Prep-Before-Striping and Preparing a Grooved Inlaid Slot To Recess Pavement Markings Specifications

Scope:
These specifications describe the prep-before-striping process controls to achieve the correct (1) slot cut width and length, (2) groove depth and (3) slot base or bed surface profile SP roughness, (4) surface soundness and (5) cleanliness to assure the successful bond between the marking and the surface.

The prep-before-striping specifications are to be intentionally separate from the pavement marking materials application specification portion of the project to assure all parties (Contractor, Engineer and Inspector) have clear guidelines and expectations on what is the acceptable and not acceptable pavement surface conditions for the new markings application. The details of the location of this work shall be designated on the plan drawings or as required by the Engineer. The Contractor and Engineer should evaluate the surfaces prior to commencing work so that all parties can acknowledge and record existing pavement and/or joint conditions. The Contractor shall schedule and coordinate the surface-prep work with the Engineer prior to the start of any pavement marking work.

Prep-Before-Striping:
This surface preparation work includes the removal of any laitance, dirt, oil, films, paint, coatings, cure, sealer, sound and unsound asphalt and other materials that will interfere with the adhesion or penetration of any applied sealer, coating, marking material or groove-inlaid slot.

Removing prior markings (obliteration) for Re-Marking in SAME location:
Before re-marking over existing markings in the same location make certain that the existing markings meets current marking dimensional sizes and are not excessively thick, loose, flaking or blistering, have excessive cracking, chipping or discoloration, have poor pavement adhesion, loss of reflectivity or vehicular damage. If these conditions are not met, then the markings shall be permanently removed and replaced. If these conditions are met, confirm with the manufacturer if the new markings are compatible with the existing markings prior to remarking.

Removing prior markings (obliteration) for Re-Marking in NEW location:
If markings must be removed and not re-applied in the same location, the markings must be removed using a method that will not cause deep scars where water can accumulate or pond. Since the removal process naturally leaves some surface scars especially on undulated surfaces, the Engineer will determine the limits and percentages of pavement marking removal to include the removal of any material that is poorly bonded, peeling or flaking. All traces of removed markings that may conflict with any new markings, shall be removed and the remaining surface shall be left approximating the contiguous surface (as is expressed as a Surface Profile Number) with only surface shadowing that will normally fade and blend with the surrounding oxidized surface over time are accepted. Painting over to match the existing pavement surface or using heat or an open flame to remove the existing pavement markings to blackout, hide, or disguise markings is unacceptable.

Existing pavement markings shall be removed to the percentage specified by the Engineer, accepting that requiring 100% removal will cause more pavement surface damage to the pavement due to the final 10% of material remaining being the most difficult to remove when the surfaces are not flat. The percentage of removal will be accepted as follows:

•Reducing thick markings: 85-90%	•Installing a new material: 90-100%
•Removing obsolete markings: 95-100%	•Installing a new color: 90-95%
•Overlaying a new surface: 90-100%	•Changing marking patters: 90-100%

Recommended Specs (2016) Grooving for Pavement Marking (cont)

Surface Soundness

Protection of Existing Pavement Surfaces and Markings:
The Engineer shall approve any safe operational equipment (scarifying, blasting, erasing, grinding, milling, shaving, scraping, etc.), cutter tool consumables and removal process that will result in a clean, dry and profiled surface to maximize bonding strength for the marking materials while protecting the existing pavement surface from damage. The Contractor shall not be held responsible for the repair of any pre-existing failed surface conditions, under or adjoining the pavement markings. If discovered, the Contractor shall notify the Engineer of the defect to take corrective action as specified under the contract plans.

Damage is defined as the result from the use of any removal process that causes the surface structure to weaken or the substructure to undermine requiring remediation to correct the surface failure at the Contractor's expense. Any process that washes out the binder or sand in asphalt and causes joint deterioration or fracturing concrete will not be accepted. Any surface rutting, pitting or deep scarring, causing the surface to deteriorate or deep grooving causing water to accumulate or pond is not accepted. When water ponds where markings previously existed, they appear as false markings or ghost lines. All repairs as a result of the removal operations shall be performed to the satisfaction of the Engineer at the contractor's expense.

Surface Roughness

The surface shall be profiled using a dry mechanical abrasion process to open the pore structure of the substrate and establish profiles suitable for the application of the specified marking material recommended by the manufacturer. The surface profile is the measure of the average distance from the peaks of the surface to the valleys as seen through a cross sectional view of the hard surface. The dimension is defined pictorially and through physical samples in the SP Profile Chart http://www.smithmfg.com/profiles.php as is expressed as a Surface Profile Number SP1–9 (SP1 is a nearly flat smooth surface and SP9 is an extremely rough with amplitude greater than 1⁄8").

