supply mechanically crushed gravel or stone aggregates that meet the definitions in Tex 100 E.
- f. Samples must be from materials produced for the project.
- g. The Contractor will establish the surface aggregate classification (SAC) and perform Los Angeles abrasion, magnesium sulfate soundness, and Micro-Deval tests.
- h. Perform all other aggregate quality tests listed in Table 2.
- i. Document all test results on the mixture design report.
- j. The Contractor may perform tests on independent or split samples to verify Contractor test results.
- k. Stockpile aggregates for each source and type separately and designate for the City.
- l. Determine aggregate gradations for mixture design and production testing based on the washed sieve analysis given in Tex 200 F, Part II.

Table 2
Aggregate Quality Requirements

Property	Test Method	Requirement
Coarse Aggregate		
SAC	AQMP	As shown on Drawings
Deleterious material, percent, max	Tex-217-F, Part I	1.5
Decantation, percent, max	Tex-217-F, Part II	1.5
Micro-Deval abrasion, percent, max	Tex-461-A	Note 1
Los Angeles abrasion, percent, max	Tex-410-A	40
Magnesium sulfate soundness, 5 cycles, percent, max	Tex-411-A	30 ²
Coarse aggregate angularity, 2 crushed faces, percent, min	Tex 460-A, Part I	85 ³
Flat and elongated particles @ 5:1, percent, max	Tex-280-F	10
Fine Aggregate		
Linear shrinkage, percent, max	Tex-107-E	3
Combined Aggregate		
Sand equivalent, percent, min	Tex-203-F	45

1. Not used for acceptance purposes. Used by the Owner as an indicator of the need for further investigation.

2. Unless otherwise shown on the Drawings.

3. Unless otherwise shown on the Drawings. Only applies to crushed gravel.

m. Coarse Aggregate

- 1) Coarse aggregate stockpiles must have no more than 20 percent material passing the No. 8 sieve.
- 2) Maximum aggregate size should not be over half of the proposed lift depth to prevent particle on particle contact issues.
- 3) Provide aggregates from sources listed in the BRSQC.
- 4) Provide aggregate from unlisted sources only when tested by the Owner and/or approved before use.
- 5) Allow 30 calendar days for the Owner to sample, test, and report results for unlisted sources.
- 6) Class B aggregate meeting all other requirements in Table 2 may be blended with a Class A aggregate in order to meet requirements for Class A materials.
- 7) When blending Class A and B aggregates to meet a Class A requirement, ensure that at least 50 percent by weight of the material retained on the No. 4 sieve comes from the Class A aggregate source.
- 8) Blend by volume if the bulk specific gravities of the Class A and B aggregates differ by more than 0.300.
- 9) When blending, do not use Class C or D aggregates.
- 10) For blending purposes, coarse aggregate from RAP will be considered as Class B aggregate.
- 11) Provide coarse aggregate with at least the minimum SAC shown on the Drawings.
- 12) SAC requirements apply only to aggregates used on the surface of travel lanes, unless otherwise shown on the Drawings.

n. RAP is salvaged, milled, pulverized, broken, or crushed asphalt pavement.

- 1) No RAP permitted for TYPE D H.M.A.C.
- 2) Use no more than 20 percent RAP on TYPE B H.M.A.C. unless otherwise shown on the Drawings.
- 3) Crush or break RAP so that 100 percent of the particles pass the 2 inch sieve.
- 4) RAP from either Contractor or Owner, including RAP generated during the project, is permitted only when shown on the Drawings.
- 5) Owner-owned RAP, if allowed for use, will be available at the location shown on the Drawings.
- 6) When RAP is used, determine asphalt content and gradation for mixture design purposes.
- 7) Perform other tests on RAP when shown on the Drawings.
- 8) When RAP is allowed by plan note, use no more than 30 percent RAP in Type A or B mixtures unless otherwise shown on the Drawings.
- 9) Do not use RAP contaminated with dirt or other objectionable materials.

- 10) Do not use the RAP if the decantation value exceeds 5 percent and the plasticity index is greater than 8.
 - 11) Test the stockpiled RAP for decantation in accordance with the laboratory method given in Tex-406-A, Part I.
 - 12) Determine the plasticity index using Tex-106-E if the decantation value exceeds 5 percent.
 - 13) The decantation and plasticity index requirements do not apply to RAP samples with asphalt removed by extraction.
 - 14) Do not intermingle Contractor-owned RAP stockpiles with City-owned RAP stockpiles.
 - 15) Remove unused Contractor-owned RAP material from the project site upon completion of the project.
 - 16) Return unused Owner-owned RAP to the designated stockpile location.
- o. Fine Aggregate
- 1) Fine aggregates consist of manufactured sands, screenings, and field sands.
 - 2) Fine aggregate stockpiles must meet the gradation requirements in Table 3.
 - 3) Supply fine aggregates that are free from organic impurities.
 - 4) The Owner may test the fine aggregate in accordance with Tex-408-A to verify the material is free from organic impurities.
 - 5) At most 15 percent of the total aggregate may be field sand or other uncrushed fine aggregate.
 - 6) With the exception of field sand, use fine aggregate from coarse aggregate sources that meet the requirements shown in Table 2, unless otherwise approved.
 - 7) If 10 percent or more of the stockpile is retained on the No. 4 sieve, test the stockpile and verify that it meets the requirements in Table 1 for coarse aggregate angularity (Tex-460-A) and flat and elongated particles (Tex-280-F).

Table 3
Gradation Requirements for Fine Aggregate

Sieve Size	percent Passing by Weight or Volume
3/8"	100
#8	70–100
#200	0–30

2. Mineral Filler
 - a. Mineral filler consists of finely divided mineral matter such as agricultural lime, crusher fines, hydrated lime, cement, or fly ash.
 - b. Mineral filler is allowed unless otherwise shown on the Drawings.
 - c. Do not use more than 2 percent hydrated lime or cement, unless otherwise shown on the Drawings. The Drawings may require or disallow specific mineral fillers. When used, provide mineral filler that:
 - 1) Is sufficiently dry, free-flowing, and free from clumps and foreign matter;
 - 2) Does not exceed 3 percent linear shrinkage when tested in accordance with Tex-107-E; and meets the gradation requirements in Table 4.

Table 4
Gradation Requirements for Mineral Filler

Sieve Size	percent Passing by Weight or Volume
#8	100
#200	55–100

3. Baghouse Fines
 - a. Fines collected by the baghouse or other dust-collecting equipment may be reintroduced into the mixing drum
4. Asphalt Binder
 - a. Furnish the type and grade of performance-graded (PG) asphalt binder specified as follows:
 - 1) Performance-Graded Binders (PG Binders)
 - a) Must be smooth and homogeneous
 - b) Show no separation when tested in accordance with Tex-540-C
 - c) Meet Table 5 requirements

Table 5
Performance-Graded Binders

Property and Test Method	Performance Grade																	
	PG 58			PG 64				PG 70				PG 76				PG 82		
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
Average 7-day max pavement design temperature, °C ¹	< 58			< 64				< 70				< 76				< 82		
Min pavement design temperature, °C ¹	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28	>-34	>-16	>-22	>-28
ORIGINAL BINDER																		
Flash point, T 48, Min, °C	230																	
Viscosity, T 316: ^{2,3} Max, 3.0 Pa·s, test temperature, °C	135																	
Dynamic shear, T 315: ⁴ G*/sin(d), Min, 1.00 kPa Test temperature @ 10 rad/sec., °C	58			64				70				76				82		
Elastic recovery, D 6084, 50°F, percent Min	–	–	30	–	–	30	50	–	30	50	60	30	50	60	70	50	60	70
ROLLING THIN-FILM OVEN (Tex-541-C)																		
Mass loss, Tex-541-C, Max, percent	1																	
Dynamic shear, T 315: G*/sin(d), Min, 2.20 kPa Test temperature @ 10 rad/sec., °C	58			64				70				76				82		

Table 5 (continued)

Performance-Graded Binders

Property and Test Method	Performance Grade																	
	PG 58			PG 64			PG 70			PG 76			PG 82					
	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28	-34	-16	-22	-28
PRESSURE AGING VESSEL (PAV) RESIDUE (R 28)																		
PAV aging temperature, °C	100																	
Dynamic shear, T 315: G*/sin(d), Max, 5000 kPa Test temperature @ 10 rad/sec., °C	25	22	19	28	25	22	19	28	25	22	19	28	25	22	19	28	25	22
Creep stiffness, T 313: ^{5,6} S, max, 300 MPa, <i>m</i> -value, min, 0.300 Test temperature @ 60 sec., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18
Direct tension, T 314: ⁶ Failure strain, min, 1.0 percent Test temperature @ 1.0 mm/min., °C	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18	-24	-6	-12	-18

1. Pavement temperatures are estimated from air temperatures using an algorithm contained in a Department-supplied computer program, may be provided by the Department, or by following the procedures outlined in AASHTO MP 2 and PP 28.
2. This requirement may be waived at the Department's discretion if the supplier warrants that the asphalt binder can be adequately pumped, mixed, and compacted at temperatures that meet all applicable safety, environmental, and constructability requirements. At test temperatures where the binder is a Newtonian fluid, any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).
3. Viscosity at 135°C is an indicator of mixing and compaction temperatures that can be expected in the lab and field. High values may indicate high mixing and compaction temperatures. Additionally, significant variation can occur from batch to batch. Contractors should be aware that variation could significantly impact their mixing and compaction operations. Contractors are therefore responsible for addressing any constructability issues that may arise.
4. For quality control of unmodified asphalt binder production, measurement of the viscosity of the original asphalt binder may be substituted for dynamic shear measurements of G*/sin(d) at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary (T 201 or T 202) or rotational viscometry (T 316).
5. Silicone beam molds, as described in AASHTO TP 1-93, are acceptable for use.
6. If creep stiffness is below 300 MPa, direct tension test is not required. If creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used instead of the creep stiffness requirement. The *m*-value requirement must be satisfied in both cases.

- b. Separation testing is not required if:
 - 1) A modifier is introduced separately at the mix plant either by injection in the asphalt line or mixer,
 - 2) The binder is blended on site in continuously agitated tanks, or binder acceptance is based on field samples taken from an in-line sampling port at the hot mix plant after the addition of modifiers.
- 5. Tack Coat
 - a. Unless otherwise shown on the Drawings or approved, furnish CSS-1H, SS-1H, or a PG binder with a minimum high-temperature grade of PG 58 for tack coat binder in accordance with Section 2.2.A.5.
- 6. Additives
 - a. General
 - 1) When shown on the Drawings, use the type and rate of additive specified.
 - 2) Other additives that facilitate mixing or improve the quality of the mixture may be allowed when approved.
 - b. Liquid Antistripping Agent
 - 1) Furnish and incorporate all required asphalt antistripping agents in asphalt concrete paving mixtures and asphalt-stabilized base mixtures to meet moisture resistance testing requirements.
 - 2) Provide a liquid antistripping agent that is uniform and shows no evidence of crystallization, settling, or separation.
 - 3) Ensure that all liquid antistripping agents arrive in:
 - a) Properly labeled and unopened containers, as shipped from the manufacturer, or
 - b) Sealed tank trucks with an invoice to show contents and quantities
 - c) Provide product information to the Owner including:
 - (1) Material safety data sheet
 - (2) Specific gravity of the agent at the manufacturer's recommended addition temperature,
 - (3) Manufacturer's recommended dosage range, and
 - (4) Handling and storage instructions
 - 4) Addition of lime or a liquid antistripping agent at the Mix Plant, incorporate into the binder as follows:
 - a) Handle in accordance with the manufacturer's recommendations.
 - b) Add at the manufacturer's recommended addition temperature.
 - c) Add into the asphalt line by means of an in-line-metering device.
 - c. Liquid Asphalt Additive Meters
 - 1) Provide a means to check the accuracy of meter output for asphalt primer, fluxing material, and liquid additives.
 - 2) Furnish a meter that reads in increments of 0.1 gal. or less.
 - 3) Verify accuracy of the meter in accordance with Tex-923-K.
 - 4) Ensure the accuracy of the meter within 5.0 percent.
- 7. Mixes
 - a. Design Requirements
 - 1) Unless otherwise shown on the Drawings, use the typical weight design example given in Tex-204-F, Part I, to design a mixture meeting the requirements listed in Tables 2 through 8.
 - 2) Furnish the Owner with representative samples of all materials used in the mixture design.
 - 3) The Owner will verify the mixture design.
 - 4) If the design cannot be verified by the Owner, furnish another mixture design.

