

**SECTION 11**  
**FULL-DEPTH ASPHALT CONCRETE RECYCLING**

**11-1 GENERAL** - The work covered by this section of the specifications consists of furnishing all labor, equipment and materials and performing all operations in connection with pulverizing, mixing, handling, grading, and compacting existing asphalt concrete, subgrade, and subbase materials to construct a new roadway subgrade structural section.

**11-2 EQUIPMENT** - Contractor shall furnish equipment capable of completely pulverizing the existing asphalt concrete surface, subgrade, and subbase materials to a well-graded, thoroughly mixed materials consisting of dirt and rock particles no greater than two (2) inches in greatest dimension. Any incidental procedures required to conform to these provisions, such as operating the equipment at a slow speed and making multiple passes over the same area, shall be at Contractor's sole cost.

**11-3 PULVERIZING AND MIXING** - Contractor shall pulverize the existing roadway structural section and subbase to the depth and dimensions shown on the plans to produce a well-graded and thoroughly-mixed material. Any visible particle greater than two (2) inches in greatest dimension shall be removed from the mixture prior to and during the subsequent grading and compacting operations.

Contractor's attention is directed to the existence of underground utilities and provisions of Section 7, "Existing Utilities," of the General Provisions of the Standard Specifications. Contractor shall pothole to confirm the location and depth of all utilities to confirm the proper clearance to ensure that said facilities will not be damaged by the pulverizing operation.

**11-4 STOCKPILING AND REPLACEMENT** - Where shown to be required by the Plans, the pulverized materials shall be removed and stockpiled to allow for the excavation of the native subbase to the lines and grades on the plans and in accordance to the Special Provisions. The excavated area shall then be compacted to not less than 90% relative compaction per California Test Method No. 216. The stockpiled pulverized materials shall be moisture-conditioned, placed, and graded, then compacted to not less than 95% relative compaction per California Test Method No. 216 to form a new roadway subgrade. The finished surface of the subgrade shall not vary by more than 0.05' from the grades shown on the Plans or established by the Engineer.

All excess pulverized materials shall become the property of the Contractor and shall be disposed of in accordance with Section 6-16, "Disposal Outside Project Limits," of the General Provisions. In the event that additional materials are required to achieve the lines and grades on the Plans, Contractor shall furnish class II aggregate base conforming to Section 8, "Aggregate Base," of these Technical Provisions. Said materials shall be furnished at no additional costs to the City.

All excavated roadway areas shall have pulverized material subgrade complete and compacted in place per these provisions by the end of each work day and prior to opening the roadway to public traffic. All roadways shall be open to public traffic at the end of each work day.

**11-5 CEMENT TREATMENT** - Work shall consist of spreading cement and mixing into pulverized materials, grading, shaping, trimming and compacting the mixture as specified by these provisions and directed by the Engineer.

**11-5.1 Cement Additive** - Cement additive shall be Portland Cement Type II, conforming to Section 90-1.02B(2), "Cement," of the State Specifications and the requirements of ASTM Test Method C-150.

**11-5.2 Spreading and Mixing** - Cement treatment work shall not be allowed while the atmospheric temperature is below fifty (50) degrees Fahrenheit.

Cement shall be distributed on the pulverized material over an area that can be mixed, compacted, and finish graded within the same working period (day). Cement shall be added in a dry state to the pulverized material at the rate of five (5) pounds per cubic foot of the pulverized mixture, and every precaution shall be taken to prevent dust. The rate of cement spread shall not vary by more than  $\pm$  five (5) percent from the above designated rate. Cement shall be furnished in bulk and spread by computer-controlled mechanical equipment. Tailgate spreading of the cement shall not be permitted. The spreader truck shall demonstrate the ability to maintain a constant computer-controlled spread rate over variable travel speeds. A pan test shall be conducted by the Contractor, in the presence of the Engineer, to demonstrate and verify the spread rate and the computer's calibration. The pan shall be provided by the Contractor and shall be at least 1x3 square feet in size.

No traffic other than the mixing equipment or other related construction equipment shall be allowed to pass over the spread cement until after completion of mixing. Once cement is spread, a minimum of two (2) mixing passes will be

required. The mixing machine shall be a cross-shaft-type mixer capable of providing a uniform, homogeneous mixture throughout the depth and to the grade indicated on the Plans. The mixing machine shall be capable of automatically adjusting itself to maintain a constant mixing depth. On the initial mix, a water truck shall be attached to the mixing machine with a solid connection. The water shall be injected directly into the mixing chamber and shall produce a homogenous blend free from streaks or pockets of dry cement. Leakage of water from the equipment shall not be permitted. Care shall be exercised to avoid the addition of any excess water. When mixed material, exclusive of one (1) inch or larger clods, is sprayed with a phenolphthalein alcohol solution, areas showing no color reaction shall be considered evidence of inadequate mixing. The entire mixing operation shall be completed within two (2) hours of the initial spreading of cement, unless otherwise permitted by the Engineer.