Table 6
Master Gradation Bands (percent Passing by Weight or Volume)
and Volumetric Properties

Sieve Size	B Fine Base	C Coarse Surface	D Fine Surface
1-1/2"	—	—	—
1"	98.0–100.0	—	—
3/4"	84.0–98.0	95.0–100.0	—
1/2"	—	—	98.0–100.0
3/8"	60.0–80.0	70.0–85.0	85.0–100.0
#4	40.0–60.0	43.0–63.0	50.0–70.0
#8	29.0–43.0	32.0–44.0	35.0–46.0
#30	13.0–28.0	14.0–28.0	15.0–29.0
#50	6.0–20.0	7.0–21.0	7.0–20.0
#200	2.0–7.0	2.0–7.0	2.0–7.0
Design VMA¹, percent Minimum			
—	13.0	14.0	15.0
Plant-Produced VMA, percent Minimum			
—	12.0	13.0	14.0

1. Voids in Mineral Aggregates.

Table 7
Laboratory Mixture Design Properties

Property	Test Method	Requirement
Target laboratory-molded density, percent	Tex-207-F	96.0 ¹
Tensile strength (dry), psi (molded to 93 percent $\pm$ 1 percent density)	Tex-226-F	85–200 ²
Boil test ³	Tex-530-C	—

1. Unless otherwise shown on the Drawings.

2. May exceed 200 psi when approved and may be waived when approved.

3. Used to establish baseline for comparison to production results. May be waived when approved.

8. Warm Mix Asphalt (WMA)
 - a. WMA is defined as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed.
 - b. WMA is allowed for use at the Contractor's option unless otherwise shown on the Drawings.
 - c. Produce an asphalt mixture within the temperature range of 215 degrees F and 275 degrees F.
 - d. When WMA is not required by Drawings, produce an asphalt mixture within the temperature range of 215 degrees F and 275 degrees F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Hauling Operations

1. Before use, clean all truck beds to ensure mixture is not contaminated.
2. When a release agent is necessary to coat truck beds, use a release agent approved by the Owner.
3. Petroleum based products, such as diesel fuel, should not be used.
4. If wind, rain, temperature or haul distance impacts cooling, insulate truck beds or cover the truck bed with tarpaulin.

5. If haul time in project is to be greater than 30 minutes, insulate truck beds or cover the truck bed with tarpaulin.

3.2 INSTALLATION

A. Equipment

1. General

- a. Provide required or necessary equipment to produce, haul, place, compact, and core asphalt concrete pavement.
- b. Ensure weighing and measuring equipment complies with specification.
- c. Synchronize equipment to produce a mixture meeting the required proportions.

2. Production Equipment

- a. Provide:
 - 1) Drum-mix type, weigh-batch, or modified weigh-batch mixing plants that ensure a uniform, continuous production
 - 2) Automatic proportioning and measuring devices with interlock cut-off circuits that stop operations if the control system malfunctions
 - 3) Visible readouts indicating the weight or volume of asphalt and aggregate proportions
 - 4) Safe and accurate means to take required samples by inspection forces
 - 5) Permanent means to check the output of metering devices and to perform calibration and weight checks
 - 6) Additive-feed systems to ensure a uniform, continuous material flow in the desired proportion

3. Weighing and Measuring Equipment

a. General

- 1) Provide weighing and measuring equipment for materials measured or proportioned by weight or volume.
- 2) Provide certified scales, scale installations, and measuring equipment meeting the requirements of NIST Handbook 44, except that the required accuracy must be 0.4 percent of the material being weighed or measured.
- 3) Furnish leak-free weighing containers large enough to hold a complete batch of the material being measured.

b. Truck Scales

- 1) Furnish platform truck scales capable of weighing the entire truck or truck-trailer combination in a single draft.

c. Aggregate Batching Scales

- 1) Equip scales used for weighing aggregate with a quick adjustment at zero that provides for any change in tare.
- 2) Provide a visual means that indicates the required weight for each aggregate.

d. Suspended Hopper

- 1) Provide a means for the addition or the removal of small amounts of material to adjust the quantity to the exact weight per batch.
- 2) Ensure the scale equipment is level.

e. Belt Scales

- 1) Use belt scales for proportioning aggregate that are accurate to within 1.0 percent based on the average of 3 test runs, where no individual test run exceeds 2.0 percent when checked in accordance with Tex-920-K.

f. Asphalt Material Meter

- 1) Provide an asphalt material meter with an automatic digital display of the volume or weight of asphalt material.
- 2) Verify the accuracy of the meter in accordance with Tex-921-K.
- 3) When using the asphalt meter for payment purposes, ensure the accuracy of the meter is within 0.4 percent.
- 4) When used to measure component materials only and not for payment, ensure the accuracy of the meter is within 1.0 percent.

g. Liquid Asphalt Additive Meters

- 1) Provide a means to check the accuracy of meter output for asphalt primer, fluxing material, and liquid additives.
- 2) Furnish a meter that reads in increments of 0.1 gallon or less.
- 3) Verify accuracy of the meter in accordance with Tex-923-K.
- 4) Ensure the accuracy of the meter within 5.0 percent.

4. Drum-Mix Plants. Provide a mixing plant that complies with the requirements below.
 - a. Aggregate Feed System
 - 1) Provide:
 - a) A minimum of 1 cold aggregate bin for each stockpile of individual materials used to produce the mix
 - b) Bins designed to prevent overflow of material
 - c) Scalping screens or other approved methods to remove any oversized material, roots, or other objectionable materials
 - d) A feed system to ensure a uniform, continuous material flow in the desired proportion to the dryer
 - e) An integrated means for moisture compensation
 - f) Belt scales, weigh box, or other approved devices to measure the weight of the combined aggregate
 - g) Cold aggregate bin flow indicators that automatically signal interrupted material flow
 - b. Reclaimed Asphalt Pavement (RAP) Feed System
 - 1) Provide a separate system to weigh and feed RAP into the hot mix plant.
 - c. Mineral Filler Feed System
 - 1) Provide a closed system for mineral filler that maintains a constant supply with minimal loss of material through the exhaust system.
 - 2) Interlock the measuring device into the automatic plant controls to automatically adjust the supply of mineral filler to plant production and provide a consistent percentage to the mixture.
 - d. Heating, Drying, and Mixing Systems
 - 1) Provide:
 - a) A dryer or mixing system to agitate the aggregate during heating
 - b) A heating system that controls the temperature during production to prevent aggregate and asphalt binder damage
 - c) A heating system that completely burns fuel and leaves no residue
 - d) A recording thermometer that continuously measures and records the mixture discharge temperature
 - e) Dust collection system to collect excess dust escaping from the drum.
 - e. Asphalt Binder Equipment
 - 1) Supply equipment to heat binder to the required temperature.
 - 2) Equip the heating apparatus with a continuously recording thermometer located at the highest temperature point.
 - 3) Produce a 24 hour chart of the recorded temperature.
 - 4) Place a device with automatic temperature compensation that accurately meters the binder in the line leading to the mixer.
 - 5) Furnish a sampling port on the line between the storage tank and mixer. Supply an additional sampling port between any additive blending device and mixer.
 - f. Mixture Storage and Discharge
 - 1) Provide a surge-storage system to minimize interruptions during operations unless otherwise approved.
 - 2) Furnish a gob hopper or other device to minimize segregation in the bin.
 - 3) Provide an automated system that weighs the mixture upon discharge and produces a ticket showing:
 - a) Date
 - b) Project identification number
 - c) Plant identification
 - d) Mix identification
 - e) Vehicle identification
 - f) Total weight of the load
 - g) Tare weight of the vehicle
 - h) Weight of mixture in each load
 - i) Load number or sequential ticket number for the day
 - g. Truck Scales
 - 1) Provide standard platform scales at an approved location.
5. Weigh-Batch Plants. Provide a mixing plant that complies with Section 2.2.B.4 "Drum-Mix Plants," except as required below:
 - a. Screening and Proportioning

- 1) Provide enough hot bins to separate the aggregate and to control proportioning of the mixture type specified.
 - a) Supply bins that discard excessive and oversized material through overflow chutes.
 - b) Provide safe access for inspectors to obtain samples from the hot bins.
 - b. Aggregate Weigh Box and Batching Scales
 - 1) Provide a weigh box and batching scales to hold and weigh a complete batch of aggregate.
 - 2) Provide an automatic proportioning system with low bin indicators that automatically stop when material level in any bin is not sufficient to complete the batch.
 - c. Asphalt Binder Measuring System
 - 1) Provide bucket and scales of sufficient capacity to hold and weigh binder for 1 batch.
 - d. Mixer
 - 1) Equipment mixers with an adjustable automatic timer that controls the dry and wet mixing period and locks the discharge doors for the required mixing period
 - 2) Furnish a pug mill with a mixing chamber large enough to prevent spillage.
 6. Modified Weigh-Batch Plants. Provide a mixing plant that complies with Section 2.2.B.5. "Weigh-Batch Plants," except as specifically described below.
 - a. Aggregate Feeds
 - 1) Aggregate control is required at the cold feeds. Hot bin screens are not required.
 - b. Surge Bins
 - 1) Provide 1 or more bins large enough to produce 1 complete batch of mixture.
 - c. Hauling Equipment
 - 1) Provide trucks with enclosed sides to prevent asphalt mixture loss.
 - 2) Cover each load of mixture with waterproof tarpaulins.
 - 3) Before use, clean all truck beds to ensure the mixture is not contaminated.
 - 4) When necessary, coat the inside truck beds with an approved release agent from the Owner.
 - d. Placement and Compaction Equipment
 - 1) Provide equipment that does not damage underlying pavement.
 - 2) Comply with laws and regulations concerning overweight vehicles.
 - 3) When permitted, other equipment that will consistently produce satisfactory results may be used.
 7. Asphalt Paver
 - a. General
 - 1) Furnish a paver that will produce a finished surface that meets longitudinal and transverse profile, typical section, and placement requirements.
 - 2) Ensure the paver does not support the weight of any portion of hauling equipment other than the connection.
 - 3) Provide loading equipment that does not transmit vibrations or other motions to the paver that adversely affect the finished pavement quality.
 - 4) Equip the paver with an automatic, dual, longitudinal-grade control system and an automatic, transverse-grade control system.
 - b. Tractor Unit
 - 1) Supply a tractor unit that can push or propel vehicles, dumping directly into the finishing machine to obtain the desired lines and grades to eliminate any hand finishing.
 - 2) Equip the unit with a hitch sufficient to maintain contact between the hauling equipment's rear wheels and the finishing machine's pusher rollers while mixture is unloaded.
 - c. Screed
 - 1) Provide a heated compacting screed that will produce a finished surface that meets longitudinal and transverse profile, typical section, and placement requirements.
 - 2) Screed extensions must provide the same compacting action and heating as the main unit unless otherwise approved.
 - d. Grade Reference
 - 1) Provide a grade reference with enough support that the maximum deflection does not exceed 1/16 inch between supports.
 - 2) Ensure that the longitudinal controls can operate from any longitudinal grade reference including a string line, ski, mobile string line, or matching shoes.
 - 3) Furnish paver skis or mobile string line at least 40 feet long unless otherwise approved.
 8. Material Transfer Devices
 - a. Provide the specified type of device when shown on the Drawings.
 - b. Ensure the devices provide a continuous, uniform mixture flow to the asphalt paver.

- c. When used, provide windrow pick-up equipment constructed to pick up substantially all roadway mixture placed in the windrow.
- 9. Remixing Equipment
 - a. When required, provide equipment that includes a pug mill, variable pitch augers, or variable diameter augers operating under a storage unit with a minimum capacity of 8 tons.
- 10. Motor Grader
 - a. When allowed, provide a self-propelled grader with a blade length of at least 12 feet and a wheelbase of at least 16 feet.
- 11. Handheld Infrared Thermometer
 - a. Provide a handheld infrared thermometer meeting the requirements of Tex-244-F.
- 12. Rollers
 - a. The Contractor may use any type of roller to meet the production rates and quality requirements of the Contract unless otherwise shown on the Drawings or directed.
 - b. When specific types of equipment are required, use equipment that meets the specified requirements.
 - c. Alternate Equipment
 - 1) Instead of the specified equipment, the Contractor may, as approved, operate other compaction equipment that produces equivalent results.
 - 2) Discontinue the use of the alternate equipment and furnish the specified equipment if the desired results are not achieved.
 - d. Owner may require Contractor to substitute equipment if production rate and quality requirements of the Contract are not met.
- 13. Straightedges and Templates. Furnish 10 foot straightedges and other templates as required or approved.
- 14. Distributor vehicles
 - a. Furnish vehicle that can achieve a uniform tack coat placement.
 - b. The nozzle patterns, spray bar height and distribution pressure must work together to produce uniform application.
 - c. The vehicle should be set to provide a "double lap" or "triple lap" coverage.
 - d. Nozzle spray patterns should be identical to one another along the distributor spray bar.
 - e. Spray bar height should remain constant.
 - f. Pressure within the distributor must be capable of forcing the tack coat material out of spray nozzles at a constant rate.
- 15. Coring Equipment
 - a. When coring is required, provide equipment suitable to obtain a pavement specimen meeting the dimensions for testing.
- B. Construction
 - 1. Design, produce, store, transport, place, and compact the specified paving mixture in accordance with the requirements of this Section.
 - 2. Unless otherwise shown on the Drawings, provide the mix design.
 - 3. The Owner will perform quality assurance (QA) testing.
 - 4. Provide quality control (QC) testing as needed to meet the requirements of this Section.
- C. Production Operations
 - 1. General
 - a. The Owner may suspend production for noncompliance with this Section.
 - b. Take corrective action and obtain approval to proceed after any production suspension for noncompliance.
 - 2. Operational Tolerances
 - a. Stop production if testing indicates tolerances are exceeded on any of the following:
 - 1) 3 consecutive tests on any individual sieve
 - 2) 4 consecutive tests on any of the sieves
 - 3) 2 consecutive tests on asphalt content
 - b. Begin production only when test results or other information indicate, to the satisfaction of the Owner, that the next mixture produced will be within Table 9 tolerances.
 - 3. Storage and Heating of Materials

- a. Do not heat the asphalt binder above the temperatures specified in Section 2.2.A. or outside the manufacturer's recommended values.
 - b. On a daily basis, provide the Owner with the records of asphalt binder and hot-mix asphalt discharge temperatures in accordance with Table 10.
 - c. Unless otherwise approved, do not store mixture for a period long enough to affect the quality of the mixture, nor in any case longer than 12 hours.
4. Mixing and Discharge of Materials
 - a. Notify the Owner of the target discharge temperature and produce the mixture within 25 degrees F of the target.
 - b. Monitor the temperature of the material in the truck before shipping to ensure that it does not exceed 350 degrees F. The Owner will not pay for or allow placement of any mixture produced at more than 350 degrees F.
 - c. Control the mixing time and temperature so that substantially all moisture is removed from the mixture before discharging from the plant.
- D. Placement Operations
1. Place the mixture to meet the typical section requirements and produce a smooth, finished surface or base course with a uniform appearance and texture.
 2. Offset longitudinal joints of successive courses of hot mix by at least 6 inches.
 3. Place mixture so longitudinal joints on the surface course coincide with lane lines, or as directed. Ensure that all finished surfaces will drain properly.
 4. When End Dump Trucks are used, ensure the bed does not contact the paver when raised.
 5. Placement can be performed by hand in situations where the paver cannot place it adequately due to space restrictions.
 6. Hand-placing should be minimized to prevent aggregate segregation and surface texture issues.
 7. All hand placement shall be checked with a straightedge or template before rolling to ensure uniformity.
 8. Place mixture within the compacted lift thickness shown in Table 9, unless otherwise shown on the Drawings or otherwise directed.

Table 9
Compacted Lift Thickness and Required Core Height

Mixture Type	Compacted Lift Thickness	
	Minimum (in.)	Maximum (in.)
B	2.00	3.00
C	2.00	2.50
D	1.50	2.00

9. Tack Coat
 - a. Clean the surface before placing the tack coat. Unless otherwise approved, apply tack coat uniformly at the rate directed by the Owner.
 - b. The Owner will set the rate between 0.04 and 0.10 gallons of residual asphalt per square yard of surface area.
 - c. Apply a thin, uniform tack coat to all contact surfaces of curbs, structures, and all joints.
 - d. Prevent splattering of tack coat when placed adjacent to curb, gutter, metal beam guard fence and structures.
 - e. Roll the tack coat with a pneumatic-tire roller when directed.
 - f. The Owner may use Tex-243-F to verify that the tack coat has adequate adhesive properties.
 - g. The Owner may suspend paving operations until there is adequate adhesion.
 - h. The tack coat should be placed with enough time to break or set before applying hot mix asphalt layers.
 - i. Traffic should not be allowed on tack coats.
 - j. When a tacked road surface must be opened to traffic, they should be covered with sand to provide friction and prevent pick-up.
 - k. A typical rate for applying a sand cover is 4 to 8 lbs/square yard.
10. General placement requirements

- a. Material should be delivered to maintain a relatively constant head of material in front of the screed.
- b. The hopper should never be allowed to empty during paving.
- c. Dumping wings between trucks not allowed. Dispose of at end of days production.

E. Lay-Down Operation

1. Minimum Mixture Placement Temperatures. Use Table 10 for minimum mixture placement temperatures.
2. Windrow Operations. When hot mix is placed in windrows, operate windrow pickup equipment so that substantially all the mixture deposited on the roadbed is picked up and loaded into the paver.

Table 10
Suggested Minimum Mixture Placement Temperature

High-Temperature Binder Grade	Minimum Placement Temperature (Before Entering Paver)
PG 64 or lower	260°F
PG 70	270°F
PG 76	280°F
PG 82 or higher	290°F

F. Compaction

1. Use air void control unless ordinary compaction control is specified on the Drawings.
2. Avoid displacement of the mixture. If displacement occurs, correct to the satisfaction of the Owner.
3. Ensure pavement is fully compacted before allowing rollers to stand on the pavement.
4. Unless otherwise directed, use only water or an approved release agent on rollers, tamps, and other compaction equipment.
5. Keep diesel, gasoline, oil, grease, and other foreign matter off the mixture.
6. Unless otherwise directed, operate vibratory rollers in static mode when not compacting, when changing directions, or when the plan depth of the pavement mat is less than 1-1/2 inches.
7. Use tamps to thoroughly compact the edges of the pavement along curbs, headers, and similar structures and in locations that will not allow thorough compaction with the rollers.
8. The Owner may require rolling with a trench roller on widened areas, in trenches, and in other limited areas.
9. Allow the compacted pavement to cool to 160 degrees F or lower before opening to traffic unless otherwise directed.
10. When directed, sprinkle the finished mat with water or limewater to expedite opening the roadway to traffic.
11. Air Void Control
 - a. General
 - 1) Compact dense-graded hot-mix asphalt to contain from 5 percent to 9 percent in-place air voids.
 - 2) Do not increase the asphalt content of the mixture to reduce pavement air voids.
 - b. Rollers
 - 1) Furnish the type, size, and number of rollers required for compaction, as approved.
 - 2) Use a pneumatic-tire roller to seal the surface, unless otherwise shown on the Drawings.
 - 3) Use additional rollers as required to remove any roller marks.
 - c. Air Void Determination
 - 1) Unless otherwise shown on the Drawings, obtain 2 roadway specimens at each location selected by the Owner for in-place air void determination.
 - 2) The Contractor will measure air voids in accordance with Tex-207-F and Tex-227-F.
 - 3) Before drying to a constant weight, cores may be predried using a Corelok or similar vacuum device to remove excess moisture.
 - 4) The Contractor will use the average air void content of the 2 cores to calculate the in-place air voids at the selected location.
 - d. Air Voids Out of Range
 - 1) If the in-place air void content in the compacted mixture is below 5 percent or greater than 9 percent, change the production and placement operations to bring the in-place air void content within requirements.

- e. Test Section
 - 1) Construct a test section of 1 lane-width and at most 0.2 miles in length to demonstrate that compaction to between 5 percent and 9 percent in-place air voids can be obtained.
 - 2) Continue this procedure until a test section with 5 percent to 9 percent in-place air voids can be produced.
 - 3) The Owner will allow only 2 test sections per day.
 - 4) When a test section producing satisfactory in-place air void content is placed, resume full production.
- 12. Ordinary Compaction Control
 - a. Furnish the type, size, and number of rollers required for compaction, as approved. Furnish at least 1 medium pneumatic-tire roller (minimum 12-ton weight).
 - b. Use the control strip method given in Tex-207-F, Part IV, to establish rolling patterns that achieve maximum compaction.
 - c. Follow the selected rolling pattern unless changes that affect compaction occur in the mixture or placement conditions.
 - d. When such changes occur, establish a new rolling pattern.
 - e. Compact the pavement to meet the requirements of the Drawings and specifications.
 - f. When rolling with the 3-wheel, tandem or vibratory rollers, start by first rolling the joint with the adjacent pavement and then continue by rolling longitudinally at the sides.
 - g. Proceed toward the center of the pavement, overlapping on successive trips by at least 1 ft., unless otherwise directed.
 - h. Make alternate trips of the roller slightly different in length.
 - i. On superelevated curves, begin rolling at the low side and progress toward the high side unless otherwise directed.

G. Irregularities

- 1. Identify and correct irregularities including, but not limited to segregation, rutting, raveling, flushing, fat spots, mat slippage, irregular color, irregular texture, roller marks, tears, gouges, streaks, uncoated aggregate particles, or broken aggregate particles.
- 2. The Owner may also identify irregularities, and in such cases, the Owner shall promptly notify the Contractor.
- 3. If the Owner determines that the irregularity will adversely affect pavement performance, the Owner may require the Contractor to remove and replace (at the Contractor's expense) areas of the pavement that contain the irregularities and areas where the mixture does not bond to the existing pavement.
- 4. If irregularities are detected, the Owner may require the Contractor to immediately suspend operations or may allow the Contractor to continue operations for no more than 1 day while the Contractor is taking appropriate corrective action.
- 5. The Owner may suspend production or placement operations until the problem is corrected.
- 6. At the expense of the Contractor and to the satisfaction of the Owner, remove and replace any mixture that does not bond to the existing pavement or that has other surface irregularities identified above.

3.3 REPAIR

- A. See Section 32 01 17.

3.4 QUALITY CONTROL

A. Production Testing

- 1. Perform production tests to verify asphalt paving meets the performance standard required in the Drawings and specifications.
- 2. Contractor to measure density of asphalt paving with nuclear gauge.
- 3. Contractor to core asphalt paving from the normal thickness of section once acceptable density achieved. Owner identifies location of cores.
 - a. Minimum core diameter: 4 inches
 - b. Minimum spacing: 200 feet
 - c. Minimum of 1 core every block
 - d. Alternate lanes between core
- 4. Contractor to use cores to determine pavement thickness and calculate theoretical density.

- a. Contractor to perform theoretical density test a minimum of 1 per day per street.

B. Density Test

1. The average measured density of asphalt paving must meet specified density.
2. Average of measurements per street not meeting the minimum specified strength shall be subject to the money penalties or removal and replacement at the Contractor's expense as show in Table 11.

**Table 11
Density Payment Schedule**

Percent Rice	Percent of Contract Price Allowed
89 and lower	remove and replace at the entire cost and expense of Contractor as directed by Owner.
90	75-percent
91-93	100-percent
94	90-percent
95	75-percent
Over 95	remove and replace at the entire cost and expense of Contractor as directed by Owner.

3. The amount of penalty shall be deducted from payment due to Contractor.
4. These requirements are in addition to the requirements of Article 1.2.

C. Pavement Thickness Test

1. Contractor measure each core thickness by averaging at least 3 measurements.
2. The number of tests and location shall be at the discretion of the Owner, unless otherwise specified in the special provisions or on the Drawings.
3. In the event a deficiency in the thickness of pavement is revealed during production testing, subsequent tests necessary to isolate the deficiency shall be at the Contractor's expense.
4. The cost for additional coring test shall be at the same rate charged by commercial laboratories.
5. Where the average thickness of pavement in the area found to be deficient, payment shall be made at an adjusted price as specified in Table 12.

**Table 12
Thickness Deficiency Penalties**

Deficiency in Thickness Determined by Cores	Proportional Part Of Contract Price
Greater Than 0 percent - Not More than 10 percent	90 percent
Greater Than 10 percent - Not More than 15 percent	80 percent
Greater Than 15 percent	remove and replace at the entire cost and expense of Contractor as directed by Owner.

6. If, in the judgment of the Owner, the area of such deficiency warrants removal, the area shall be removed and replaced, at the Contractor's entire expense, with asphalt paving of the thickness shown on the Drawings.
7. No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by the Drawings.

END OF SECTION

SECTION 32 11 23
FLEXIBLE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Foundation course for surface course or for other base course composed of flexible base constructed in one or more courses in conformity with the typical section.
- B. Deviations from this City of Austin Standard Specification
 - 1. None
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Measurement
 - a. Measurement for this Item will be by the square yard of Flexible Base Course for various:
 - 1) Depths
 - 2) Types
 - 3) Gradations
 - 2. Payment
 - a. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per square yard of Flexible Base Course.
 - 3. The price bid shall include:
 - a. Preparation and correction of subgrade
 - b. Furnishing of material
 - c. Hauling
 - d. Blading
 - e. Sprinkling
 - f. Compacting

1.3 REFERENCES

- A. Definitions

1. RAP – Recycled Asphalt Pavement.

B. Reference Standards

1. Reference standards cited in this specification refer to the current reference standard published at the time of the latest revision date logged at the end of this specification, unless a date is specifically cited.
2. ASTM International (ASTM):
 - a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³))
3. Texas Department of Transportation (TXDOT):
 - a. Tex-104-E, Determining Liquid Limits of Soils
 - b. Tex-106-E, Calculating the Plasticity Index of Soils
 - c. Tex-107-E, Determining the Bar Linear Shrinkage of Soils
 - d. Tex-110-E, Particle Size Analysis of Soils
 - e. Tex-116-E, Ball Mill Method for Determining the Disintegration of Flexible Base Material
 - f. Tex-117-E, Triaxial Compression for Disturbed Soils and Base Materials
 - g. Tex-411-A, Soundness of Aggregate Using Sodium Sulfate or Magnesium Sulfate
 - h. Tex-413-A, Determining Deleterious Material in Mineral Aggregate

PART 2 - PRODUCTS

2.1 CONTRACTOR-FURNISHED PRODUCTS

2.2 MATERIALS

A. General

1. Furnish uncontaminated materials of uniform quality that meet the requirements of the Drawings and specifications.
2. Obtain materials from approved sources.
3. Notify Owner of changes to material sources.
4. The owner may sample and test project materials at any time before compaction throughout the duration of the project to assure specification compliance.