The mixed material shall be placed such that after compaction only minor trimming is needed to achieve the finished grade shown on the Plans. Extensive cutting and filling of material from high areas to low areas shall not be allowed.

**11-5.3 Compacting and Finish Grading** - Shaping, compacting, and finish grading of the materials shall commence immediately upon satisfactory mixing of the cement. Initial compaction shall be by a sheepsfoot or segmented wheel roller with a minimum weight of ten (10) tons. Compaction shall be accompanied by sufficient blading to eliminate all irregularities in the surface and grading plane. Finish grading and compaction by steel-drum rollers shall immediately follow. All excess materials above the final grade tolerance shall be removed prior to final compaction. All trimmed surfaces shall receive finish rolling consisting of at least one (1) complete pass. No vibratory rollers shall be allowed. The final subgrade shall have a 95% relative compaction based on California Test Method No. 216.

The finished subgrade surface shall not vary by more than 0.05' from the grades shown on the plans or established by the Engineer. Contractor shall complete all grading of cement-treated areas on the same day of the treatment. Contractor shall micro-crack the treated subgrade with a ten (10)-ton smooth drum vibratory roller twenty-four (24) hours after final compaction.

**11-5.4 Curing** - After final finish grading of the cement treated material, it shall be kept moist until the asphalt concrete paving operation begins. The material shall be cured for a minimum period of forty-eight (48) hours before asphalt concrete paving can begin. The Contractor shall carefully monitor the curing operation to prevent over saturation of the base material, and keep the surface moist enough to minimize dust resulting from vehicle traffic. When the cement treated surface is left exposed over weekends or holidays, the contractor shall provide at his own costs suitable equipment and personnel to monitor and maintain proper moisture levels on the treated surface to allow for proper curing and dust control.

The staging and storing of equipment and materials on the cement-treated base shall not be permitted. The Contractor shall make every effort to stage his work to minimize construction equipment and garbage and recycling truck impacts on the treated material.

All cement treated areas shall be paved with the asphalt concrete base course within three (3) working days after the minimum cure time. All base failures that develop after this time shall be repaired by the Contractor at no cost to the City as specified below.

**11-5.5 Proof Rolling and Base Repair** - Prior to paving, Contractor shall proof-roll the finished subgrade surface using a ten (10)-ton smooth drum roller to detect and locate unstable (pumping) areas. Unstable areas shall be excavated to a depth of at least six (6) inches and backfilled with asphalt concrete per Section 9-5 of the Technical Provisions prior to paving. Repairs of said unstable areas shall be paid as "Extra Work" per Section 9-3 of the General Provisions of these Specifications, or per square foot of "Street Failed Area Repair" per Section 5 of these Technical Provisions or the Project Special Provisions, whichever resulting in the lower cost to City.

**11-6 PUBLIC SAFETY** - Prior to opening the roadway to public traffic, the Contractor shall ensure that no vertical joints or elevation deviation remain in areas open to vehicles. The Contractor shall construct all necessary temporary ramps at intersections with driveways and side streets, longitudinal and transverse joints, and roadway conform lines. Temporary ramps shall be constructed of pulverized materials or aggregate base to conform to the elevation of the adjacent existing surface and tapered on a slope of 30:1 horizontal to vertical, or flatter. At driveways, ramps may be tapered to a 12:1 slope, spanning the entire driveway or twenty (20) feet, whichever is wider. The ramps shall be compacted to produce a smooth riding surface. Temporary ramps in conflict with the next sequence of work shall be removed prior to said work. During the work day, access to driveways shall be provided temporarily within fifteen (15) minutes of a request by the Engineer.

During all phases of work the roadway surface shall be bladed to a smooth surface suitable for vehicular traffic at the end of each work day. Utility structures that protrude above the graded surface shall have ramps along all edges to allow for the safe passage of vehicles. Placement of barricades, cones, and other traffic warning devices around utility facilities shall not be acceptable as a means to satisfy safe traffic passage.

**11-7 MEASUREMENT** - Pulverizing and mixing of the existing roadway structural section and subbase; and stockpiling, handling, replacement, grading, and compacting of the pulverized mixture materials shall all be measured by the cubic yard of final structural subgrade in place as provided for in the Bid Proposal. Cement treatment shall be measured by the square foot of treated subgrade area as provided in the Bid Proposal.

**11-8 PAYMENT** - The contract unit price paid per cubic yard for pulverizing, mixing, and grading, together with the contract unit price paid per square foot for cement treatment when specified, shall include full compensation for furnishing all labor, materials, tools, and equipment, and doing all other incidental work involved in recycling the existing roadway structural section and subbase to create a new structural subgrade as specified, and no additional payment should be made therefor.