B. Aggregate

1. Furnish aggregate of the type and grade shown on the Drawings and conforming to the requirements of Table 1.
2. Each source must meet Table 1 requirements for liquid limit, Plasticity index, and wet ball mill for the grade specified.
3. Do not use additives such as but not limited to lime, cement, or fly ash to modify aggregates to meet the requirements of Table 1, unless shown on the Drawings.

Table 1
Material Requirements

Property	Test Method	Grade 1	Grade 2
Master gradation sieve size (% retained)	Tex-110-E		
2-1/2 in.		–	0
1-3/4 in.		0	0–10
7/8 in.		10–35	–
3/8 in.		30–50	–
No. 4		45–65	45–75
No. 40		70–85	60–85
Liquid limit, % max. ¹	Tex-104-E	35	40
PlastiCity index, max. ¹	Tex-106-E	10	12
Wet ball mill, % max. ²	Tex-116-E	40	45
Wet ball mill, % max. increase passing the No. 40 sieve		20	20
Classification ³	Tex-117-E	1.0	1.1–2.3
Min. compressive strength ³ , psi			
lateral pressure 0 psi		45	35
lateral pressure 15 psi		175	175

1. Determine plastic index in accordance with Tex-107-E (linear shrinkage) when liquid limit is unattainable as defined in Tex-104-E.

Property	Test Method	Grade 1	Grade 2
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2. When a soundness value is required by the Drawings, test material in accordance with Tex-411-A.

3. Meet both the classification and the minimum compressive strength, unless otherwise shown on the Drawings.

4. Material Tolerances

- a. The City may accept material if no more than 1 of the 5 most recent gradation tests has an individual sieve outside the specified limits of the gradation.
- b. When target grading is required by the Drawings, no single failing test may exceed the master grading by more than 5 percentage points on sieves No. 4 and larger or 3 percentage points on sieves smaller than No. 4.
- c. The City may accept material if no more than 1 of the 5 most recent plasticity index tests is outside the specified limit. No single failing test may exceed the allowable limit by more than 2 points.

5. Material Types

- a. Do not use fillers or binders unless approved.
- b. Furnish the type specified on the Drawings in accordance with the following:
 - 1) Type A
 - a) Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source.
 - b) Do not use gravel or multiple sources.
 - 2) Type B
 - a) Only for use as base material for temporary pavement repairs.
 - b) Do not exceed 20 percent RAP by weight unless shown on Drawings.
 - 3) Type D
 - a) Type A material or crushed concrete.
 - b) Crushed concrete containing gravel will be considered Type D material.
 - c) The City may require separate dedicated stockpiles in order to verify compliance.
 - d) Crushed concrete must meet the following requirements:
 - (1) Table 1 for the grade specified.

- (2) Recycled materials must be free from reinforcing steel and other objectionable material and have at most 1.5 percent deleterious material when tested in accordance with TEX-413-A.

C. Water

1. Furnish water free of industrial wastes and other objectionable matter.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION

A. General

1. Shape the subgrade or existing base to conform to the typical sections shown on the Drawings or as directed.
2. When new base is required to be mixed with existing base:
 - a. Deliver, place, and spread the new flexible base in the required amount.
 - b. Manipulate and thoroughly mix the new base with existing material to provide a uniform mixture to the specified depth before shaping.

B. Subgrade Compaction

1. Proof roll the roadbed before pulverizing or scarifying in accordance with the following:
 - a. Proof Rolling
 - 1) City Project Representative must be on-site during proof rolling operations.
 - 2) Use equipment that will apply sufficient load to identify soft spots that rut or pump.
 - a) Acceptable equipment includes fully loaded single-axle water truck with a 1500 gallon capacity.
 - 3) Make at least 2 passes with the proof roller (down and back = 1 pass).
 - 4) Offset each trip by at most 1 tire width.
 - 5) If an unstable or non-uniform area is found, correct the area.
 - b. Correct
 - 1) Soft spots that rut or pump greater than 3/4 inch
 - 2) Areas that are unstable or non-uniform
2. Installation of base material cannot proceed until compacted subgrade approved by the City.

3.4 INSTALLATION

A. General

1. Construct each layer uniformly, free of loose or segregated areas, and with the required density and moisture content.
2. Provide a smooth surface that conforms to the typical sections, lines, and grades shown on the Drawings or as directed.
3. Haul approved flexible base in clean, covered trucks.

B. Equipment

1. General

- a. Provide machinery, tools, and equipment necessary for proper execution of the work.

2. Rollers

- a. The Contractor may use any type of roller to meet the production rates and quality requirements of the Contract unless otherwise shown on the Drawings or directed.
- b. When specific types of equipment are required, use equipment that meets the specified requirements.
- c. Alternate Equipment.
 - 1) Instead of the specified equipment, the Contractor may, as approved, operate other compaction equipment that produces equivalent results.
 - 2) Discontinue the use of the alternate equipment and furnish the specified equipment if the desired results are not achieved.
- d. City may require Contractor to substitute equipment if production rate and quality requirements of the Contract are not met.

C. Placing

1. Spread and shape flexible base into a uniform layer by approved means the same day as delivered unless otherwise approved.
2. Place material such that it is mixed to minimize segregation.
3. Construct layers to the thickness shown on the Drawings, while maintaining the shape of the course.
4. Where subbase or base course exceeds 6 inches in thickness, construct in 2 or more courses of equal thickness.
5. Minimum lift depth: 3 inches
6. Control dust by sprinkling.
7. Correct or replace segregated areas as directed.
8. Place successive base courses and finish courses using the same construction methods required for the first course.

D. Compaction

1. General

- a. Compact using density control unless otherwise shown on the Drawings.
- b. Multiple lifts are permitted when shown on the Drawings or approved.
- c. Bring each layer to the moisture content directed. When necessary, sprinkle the material to the extent necessary to provide not less than the required density.
- d. Compact the full depth of the subbase or base to the extent necessary to remain firm and stable under construction equipment.

2. Rolling

- a. Begin rolling longitudinally at the sides and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the roller unit.
- b. On superelevated curves, begin rolling at the low side and progress toward the high side.
- c. Offset alternate trips of the roller.
- d. Operate rollers at a speed between 2 and 6 mph as directed.
- e. Rework, recompact, and refinish material that fails to meet or that loses required moisture, density, stability, or finish before the next course is placed or the project is accepted.
- f. Continue work until specification requirements are met.
- g. Proof roll the compacted flexible base in accordance with the following:

1) Proof Rolling

- a) City Project Representative must be on-site during proof rolling operations.
- b) Use equipment that will apply sufficient load to identify soft spots that rut or pump.
 - (1) Acceptable equipment includes fully loaded single-axle water truck with a 1500 gallon capacity.
- c) Make at least 2 passes with the proof roller (down and back = 1 pass).
- d) Offset each trip by at most 1 tire width.
- e) If an unstable or non-uniform area is found, correct the area.

2) Correct

- a) Soft spots that rut or pump greater than 3/4 inch.
- b) Areas that are unstable or non-uniform.

3. Tolerances

- a. Maintain the shape of the course by blading.
- b. Completed surface shall be smooth and in conformity with the typical sections shown on the Drawings to the established lines and grades.

- c. For subgrade beneath paving surfaces, correct any deviation in excess of 1/4 inch in cross section in length greater than 16 feet measured longitudinally by loosening, adding or removing material. Reshape and recompact by sprinkling and rolling.
- d. Correct all fractures, settlement or segregation immediately by scarifying the areas affected, adding suitable material as required. Reshape and recompact by sprinkling and rolling.
- e. Should the subbase or base course, due to any reason, lose the required stability, density and finish before the surfacing is complete, it shall be recompact at the sole expense of the Contractor.

4. Density Control

- a. Minimum Density: 95 percent compaction as determined by ASTM D698.
- b. Moisture content: minus 2 to plus 4 of optimum.

E. Finishing

- 1. After completing compaction, clip, skin, or tight-blade the surface with a maintainer or subgrade trimmer to a depth of approximately 1/4 inch.
- 2. Remove loosened material and dispose of it at an approved location.
- 3. Seal the clipped surface immediately by rolling with an appropriate size pneumatic tire roller until a smooth surface is attained.
- 4. Add small increments of water as needed during rolling.
- 5. Shape and maintain the course and surface in conformity with the typical sections, lines, and grades as shown on the Drawings or as directed.
- 6. In areas where surfacing is to be placed, correct grade deviations greater than 1/4 inch in 16 feet measured longitudinally or greater than 1/4 inch over the entire width of the cross-section.
- 7. Correct by loosening, adding, or removing material.
- 8. Reshape and recompact in accordance with 3.4.C.

3.5 REPAIR/RESTORATION [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 QUALITY CONTROL

A. Density Test

- 1. City to measure density of flexible base course.
 - a. Notify City Project Representative when flexible base ready for density testing.
 - b. Spacing directed by City (1 per block minimum).
 - c. City Project Representative determines location of density testing.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Finished pavement constructed of portland cement concrete including monolithically poured curb on the prepared subgrade or other base course.
- B. Deviations from this City of Austin Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract
 - 2. Division 1 - General Requirements
 - 3. Section 32 01 29 - Concrete Paving Repair
 - 4. Section 32 13 73 - Concrete Paving Joint Sealants

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement
 - 1. Measurement
 - a. Measurement for this Item shall be by the square yard of completed and accepted Concrete Pavement in its final position as measured from back of curb for various:
 - 1) Classes
 - 2) Thicknesses
 - 2. Payment
 - a. The work performed and materials furnished in accordance with this Item will be paid for at the unit price bid per square yard of Concrete Pavement.
 - 3. The price bid shall include:
 - a. Shaping and fine grading the placement area
 - b. Furnishing and applying all water required
 - c. Furnishing, loading and unloading, storing, hauling and handling all concrete ingredients including all freight and royalty involved
 - d. Mixing, placing, finishing and curing all concrete
 - e. Furnishing and installing all reinforcing steel

- f. Furnishing all materials and placing longitudinal, warping, expansion, and contraction joints, including all steel dowels, dowel caps and load transmission units required, wire and devices for placing, holding and supporting the steel bar, load transmission units, and joint filler material in the proper position; for coating steel bars where required by the Drawings
- g. Sealing joints
- h. Monolithically poured curb
- i. Cleanup

1.3 REFERENCES

A. Reference Standards

1. Reference standards cited in this specification refer to the current reference standard published at the time of the latest revision date logged at the end of this specification, unless a date is specifically cited.
2. ASTM International (ASTM):
 - a. A615/A615M, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - b. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - c. C33, Concrete Aggregates
 - d. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - e. C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - f. C94/C94M, Standard Specifications for Ready-Mixed Concrete
 - g. C150, Portland Cement
 - h. C156, Water Retention by Concrete Curing Materials
 - i. C172, Standard Practice for Sampling Freshly Mixed Concrete
 - j. C260, Air Entraining Admixtures for Concrete
 - k. C309, Liquid Membrane-Forming Compounds for Curing Concrete, Type 2
 - l. C494, Chemical Admixtures for Concrete, Types "A", "D", "F" and "G"
 - m. C618, Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Concrete
 - n. C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
 - o. C1064, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
 - p. C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
 - q. D698, Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
3. American Concrete Institute (ACI):
 - a. ACI 305.1-06 Specification for Hot Weather Concreting

- b. ACI 306.1-90, Standard Specification for Cold Weather Concreting
- c. ACI 318

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

- A. Mix Design: submit for approval. See Item 2.4.A.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD CONDITIONS

A. Weather Conditions

1. Place concrete when concrete temperature is between 40 and 100 degrees when measured in accordance with ASTM C1064 at point of placement.
2. Hot Weather Concreting
 - a. Take immediate corrective action or cease paving when the ambient temperature exceeds 95 degrees.
 - b. Concrete paving operations shall be approved by the City when the concrete temperature exceeds 100 degrees. See Standard Specification for Hot Weather Concreting (ACI 305.1-06).
3. Cold Weather Concreting
 - a. Do not place when ambient temp in shade is below 40 degrees and falling. Concrete may be placed when ambient temp is above 35 degrees and rising or above 40 degrees.
 - b. Concrete paving operations shall be approved by the City when ambient temperature is below 40 degrees. See Standard Specification for Cold Weather Concreting (ACI 306.1-90).

- B. Time: Place concrete after sunrise and no later than shall permit the finishing of the pavement in natural light, or as directed by the City.

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS [NOT USED]

2.2 MATERIALS

- A. Cementitious Material: ASTM C150.
- B. Aggregates: ASTM C33.

C. Water: ASTM C1602.

D. Admixtures: When admixtures are used, conform to the appropriate specification:

1. Air-Entraining Admixtures for Concrete: ASTM C260.
2. Chemical Admixtures for Concrete: ASTM C494, Types "A", "D", "F" and "G."
3. Fly Ash
 - a. Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete: ASTM C618.
 - b. Fly ash may be substituted at one pound per pound of cement up to 25% of the specified cement content when such batch design is approved by the Engineer.

E. Steel Reinforcement: ASTM A615.

F. Steel Wire Reinforcement: Not used for concrete pavement.

G. Dowels and Tie Bars

1. Dowel and tie bars: ASTM A615.
2. Dowel Caps
 - a. Provide dowel caps with enough range of movement to allow complete closure of the expansion joint.
 - b. Caps for dowel bars shall be of the length shown on the Drawings and shall have an internal diameter sufficient to permit the cap to freely slip over the bar.
 - c. In no case shall the internal diameter exceed the bar diameter by more 1/8 inch, and one end of the cap shall be rightly closed.
3. Epoxy for Dowel and Tie Bars: ASTM C881.
 - a. See following table for approved producers of epoxies and adhesives

Pre-Qualified Producers of Epoxies and Adhesives	
Product Name	Producer
Concresive 1420	BASF
HTE-50	Hilti
T 308 +	Powers Fasteners
P E 1000+	Powers Fasteners
C-6	Ramset-Redhead
Epcon G-5	Ramset-Redhead
Pro-Poxy-300 Fast Tube	Unitex
Shep-Poxy TxIII	CMC Construction Services

Ultrabond 1300 Tubes	Adhesives Technology
Ultrabond 2300 N.S. A-22-2300 Slow Set	Adhesives Technology
Dynapoxy EP-430	Pecora Corp.
EDOT	Simpson Strong Tie
ET22	Simpson Strong Tie
SET 22	Simpson Strong Tie
SpecPoxy 3000FS	SpecChem

b. Epoxy Use, Storage and Handling

- 1) Package components in airtight containers and protect from light and moisture.
- 2) Include detailed instructions for the application of the material and all safety information and warnings regarding contact with the components.
- 3) Epoxy label requirements
 - a) Resin or hardener components
 - b) Brand name
 - c) Name of manufacturer
 - d) Lot or batch number
 - e) Temperature range for storage
 - f) Date of manufacture
 - g) Expiration date
 - h) Quantity contained
- 4) Store epoxy and adhesive components at temperatures recommended by the manufacturer.
- 5) Do not use damaged or previously opened containers and any material that shows evidence of crystallization, lumps skinning, extreme thickening, or settling of pigments that cannot be readily dispersed with normal agitation.
- 6) Follow sound environmental practices when disposing of epoxy and adhesive wastes.
- 7) Dispose of all empty containers separately.
- 8) Dispose of epoxy by completely emptying and mixing the epoxy before disposal

H. Reinforcement Bar Chairs

1. Reinforcement bar chairs or supports shall be of adequate strength to support the reinforcement bars and shall not bend or break under the weight of the reinforcement bars or Contractor's personnel walking on the reinforcing bars.
2. Bar chairs may be made of metal (free of rust), precast mortar or concrete blocks or plastic.

3. For approval of plastic chairs, representative samples of the plastic shall show no visible indications of deterioration after immersion in a 5-percent solution of sodium hydroxide for 120-hours.
4. Bar chairs may be rejected for failure to meet any of the requirements of this specification.

I. Joint Filler

1. Joint filler is the material placed in concrete pavement and concrete structures to allow for the expansion and contraction of the concrete.
2. Wood Boards: Used as joint filler for concrete paving.
 - a. Boards for expansion joint filler shall be of the required size, shape and type indicated on the Drawings or required in the specifications.
 - 1) Boards shall be of selected stock of redwood or cypress. The boards shall be sound heartwood and shall be free from sapwood, knots, clustered birdseyes, checks and splits.
 - 2) Joint filler, boards, shall be smooth, flat and straight throughout, and shall be sufficiently rigid to permit ease of installation.
 - 3) Boards shall be furnished in lengths equal to the width between longitudinal joints, and may be furnished in strips or scored sheet of the required shape.
3. Dimensions. The thickness of the expansion joint filler shall be shown on the Drawings; the width shall be not less than that shown on the Drawings, providing for the top seal space.
4. Rejection. Expansion joint filler may be rejected for failure to meet any of the requirements of this specification.

J. Joint Sealants. Provide Joint Sealants in accordance with Section 32 13 73.

K. Curing Materials

1. Membrane-Forming Compounds.
 - a. Conform to the requirements of ASTM C309, Type 2, white pigmented compound and be of such nature that it shall not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete.
 - b. The compound shall produce a firm, continuous uniform moisture-impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete.
 - c. It shall, when applied to the damp concrete surface at the specified rate of coverage, dry to touch in 1 hour and dry through in not more than 4 hours under normal conditions suitable for concrete operations.
 - d. It shall adhere in a tenacious film without running off or appreciably sagging.
 - e. It shall not disintegrate, check, peel or crack during the required curing period.
 - f. The compound shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.
 - g. The compound shall be delivered to the job site in the manufacturer's original containers only, which shall be clearly labeled with the manufacturer's name, the trade name of the material and a batch number or symbol with which test samples may be correlated.

- h. When tested in accordance with ASTM C156 Water Retention by Concrete Curing Materials, the liquid membrane-forming compound shall restrict the loss of water present in the test specimen at the time of application of the curing compound to not more than 0.01-oz.-per-2 inches of surface.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL

A. Mix Design

1. Concrete Mix Design and Control

- a. At least 10 calendar days prior to the start of concrete paving operations, the Contractor shall submit a design of the concrete mix it proposes to use and a full description of the source of supply of each material component.
- b. The design of the concrete mix shall produce a quality concrete complying with these specifications and shall include the following information:
 - 1) Design Requirements and Design Summary
 - 2) Material source
 - 3) Dry weight of cement/cubic yard and type
 - 4) Dry weight of fly ash/cubic yard and type, if used
 - 5) Saturated surface dry weight of fine and coarse aggregates/cubic yard
 - 6) Design water/cubic yard
 - 7) Quantities, type, and name of admixtures with manufacturer's data sheets
 - 8) Current strength tests or strength tests in accordance with ACI 318
 - 9) Current Sieve Analysis and -200 Decantation of fine and coarse aggregates and date of tests
 - 10) Fineness modulus of fine aggregate
 - 11) Specific Gravity and Absorption Values of fine and coarse aggregates
 - 12) L.A. Abrasion of coarse aggregates
- c. Once mix design approved by City, maintain intent of mix design and maximum water to cement ratio.
- d. No concrete may be placed on the job site until the mix design has been approved by the City.

2. Quality of Concrete

- a. Consistency
 - 1) In general, the consistency of concrete mixtures shall be such that:
 - a) Mortar shall cling to the coarse aggregate
 - b) Aggregate shall not segregate in concrete when it is transported to the place of deposit

- c) Concrete, when dropped directly from the discharge chute of the mixer, shall flatten out at the center of the pile, but the edges of the pile shall stand and not flow
 - d) Concrete and mortar shall show no free water when removed from the mixer
 - e) Concrete shall slide and not flow into place when transported in metal chutes at an angle of 30 degrees with the horizontal
 - f) Surface of the finished concrete shall be free from a surface film or laitance
- 2) When field conditions are such that additional moisture is needed for the final concrete surface finishing operation, the required water shall be applied to the surface by hand sprayer only and be held to a minimum amount.
 - 3) The concrete shall be workable, cohesive, possess satisfactory finishing qualities and be of the stiffest consistency that can be placed and vibrated into a homogeneous mass.
 - 4) Excessive bleeding shall be avoided.
 - 5) If the strength or consistency required for the class of concrete being produced is not secured with the minimum cement specified or without exceeding the maximum water/cement ratio, the Contractor may use, or the City may require, an approved cement dispersing agent (water reducer); or the Contractor shall furnish additional aggregates, or aggregates with different characteristics, or the Contractor may use additional cement in order to produce the required results.
 - 6) The additional cement may be permitted as a temporary measure, until aggregates are changed and designs checked with the different aggregates or cement dispersing agent.
 - 7) The Contractor is solely responsible for the quality of the concrete produced.
 - 8) The City reserves the right to independently verify the quality of the concrete through inspection of the batch plant, testing of the various materials used in the concrete and by casting and testing concrete cylinders or beams on the concrete actually incorporated in the pavement.
- b. Standard Class
 - 1) Unless otherwise shown on the Drawings or detailed specifications, the standard class for concrete paving for streets and alleys is shown in the following table:

Standard Classes of Pavement Concrete

Class of Concrete ¹	Minimum Cementitious, Lb./CY	28 Day Min. Compressive, Strength ² psi	Maximum Water/ Cementitious, Ratio	Course Aggregate Maximum Size inch
P	517	3600	0.49	1-1/2
H	564	4500	0.45	1-1/2

1.All exposed horizontal concrete shall have entrained-air.

2.Minimum Compressive Strength Required.

2) Machine-Laid concrete: Class P

3) Hand-Laid concrete: Class H

c. High Early Strength Concrete (HES)

1) When shown on the Drawings or allowed, provide Class HES concrete for very early opening of pavements area or leaveouts to traffic.

2) Design class HES to meet the requirements of class specified for concrete pavement and a minimum compressive strength of 2,600 psi in 24 hours, unless other early strength and time requirements are shown on the Drawings allowed.

3) No strength overdesign is required.

Standard Classes of Pavement Concrete

Class of Concrete ¹	Minimum Cementitious Lb./CY	28 Day Min. Compressive Strength ² psi	Maximum Water/ Cementitious Ratio	Course Aggregate Maximum Size, inch
HES	564	4500	0.45	1-1/2

d. Slump

1) Slump requirements for pavement and related concrete shall be as specified in the following table:

Concrete Pavement Slump Requirements

Concrete Use	Recommended Design and Placement Slump, inch	Maximum Acceptable Placement Slump, inch
Slip-Form/Form-Riding Paving	1-1/2	3
Hand Formed Paving	4	5
Sidewalk, Curb and Gutter, Concrete Valley Gutter and Other Miscellaneous Concrete	4	5

- 2) No concrete shall be permitted with slump in excess of the maximums shown.
- 3) Any concrete mix failing to meet the above consistency requirements, although meeting the slump requirements, shall be considered unsatisfactory, and the mix shall be changed to correct such unsatisfactory conditions.

PART 3 - EXECUTION

3.3 INSTALLATION

A. Equipment

1. All equipment necessary for the construction of this item shall be on the project.
2. The equipment shall include spreading devices (augers), internal vibration, tamping, and surface floating necessary to finish the freshly placed concrete in such a manner as to provide a dense and homogeneous pavement.
3. Machine-Laid Concrete Pavement
 - a. Fixed-Form Paver. Fixed-form paving equipment shall be provided with forms that are uniformly supported on a very firm subbase to prevent sagging under the weight of machine.
 - b. Slip-Form Paver
 - 1) Slip-form paving equipment shall be provided with traveling side forms of sufficient dimensions, shape and strength so as to support the concrete laterally for a sufficient length of time during placement.
 - 2) City may reject use of Slip-Form Paver if paver requires over-digging and impacts trees, mailboxes or other improvements.
4. Hand-Laid Concrete Pavement
 - a. Machines that do not incorporate these features, such as roller screeds or vibrating screeds, shall be considered tools to be used in hand-laid concrete construction, as slumps, spreading methods, vibration, and other procedures are more common to hand methods than to machine methods.

5. City may reject equipment and stop operation if equipment does not meet requirements.

B. Concrete Mixing and Delivery

1. Transit Batching: shall not be used – onsite mixing not permitted

2. Ready Mixed Concrete

- a. The concrete shall be produced in an approved method conforming to the requirements of this specification and ASTM C94/C94M. City shall have access ready mix to get samples of materials.
- b. City shall have access to ready mix plant to obtain material samples.
- c. When ready-mix concrete is used, sample concrete per ASTM C94 Alternate Procedure 2:
 - 1) As the mixer is being emptied, individual samples shall be taken after the discharge of approximately 15 percent and 85 percent of the load.
 - 2) The method of sampling shall provide that the samples are representative of widely separated portions, but not from the very ends of the batch.
- d. The mixing of each batch, after all materials are in the drum, shall continue until it produces a thoroughly mixed concrete of uniform mass as determined by established mixer performance ratings and inspection, or appropriate uniformity tests as described in ASTM C94.
- e. The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch.
- f. Retempering or remixing shall not be permitted.

3. Delivery

- a. Deliver concrete at an interval not exceeding 30 minutes or as determined by City to prevent cold joint.

4. Delivery Tickets

- a. For all operations, the manufacturer of the concrete shall, before unloading, furnish to the purchaser with each batch of concrete at the site a delivery ticket on which is printed, stamped, or written, the following information to determine that the concrete was proportioned in accordance with the approved mix design:
 - 1) Name of concrete supplier
 - 2) Serial number of ticket
 - 3) Date
 - 4) Truck number
 - 5) Name of purchaser
 - 6) Specific designation of job (name and location)
 - 7) Specific class, design identification and designation of the concrete in conformance with that employed in job specifications
 - 8) Amount of concrete in cubic yards

- 9) Time loaded or of first mixing of cement and aggregates
- 10) Water added by receiver of concrete
- 11) Type and amount of admixtures

C. Subgrade

1. When manipulation or treatment of subgrade is required on the Drawings, the work shall be performed in proper sequence with the preparation of the subgrade for pavement.
2. The roadbed shall be excavated and shaped in conformity with the typical sections and to the lines and grades shown on the Drawings or established by the City.
3. All holes, ruts and depressions shall be filled and compacted with suitable material and, if required, the subgrade shall be thoroughly wetted and reshaped.
4. Irregularities of more than 1/2 inch., as shown by straightedge or template, shall be corrected.
5. The subgrade shall be uniformly compacted to at least 95 percent of the maximum density as determined by ASTM D698.
6. Moisture content shall be within minus 2 percent to plus 4 percent of optimum.
7. The prepared subgrade shall be wetted down sufficiently in advance of placing the pavement to ensure its being in a firm and moist condition.
8. Sufficient subgrade shall be prepared in advance to ensure satisfactory prosecution of the work.
9. The Contractor shall notify the City at least 24 hours in advance of its intention to place concrete pavement.
10. After the specified moisture and density are achieved, the Contractor shall maintain the subgrade moisture and density in accordance with this Section.
11. In the event that rain or other conditions may have adversely affected the condition of the subgrade or base, additional tests may be required as directed by the City.

D. Placing and Removing Forms

1. Placing Forms

a. Forms for machine-laid concrete

- 1) The side forms shall be metal, of approved cross section and bracing, of a height no less than the prescribed edge thickness of the concrete section, and a minimum of 10 feet in length for each individual form.
- 2) Forms shall be of ample strength and staked with adequate number of pins capable of resisting the pressure of concrete placed against them and the thrust and the vibration of the construction equipment operating upon them without appreciable springing, settling or deflection.
- 3) The forms shall be free from warps, bends or kinks and shall show no variation from the true plane for face or top.

- 4) Forms shall be jointed neatly and tightly and set with exactness to the established grade and alignment.
 - 5) Forms shall be set to line and grade at least 200 feet, where practicable, in advance of the paving operations.
 - 6) In no case shall the base width be less than 8 inches for a form 8 inches or more in height.
 - 7) Forms must be in firm contact with the subgrade throughout their length and base width.
 - 8) If the subgrade becomes unstable, forms shall be reset, using heavy stakes or other additional supports may be necessary to provide the required stability.
- b. Forms for hand-laid concrete
- 1) Forms shall extend the full depth of concrete and be a minimum of 1-1/2 inches in thickness or equivalent when wooden forms are used, or be of a gauge that shall provide equivalent rigidity and strength when metal forms are used.
 - 2) For curves with a radius of less than 250 feet, acceptable flexible metal or wood forms shall be used.
 - 3) All forms showing a deviation of 1/8 inch in 10 feet from a straight line shall be rejected.
2. Settling. When forms settle over 1/8 inch under finishing operations, paving operations shall be stopped the forms reset to line and grade and the pavement then brought to the required section and thickness.
 3. Cleaning. Forms shall be thoroughly cleaned after each use.
 4. Removal.
 - a. Forms shall remain in place until the concrete has taken its final set.
 - b. Avoid damage to the edge of the pavement when removing forms.
 - c. Repair damage resulting from form removal and honeycombed areas with a mortar mix within 24 hours after form removal unless otherwise approved.
 - d. Clean joint face and repair honeycombed or damaged areas within 24 hours after a bulkhead for a transverse construction joint has been removed unless otherwise approved.
 - e. When forms are removed before 72 hours after concrete placement, promptly apply membrane curing compound to the edge of the concrete pavement.

E. Placing Reinforcing Steel, Tie, and Dowel Bars

1. General
 - a. When reinforcing steel tie bars, dowels, etc., are required they shall be placed as shown on the Drawings.
 - b. All reinforcing steel shall be clean, free from rust in the form of loose or objectionable scale, and of the type, size and dimensions shown on the Drawings.
 - c. Reinforcing bars shall be securely wired together at the alternate intersections and all splices and shall be securely wired at each intersection dowel and load-transmission unit intersected.
 - d. All bars shall be installed in their required position as shown on the Drawings.

- e. The storing of reinforcing or structural steel on completed roadway slabs generally shall be avoided and, where permitted, such storage shall be limited to quantities and distribution that shall not induce excessive stresses.
2. Splices
- a. Provide standard reinforcement splices by lapping and tying ends.
 - b. Comply with ACI 318 for minimum lap of spliced bars where not specified on the Drawings.
3. Installation of Reinforcing Steel
- a. All reinforcing bars and bar mats shall be installed in the slab at the required depth below the finished surface and supported by and securely attached to bar chairs installed on prescribed longitudinal and transverse centers as shown by sectional and detailed drawings on the Drawings.
 - b. Chairs Assembly. The chair assembly shall be similar and equal to that shown on the Drawings and shall be approved by the City prior to extensive fabrication.
 - c. After the reinforcing steel is securely installed above the subgrade as specified in Drawings and as herein prescribed, no loading shall be imposed upon the bar mats or individual bars before or during the placing or finishing of the concrete.
4. Installation of Dowel Bars
- a. Install through the predrilled joint filler and rigidly support in true horizontal and vertical positions by an assembly of bar chairs and dowel baskets.
 - b. Dowel Baskets
 - 1) The dowels shall be held in position exactly parallel to surface and centerline of the slab, by a dowel basket that is left in the pavement.
 - 2) The dowel basket shall hold each dowel in exactly the correct position so firmly that the dowel's position cannot be altered by concreting operations.
 - c. Dowel Caps
 - 1) Install cap to allow the bar to move not less than 1-1/4 inch in either direction.
5. Tie Bar and Dowel Placement
- a. Place at mid-depth of the pavement slab, parallel to the surface.
 - b. Place as shown on the Drawings.
6. Epoxy for Tie and Dowel Bar Installation
- 1) Epoxy bars as shown on the Drawings.
 - 2) Use only drilling operations that do not damage the surrounding operations.
 - 3) Blow out drilled holes with compressed air.
 - 4) Completely fill the drilled hole with approved epoxy before inserting the tie bar into the hole.
 - 5) Install epoxy grout and bar at least 6 inches embedded into concrete.

F. Joints

1. Joints shall be placed where shown on the Drawings or where directed by the City.
2. The plane of all joints shall make a right angle with the surface of the pavement.
3. No joints shall have an error in alignment of more than 1/2 inch at any point.
4. Joint Dimensions
 - a. The width of the joint shall be shown on the Drawings, creating the joint sealant reservoir.
 - b. The depth of the joint shall be shown on the Drawings.
 - c. Dimensions of the sealant reservoir shall be in accordance with manufacturer's recommendations.
 - d. After curing, the joint sealant shall be 1/8 inch to 1/4 inch below the pavement surface at the center of the joint.
5. Transverse Expansion Joints
 - a. Expansion joints shall be installed perpendicularly to the surface and to the centerline of the pavement at the locations shown on the Drawings, or as approved by the City.
 - b. Joints shall be of the design width, and spacing shown on the Drawings, or as approved by the City.
 - c. Dowel bars, shall be of the size and type shown on the Drawings, or as approved by the City, and shall be installed at the specified spacing.
 - d. Support dowel bars with dowel baskets.
 - e. Dowels shall restrict the free opening and closing of the expansion joint and shall not make planes of weaknesses in the pavement.
 - f. Greased Dowels for Expansion Joints.
 - 1) Coat dowels with a thin film of grease or other approved de-bonding material.
 - 2) Provide dowel caps on the lubricated end of each dowel bar.
 - g. Proximity to Existing Structures. When the pavement is adjacent to or around existing structures, expansions joints shall be constructed in accordance with the details shown on the Drawings.
6. Transverse Contraction Joints
 - a. Contraction or dummy joints shall be installed at the locations and at the intervals shown on the Drawings.
 - b. Joints shall be of the design width, and spacing shown on the Drawings, or as approved by the City.
 - c. Dowel bars, shall be of the size and type shown on the Drawings, or as approved by the City, and shall be installed at the specified spacing.
 - d. Joints shall be sawed into the completed pavement surface as soon after initial concrete set as possible so that some raveling of the concrete is observed in order for the sawing process to prevent uncontrolled shrinkage cracking.

- e. The joints shall be constructed by sawing to a 1/4 inch width and to a depth of 1/3 inch (1/4 inch permitted if limestone aggregate used) of the actual pavement thickness, or deeper if so indicated on the Drawings.
- f. Complete sawing as soon as possible in hot weather conditions and within a maximum of 24 hours after saw cutting begins under cool weather conditions.
- g. If sharp edge joints are being obtained, the sawing process shall be sped up to the point where some raveling is observed.
- h. Damage by blade action to the slab surface and to the concrete immediately adjacent to the joint shall be minimized.
- i. Any portion of the curing membrane which has been disturbed by sawing operations shall be restored by spraying the areas with additional curing compound.

7. Transverse Construction Joints

- a. Construction joints formed at the close of each day's work or when the placing of concrete has been stopped for 30-minutes or longer shall be constructed by use of metal or wooden bulkheads cut true to the section of the finished pavement and cleaned.
- b. Wooden bulkheads shall have a thickness of not less than 2-inch stock material.
- c. Longitudinal bars shall be held securely in place in a plane perpendicular to the surface and at right angles to the centerline of the pavement.
- d. Edges shall be rounded to 1/4 inch radius.
- e. Any surplus concrete on the subgrade shall be removed upon the resumption of the work.

8. Longitudinal Construction Joints

- a. Longitudinal construction joints shall be of the type shown on the Drawings.

9. Joint Filler

- a. Joint filler shall be as specified in 2.2.1 of the size and shape shown on the Drawings.
- b. Redwood Board joints shall be used for all pavement joints except for expansion joints that are coincident with a butt joint against existing pavements.
- c. Boards with less than 25-percent of moisture at the time of installation shall be thoroughly wetted on the job.
- d. Green lumber of much higher moisture content is desirable and acceptable.
- e. The joint filler shall be appropriately drilled to admit the dowel bars when required.
- f. The bottom edge of the filler shall extend to or slightly below the bottom of the slab. The top edge shall be held approximately 1/2 inch below the finished surface of the pavement in order to allow the finishing operations to be continuous.
- g. The joint filler may be composed of more than one length of board in the length of joint, but no board of a length less than 6 foot may be used unless otherwise shown on the Drawings.
- h. After the removal of the side forms, the ends of the joints at the edges of the slab shall be carefully opened for the entire depth of the slab.

10. Joint Sealing. Routine pavement joints shall be filled consistent with paving details and as specified in Section 32 13 73. Materials shall generally be handled and applied according to the manufacturer's recommendations as specified in Section 32 13 73.

G. Placing Concrete

1. Unless otherwise specified in the Drawings, the finished pavement shall be constructed monolithically and constructed by machined laid method unless impractical.
2. The concrete shall be rapidly deposited on the subgrade in successive batches and shall be distributed to the required depth and for the entire width of the pavement by shoveling or other approved methods.
3. Any concrete not placed as herein prescribed within the time limits in the following table will be rejected. Time begins when the water is added to the mixer.

Temperature – Time Requirements

Concrete Temperature (at point of placement)	Max Time – minutes (no retarding agent)	Max Time – minutes (with retarding agent) ¹
Non-Agitated Concrete		
All temperatures	45	45
Agitated Concrete		
Above 90°F	Time may be reduced by City	75
Above 75°F thru 90°F	60	90
75°F and Below	60	120

¹ Normal dosage of retarder.

4. Rakes shall not be used in handling concrete.
5. At the end of the day, or in case of unavoidable interruption or delay of more than 30 minutes or longer to prevent cold joints, a transverse construction joint shall be placed in accordance with 3.4.F.7 of this Section.
6. Honeycombing
 - a. Special care shall be taken in placing and spading the concrete against the forms and at all joints and assemblies so as to prevent honeycombing.
 - b. Excessive voids and honeycombing in the edge of the pavement, revealed by the removal of the side forms, may be cause for rejection of the section of slab in which the defect occurs.

H. Finishing

1. Machine

a. Tolerance Limits

- 1) While the concrete is still workable, it shall be tested for irregularities with a 10 foot straightedge placed parallel to the centerline of the pavement so as to bridge depressions and to touch all high spots.
- 2) Ordinates measured from the face of the straightedge to the surface of the pavement shall at no place exceed 1/16 inch-per-foot from the nearest point of contact.
- 3) In no case shall the maximum ordinate to a 10 foot straightedge be greater than 1/8 inch.
- 4) Any surface not within the tolerance limits shall be reworked and refinished.

b. Edging

- 1) The edges of slabs and all joints requiring edging shall be carefully tooled with an edger of the radius required by the Drawings at the time the concrete begins to take its "set" and becomes non-workable.
- 2) All such work shall be left smooth and true to lines.

2. Hand

- a. Hand finishing permitted only in intersections and areas inaccessible to a finishing machine.
- b. When the hand method of striking off and consolidating is permitted, the concrete, as soon as placed, shall be approximately leveled and then struck off with screed bar to such elevation above grade that, when consolidated and finished, the surface of the pavement shall be at the grade elevation shown on the Drawings.
- c. A slight excess of material shall be kept in front of the cutting edge at all times.
- d. The straightedge and joint finishing shall be as prescribed herein.

I. Curing

1. The curing of concrete pavement shall be thorough and continuous throughout the entire curing period.
2. Failure to provide proper curing as herein prescribed shall be considered as sufficient cause for immediate suspension of the paving operations.
3. The curing method as herein specified does not preclude the use of any of the other commonly used methods of curing, and the City may approve another method of curing if so requested by the Contractor.
4. If any selected method of curing does not afford the desired results, the City shall have the right to order that another method of curing be instituted.
5. After removal of the side forms, the sides of the slab shall receive a like coating before earth is banked against them.
6. The solution shall be applied, under pressure with a spray nozzle, in such a manner as to cover the entire surfaces thoroughly and completely with a uniform film.

7. The rate of application shall be such as to ensure complete coverage and shall not exceed 20-square-yards-per-gallon of curing compound.
8. When thoroughly dry, it shall provide a continuous and flexible membrane, free from cracks or pinholes, and shall not disintegrate, check, peel or crack during the curing period.
9. If for any reason the seal is broken during the curing period, it shall be immediately repaired with additional sealing solution.
10. When tested in accordance with ASTM C156 Water Retention by Concrete Curing Materials, the curing compound shall provide a film which shall have retained within the test specimen a percentage of the moisture present in the specimen when the curing compound was applied according to the following.
11. Contractor shall maintain and properly repair damage to curing materials on exposed surfaces of concrete pavement continuously for a least 72 hours.

J. Monolithic Curbs

1. Concrete for monolithic curb shall be the same as for the pavement and, if carried back from the paving mixer, shall be placed within 20-minutes after being mixed.
2. After the concrete has been struck off and sufficiently set, the exposed surfaces shall be thoroughly worked with a wooden flat.
3. The exposed edges shall be rounded by the use of an edging tool to the radius indicated on the Drawings.
4. All exposed surfaces of curb shall be brushed to a smooth and uniform surface.

K. Alley Paving

1. Alley paving shall be constructed in accordance with the specifications for concrete paving hereinbefore described, in accordance with the details shown on the Drawings, and with the following additional provisions:
 - a. Alley paving shall be constructed to the typical cross sections shown on the Drawings.
 - b. Transverse expansion joints of the type shown on the Drawings shall be constructed at the property line on each end of the alley with a maximum spacing of 600 feet.
 - c. Transverse contraction and dummy joints shall be placed at the spacing shown on the Drawings.
 - d. Contraction and dummy joints shall be formed in such a manner that the required joints shall be produced to the satisfaction of the City.
 - e. All joints shall be constructed in accordance with this specification and filled in accordance with the requirement of Section 32 13 73.

L. Pavement Leaveouts

1. Pavement leaveouts as necessary to maintain and provide for local traffic shall be provided at location indicated on the Drawings or as directed by the City.

2. The extent and location of each leaveout required and a suitable crossover connection to provide for traffic movements shall be determined in the field by the City.

3.4 REPAIR

- A. Repair of concrete pavement concrete shall be consistent with the Drawings and as specified in Section 32 01 29.

3.5 RE-INSTALLATION [NOT USED]

3.7 SITE QUALITY CONTROL

A. Concrete Placement

1. Place concrete using a fully automated paving machine. Hand paving only permitted in areas such as intersections where use of paving machine is not practical
 - a. All concrete pavement not placed by hand shall be placed using a fully automated paving machine as approved by the City.
 - b. Screeds will not be allowed except if approved by the City.

B. Testing of Materials

1. Samples of all materials for test shall be made at the expense of the City, unless otherwise specified in the special provisions or in the Drawings.
2. In the event the initial sampling and testing does not comply with the specifications, all subsequent testing of the material in order to determine if the material is acceptable shall be at the Contractor's expense at the same rate charged by the commercial laboratories.
3. All testing shall be in accordance with applicable ASTM Standards and concrete testing technician must be ACI certified or equivalent.

C. Pavement Thickness Test

1. Upon completion of the work and before final acceptance and final payment shall be made, pavement thickness test shall be made by the City.
2. The number of tests and location shall be at the discretion of the City, unless otherwise specified in the special provisions or on the Drawings.
3. The cost for the initial pavement thickness test shall be the expense of the City.
4. In the event a deficiency in the thickness of pavement is revealed during normal testing operations, subsequent tests necessary to isolate the deficiency shall be at the Contractor's expense.
5. The cost for additional coring test shall be at the same rate charged by commercial laboratories.
6. Where the average thickness of pavement in the area found to be deficient in thickness by more than 0.20 inch, but not more than 0.50 inch, payment shall be made at an adjusted price as specified in the following table.

Deficiency in Thickness Determined by Cores	Proportional Part Of Contract Price
Inches	Allowed
0.00 – 0.20	100 percent
0.21 – 0.30	80 percent
0.31 – 0.40	70 percent
0.41 – 0.50	60 percent

7. Any area of pavement found deficient in thickness by more than 0.50 inch but not more than 0.75 inch or 1/10 of the thickness specified on the Drawings, whichever is greater, shall be evaluated by the City.
8. If, in the judgment of the City the area of such deficiency should not be removed and replaced, there shall be no payment for the area retained.
9. If, in the judgment of the City, 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 Drawings.
10. Any area of pavement found deficient in thickness by more than 0.75 inch or more than 1/10 of the plan thickness, whichever is greater, shall be removed and replaced, at the Contractor's entire expense, with concrete of the thickness shown on the Drawings.
11. No additional payment over the contract unit price shall be made for any pavement of a thickness exceeding that required by the Drawings.

D. Pavement Strength Test

1. During the progress of the work the City shall provide trained technicians to cast test cylinders for conforming to ASTM C31, to maintain a check on the compressive strengths of the concrete being placed.
2. After the cylinders have been cast, they shall remain on the job site and then transported, moist cured, and tested by the City in accordance with ASTM C31 and ASTM C39.
3. In each set, 1 of the cylinders shall be tested at 7 days, 2 cylinders shall be tested at 28 days, and 1 cylinder shall be held or tested at 56 days, if necessary.
4. If the 28 day test results indicate deficient strength, the Contractor may, at its option and expense, core the pavement in question and have the cores tested by an approved laboratory, in accordance with ASTM C42 and ACI 318 protocol, except the average of all cores must meet 100 percent of the minimum specified strength, with no individual core resulting in less than 90 percent of design strength, to override the results of the cylinder tests.
5. Cylinders and/or cores must meet minimum specified strength. If cylinders do not meet minimum specified strength, additional cores shall be taken to identify the limits of deficient concrete pavement at the expense of the Contractor.

6. Cylinders and/or cores must meet minimum specified strength. Pavement not meeting the minimum specified strength shall be subject to the money penalties or removal and placement at the Contractor's expense as show in the following table.

Percent Deficient	Percent of Contract Price Allowed
Greater Than 0 percent - Not More Than 10 percent	90-percent
Greater Than 10 percent - Not More Than 15 percent	80-percent
Greater Than 15 percent	0-percent or removed and replaced at the entire cost and expense of Contractor as directed by City

7. The amount of penalty shall be deducted from payment due to Contractor; such as penalty deducted is to defray the cost of extra maintenance.
8. The strength requirements for structures and other concrete work are not altered by the special provision.
9. No additional payment over the contract unit price shall be made for any pavement of strength exceeding that required by the Drawings and/or specifications.

E. Cracked Concrete Acceptance Policy

1. If cracks exist in concrete pavement upon completion of the project, the Project Inspector shall make a determination as to the need for action to address the cracking as to its cause and recommended remedial work.
2. If the recommended remedial work is routing and sealing of the cracks to protect the subgrade, the Inspector shall make the determination as to whether to rout and seal the cracks at the time of final inspection and acceptance or at any time prior to the end of the project maintenance period. The Contractor shall perform the routing and sealing work as directed by the Project Inspector, at no cost to the City, regardless of the cause of the cracking.
3. If remedial work beyond routing and sealing is determined to be necessary, the Inspector and the Contractor will attempt to agree on the cause of the cracking. If agreement is reached that the cracking is due to deficient materials or workmanship, the Contractor shall perform the remedial work at no cost to the City. Remedial work in this case shall be limited to removing and replacing the deficient work with new material and workmanship that meets the requirements of the contract.
4. If remedial work beyond routing and sealing is determined to be necessary, and the Inspector and the Contractor agree that the cause of the cracking is not deficient materials or workmanship, the City may request the Contractor to provide an estimate of the cost of the necessary remedial work and/or additional work to address the cause of the cracking, and the Contractor will perform that work at the agreed-upon price if the City elects to do so.
5. If remedial work is necessary, and the Inspector and the Contractor cannot agree on the cause of the cracking, the City may hire an independent geotechnical engineer to perform testing and analysis to determine the cause of the cracking. The contractor will escrow 50 percent of the

proposed costs of the geotechnical contract with the City. The Contractor and the City shall use the services of a geotechnical firm acceptable to both parties.

6. If the geotechnical engineer determines that the primary cause of the cracking is the Contractor's deficient material or workmanship, the remedial work will be performed at the Contractor's entire expense and the Contractor will also reimburse the City for the balance of the cost of the geotechnical investigation over and above the amount that has previously been escrowed. Remedial work in this case shall be limited to removing and replacing the deficient work with new material and workmanship that meets the requirements of the contract.
7. If the geotechnical engineer determines that the primary cause of the cracking is not the Contractor's deficient material or workmanship, the City will return the escrowed funds to the Contractor. The Contractor, on request, will provide the City an estimate of the costs of the necessary remedial work and/or additional work and will perform the work at the agreed-upon price as directed by the City.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pavement Markings
 - a. Thermoplastic, hot-applied, spray (HAS) pavement markings
 - b. Thermoplastic, hot-applied, extruded (HAE) pavement markings
 - c. Preformed polymer tape
 - d. Preformed heat-activated thermoplastic tape
 - 2. Raised markers
 - 3. Work zone markings
 - 4. Removal of pavement markings and markers
- B. Deviations from this City of Austin Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Pavement Markings
 - a. Measurement
 - 1) Measurement for this Item shall be per linear foot of material placed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" shall be paid for at the unit price bid per linear foot of "Pvmt Marking" installed for:
 - a) Various Widths
 - b) Various Types
 - c) Various Materials
 - d) Various Colors
 - c. The price bid shall include:
 - 1) Installation of Pavement Marking
 - 2) Glass beads, when required
 - 3) Surface preparation
 - 4) Clean-up
 - 5) Testing (when required)
 - 2. Fire Lane Markings
 - a. Measurement
 - 1) Measurement for this Item shall be per the linear foot.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" shall be paid for at the unit price bid per linear foot of "Fire Lane Marking" installed.
 - c. The price bid shall include:
 - 1) Surface preparation
 - 2) Clean-up
 - 3) Testing
 - 3. Pavement Marking Removal
 - a. Measurement

- 1) Measure for this Item shall be per linear foot.
- b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" shall be paid for at the unit price bid per linear foot of "Remove Pvmnt Marking" performed for:
 - a) Various widths
- c. The price bid shall include:
 - 1) Removal of Pavement Markings
 - 2) Clean-up

1.3 REFERENCES

A. Reference Standards

1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
2. Texas Manual on Uniform Traffic Control Devices (MUTCD), 2011 Edition
 - a. Part 3, Markings
3. American Association of State Highway and Transportation Officials (AASHTO)
 - a. Standard Specification for Glass Beads Used in Pavement Markings, M 247-09
4. Federal Highway Administration (FHWA)
 - a. 23 CFR Part 655, FHWA Docket No. FHWA-2009-0139
5. Texas Department of Transportation (TxDOT)
 - a. DMS-4200, Pavement Markers (Reflectorized)
 - b. DMS-4300, Traffic Buttons
 - c. DMS-8220, Hot Applied Thermoplastic
 - d. DMS-8240, Permanent Prefabricated Pavement Markings
 - e. DMS-8241, Removable Prefabricated Pavement Markings
 - f. DMS-8242, Temporary Flexible-Reflective Road Marker Tabs

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. All submittals shall be approved by the Owner prior to delivery and/or fabrication for specials.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 1. The Contractor shall secure and maintain a location to store the material in accordance with Section 01 50 00.

PART 2 - PRODUCTS

2.1 OWNER-SUPPLIED PRODUCTS

- A. New Products
 1. Refer to Drawings to determine if there are owner-supplied products for the Project.

2.2 MATERIALS

- A. Manufacturers
 1. Only the manufacturers as listed in the City's Standard Products List will be considered.
 - a. The manufacturer must comply with this Specification and related Sections.
 2. Any product that is not listed on the Standard Products List is considered a substitution and shall be submitted for review.
- B. Materials
 1. Pavement Markings

- a. Thermoplastic, hot applied, spray
 - 1) Refer to Drawings and City Standard Detail Drawings for width of longitudinal lines.
 - 2) Product shall be especially compounded for traffic markings.
 - 3) When placed on the roadway, the markings shall not be slippery when wet, lift from pavement under normal weather conditions nor exhibit a tacky exposed surface.
 - 4) Cold ductility of the material shall permit normal road surface expansion and contraction without chipping or cracking.
 - 5) The markings shall retain their original color, dimensions and placement under normal traffic conditions at road surface temperatures of 158 degrees Fahrenheit and below.
 - 6) Markings shall have uniform cross-section, clean edges, square ends and no evidence of tracking.
 - 7) The density and quality of the material shall be uniform throughout the markings.
 - 8) The thickness shall be uniform throughout the length and width of the markings.
 - 9) The markings shall be 95 percent free of holes and voids, and free of blisters for a minimum of 60 days after application.
 - 10) The material shall not deteriorate by contact with sodium chloride, calcium chloride or other chemicals used to prevent roadway ice or because of the oil content of pavement markings or from oil droppings or other effects of traffic.
 - 11) The material shall not prohibit adhesion of other thermoplastic markings if, at some future time, new markings are placed over existing material.
 - a) New material shall bond itself to the old line in such a manner that no splitting or separation takes place.
 - 12) The markings placed on the roadway shall be completely retroreflective both internally and externally with traffic beads and shall exhibit uniform retro-directive reflectance.
 - 13) Traffic beads
 - a) Manufactured from glass
 - b) Spherical in shape
 - c) Essentially free of sharp angular particles
 - d) Essentially free of particles showing cloudiness, surface scoring or surface scratching
 - e) Water white in color
 - f) Applied at a uniform rate
 - g) Meet or exceed Specifications shown in AASHTO Standard Specification for Glass Beads Used in Pavement Markings, AASHTO Designation: M 247-09.
- b. Thermoplastic, hot applied, extruded
 - 1) Product shall be especially compounded for traffic markings
 - 2) When placed on the roadway, the markings shall not be slippery when wet, lift from pavement under normal weather conditions nor exhibit a tacky exposed surface.
 - 3) Cold ductility of the material shall permit normal road surface expansion and contraction without chipping or cracking.
 - 4) The markings shall retain their original color, dimensions and placement under normal traffic conditions at road surface temperatures of 158 degrees Fahrenheit and below.
 - 5) Markings shall have uniform cross-section, clean edges, square ends and no evidence of tracking.
 - 6) The density and quality of the material shall be uniform throughout the markings.
 - 7) The thickness shall be uniform throughout the length and width of the markings.
 - 8) The markings shall be 95 percent free of holes and voids, and free of blisters for a minimum of 60 days after application.
 - 9) The minimum thickness of the marking, as measured above the plane formed by the pavement surface, shall not be less than 1/8 inch in the center of the marking and 3/32 inch at a distance of 1/2 inch from the edge.
 - 10) Maximum thickness shall be 3/16 inch.
 - 11) The material shall not deteriorate by contact with sodium chloride, calcium chloride or other chemicals used to prevent roadway ice or because of the oil content of pavement markings or from oil droppings or other effects of traffic.
 - 12) The material shall not prohibit adhesion of other thermoplastic markings if, at some future time, new markings are placed over existing material. New material shall bond itself to the old line in such a manner that no splitting or separation takes place.
 - 13) The markings placed on the roadway shall be completely retroreflective both internally and externally with traffic beads and shall exhibit uniform retro-directive reflectance.
 - 14) Traffic beads

- a) Manufactured from glass
 - b) Spherical in shape
 - c) Essentially free of sharp angular particles
 - d) Essentially free of particles showing cloudiness, surface scoring or surface scratching
 - e) Water white in color
 - f) Applied at a uniform rate
 - g) Meet or exceed Specifications shown in AASHTO Standard Specification for Glass Beads Used in Pavement Markings, AASHTO Designation: M 247-09.
- c. Preformed Polymer Tape
 - 1) Material shall meet or exceed the Specifications for SWARCO Director 35, 3M High Performance Tape Series 3801 ES, or approved equal.
 - d. Preformed Heat-Activated Thermoplastic Tape
 - 1) Material shall meet or exceed the Specifications for HOT Tape Brand 0.125 mil preformed thermoplastic or approved equal.

2.3 SOURCE QUALITY CONTROL

A. Performance

1. Minimum maintained retroreflectivity levels for longitudinal markings shall meet the requirements detailed in the table below for a minimum of 30 calendar days.

	Posted Speed (mph)		
	≤ 30	35 – 50	≥ 55
2-lane roads with centerline markings only (1)	n/a	100	250
All other roads (2)	n/a	50	100

(1) Measured at standard 30-m geometry in units of mcd/m²/lux.

(2) Exceptions:

A. When raised reflective pavement markings (RRPMs) supplement or substitute for a longitudinal line, minimum pavement marking retroreflectivity levels are not applicable as long as the RRPMs are maintained so that at least 3 are visible from any position along that line during nighttime conditions.

B. When continuous roadway lighting assures that the markings are visible, minimum pavement marking retroreflectivity levels are not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Pavement Conditions

1. Roadway surfaces shall be free of dirt, grease, loose and/or flaking existing markings and other forms of contamination.
2. New Portland cement concrete surfaces shall be cleaned sufficiently to remove the curing membrane.
3. Pavement to which material is to be applied shall be completely dry.
4. Pavement shall be considered dry, if, on a sunny day after observation for 15 minutes, no condensation develops on the underside of a 1 square foot piece of clear plastic that has been placed on the pavement and weighted on the edges.
5. Equipment and methods used for surface preparation shall not damage the pavement or present a hazard to motorists or pedestrians.

3.2 INSTALLATION

A. General

1. The materials shall be applied according to the manufacturer's recommendations.

2. Markings and markers shall be applied within temperature limits recommended by the material manufacturer, and shall be applied on clean, dry pavement having a surface temperature above 50 degrees Fahrenheit.
3. Markings that are not properly applied due to faulty application methods or being placed in the wrong position or alignment shall be removed and replaced by the Contractor at the Contractor's expense. If the mistake is such that it would be confusing or hazardous to motorists, it shall be remedied the same day of notification. Notification will be made by phone and confirmed by fax. Other mistakes shall be remedied within 5 days of written notification.
4. When markings are applied on roadways open to traffic, care will be taken to ensure that proper safety precautions are followed, including the use of signs, cones, barricades, flaggers, etc.
5. Freshly applied markings shall be protected from traffic damage and disfigurement.
6. Temperature of the material must be equal to the temperature of the road surface before allowing traffic to travel on it.

B. Pavement Markings

1. Thermoplastic, hot applied, spray
 - a. This method shall be used to install and replace long lines – centerlines, lane lines, edge lines, turn lanes, and dots.
 - b. Markings shall be applied at a 110 mil thickness.
 - c. Markings shall be applied at a 90 mil thickness when placed over existing markings.
 - d. A sealer shall be used if concrete or asphalt is older than three (3) years.
 - e. Typical setting time shall be between 4 minutes and 10 minutes depending upon the roadway surface temperature and the humidity factor.
 - f. Retroreflective raised markers shall be used to supplement the centerlines, lane lines, and turn lanes. Refer to City Standard Detail Drawings for placement.
 - g. Minimum retroreflectivity of markings shall meet or exceed values shown in subparagraph 2.4.A.1 of this Specification.
2. Thermoplastic, hot applied, extruded
 - a. This method shall be used to install and replace crosswalks and stop-lines.
 - b. Markings shall be applied at a 125 mil thickness.
 - c. Minimum retroreflectivity of markings shall meet or exceed values shown in this Specification.
3. Preformed Polymer Tape
 - a. This method shall be used to install and replace crosswalks, stop-lines, and legends.
 - b. The applied marking shall adhere to the pavement surface with no slippage or lifting and have square ends, straight lines and clean edges.
 - c. Minimum retroreflectivity of markings shall meet or exceed values shown in this Specification.
4. Preformed Heat-Activated Thermoplastic Tape
 - a. This method shall be used to install and replace crosswalks, stop-lines, and legends.
 - b. The applied marking shall adhere to the pavement surface with no slippage or lifting and have square ends, straight lines and clean edges.
 - c. Minimum retroreflectivity of markings shall meet or exceed values shown in this Specification.

C. Raised Markers

1. All permanent raised pavement markers on Portland Cement roadways shall be installed with epoxy adhesive. Bituminous adhesive is not acceptable.
2. All permanent raised pavement markers on new asphalt roadways may be installed with epoxy or bituminous adhesive.
3. A chalk line, chain or equivalent shall be used during layout to ensure that individual markers are properly aligned. All markers shall be placed uniformly along the line to achieve a smooth continuous appearance.

3.3 REMOVALS

1. Pavement Marking and Marker Removal
 - a. The industry's best practice shall be used to remove existing pavement markings and markers.
 - b. If the roadway is being damaged during the marker removal, Work shall be halted until consultation with the Owner.
 - c. Removals shall be done in such a manner that color and texture contrast of the pavement surface will be held to a minimum.

- d. Repair damage to asphaltic surfaces, such as spalling, shelling, etc., greater than ¼ inch in depth resulting from the removal of pavement markings and markers. Driveway patch asphalt emulsion may be broom applied to reseal damage to asphaltic surfaces.
- e. Dispose of markers in accordance with federal, state, and local regulations.
- f. Use any of the following methods unless otherwise shown on the Drawings.
 - 1) Surface Treatment Method
 - a) Apply surface treatment at rates shown on the Drawings or as directed. Place a surface treatment a minimum of 2 feet wide to cover the existing marking.
 - b) Place a surface treatment, thin overlay, or microsurfacing a minimum of 1 lane in width in areas where directional changes of traffic are involved or in other areas as directed by the Owner.
 - 2) Burn Method
 - a) Use an approved burning method.
 - b) For thermoplastic pavement markings or prefabricated pavement markings, heat may be applied to remove the bulk of the marking material prior to blast cleaning.
 - c) When using heat, avoid spalling pavement surfaces.
 - d) Sweeping or light blast cleaning may be used to remove minor residue.
 - 3) Blasting Method
 - a) Use a blasting method such as water blasting, abrasive blasting, water abrasive blasting, shot blasting, slurry blasting, water-injected abrasive blasting, or brush blasting as approved.
 - b) Remove pavement markings on concrete surfaces by a blasting method only.
 - 4) Mechanical Method
 - a) Use any mechanical method except grinding.
 - b) Flail milling is acceptable in the removal of markings on asphalt and concrete surfaces.
- 2. If a location is to be paved over, no additional compensation will be allowed for marking or marker removal.

3.4 REPAIR / RESTORATION [NOT USED]

3.5 RE-INSTALLATION [NOT USED]

3.6 FIELD QUALITY CONTROL

- A. All lines must have clean edges, square ends, and be uniform cross-section.
- B. The density and quality of markings shall be uniform throughout their thickness.
- C. The applied markings shall have no more than 5 percent, by area, of holes or voids and shall be free of blisters.

3.7 SYSTEM STARTUP [NOT USED]

3.8 ADJUSTING [NOT USED]

3.9 CLEANING

- A. Contractor shall clean up and remove all loose material resulting from construction operations.

END OF SECTION