Surface Profiles can be accomplished by a variety of tools, equipment and materials and is dependent upon the type of surface to be prepared, plus the type of system and material thickness to be installed. All factors play an important role in the selection process. Regardless of the method selected or tools employed, the final surface must allow for the secure mechanical bond of the pavement marking to the hard surface. The type of service to which the structure will be subjected will also help to define the degree of profile required. If the binder material manufacturer does not recommend an SP range for their product, the follow is a recommend SP# range. (SP1-3): Thin Paint, (SP3-5): High Builds (4-6): Epoxy, Polyester, Urethane, MMA, Thermoplastic, Preform Tapes.

Groove Slot Cut Tolerances

Width and Length Tolerance shall not exceed the width of the marking material by 2". For example, a 4" wide lane marking shall have a 6" maximum wide groove. The pattern of specialty legends or symbols shall be cut to fit in each letter or symbol pattern within a 1" wider groove.

Depth Tolerance can be specified from 20mil to 250mil deep depending upon the pavement surface and the applied marking material thickness. A depth tolerance of +/-10% across the complete width of the slot is acceptable, depending upon pavement surface conditions and marking type. Appropriate depth should be measured with a depth gauge or depth plates and maintained and inspected on a regular basis. Note: The top coating of the reflective element shall be embedded into the marking, 50% of the bead diameter and shall be flush to or slightly recessed below the pavement surface.

Surface Base Profile: The final groove tolerance slot cut surface base profile will reveal a consistent, sound SP# range designed for the new coating, binder or preform marking to bond. The SP# dependent upon the surface type, marking type and manufacturer's recommendation with final determination by the Engineer.

Joint Position: Lane lines shall not be placed over a longitudinal pavement joint and shall not be installed closer than 1" or more than 2" away from the edge of concrete joints or asphalt seams along edge or centerlines.

Groove-inlay Slot Cutting Equipment Requirements:
Approved equipment shall be capable of producing the total groove dimensions and base profiles in one or multiple passes with a uniform and consistent dimensional width, depth, straightness and surface finish on a wide range of surface conditions. The equipment shall produce minimal surface vibration to prevent micro-cracking on the target pavement surface. The equipment shall include a drive system with variable speed controls to ensure uniform and consistent width, depth, straightness and surface finish.

For transverse groove-inlay work requiring multiple passes, the equipment must be capable of repeatable seamless overlap for one or multiple passes to complete the final specified groove width and length. Control mechanisms shall be capable of adjustments as fine as .010". If the equipment does not have independent pitch and depth control mechanisms along the cutter drum axis to hold uniform depth consistencies then a surface plate, with the same thickness of the cut path, shall be used to raise one side of the machine wheels to hold a seamless uniform depth controls.

The approximate working removal speed for grooving Asphalt/Concrete at 100 mils deep using a 37HP power unit with a 12" diameter diamond multi-surface combo blades are as follows: (a) 5" cut path, 800-1050 ft/hr, (b) 16" cut path, 500-600 ft/hr, (c) 25" cut path, 250-325 ft/hr.

Groove-inlay Slot Cutting Restrictions:
The dimension of the slot width, length and depth with SP profile finish base shall be specified in the plans depending upon the pavement surface and marking material to be applied. Priming and marking application shall only be performed after the Engineer accepts the slot groove and the slot is dry, free of loose debris and ambient conditions are acceptable for the marking materials application in accordance to the pavement marking material manufacturer recommendations.

If the slot is exposed to traffic or adverse weather conditions overnight, the Contractor shall clean and dry the groove slot prior to priming and applying the marking materials. Accumulation of any debris on the surface or from the right of way as a result from the removal operation shall be collected and disposed of in accordance with applicable Federal, State, and Local regulations at no additional cost.

Dust and Debris Collection:
All airborne dust from the surface-prep and grooving operations shall be contained and HEPA filtrated to protect operators and work environment. The dust producing removal operations shall provide a positive means to control airborne dust with use of a dust collector attached to the removal equipment. Any remaining materials shall be collected with a secondary operation. Accumulation of heavier debris, accumulated piles of any debris on the surface or from the right of way as a result from the removal operation shall be collected and disposed of in accordance with applicable Federal, State, and Local regulations, at no additional cost.

Prior to the installation of the marking material, all remaining loose materials or debris must be removed using a vacuum or compressed air or blower as long as it does not create a nuisance.

Field Tests:

To confirm the grooved slot meets requirements, the Inspector shall conduct field the following tests before, during and after the surface is prepared and prior to the marking application with provisions provided under specifications and acceptable engineering practices.

Recommended Specs (2016) Grooving for Pavement Marking (cont)

Key Scrape Test:
This test determines the surface integrity prior to starting any surface profiling or preparation work. With the serrated side of a key, lightly scrape the surface. If the key dislodges aggregate or some of the surface, it would receive a f*ailing* "F" grade. A passing "P" grade indicates the surface is structurally sound. Should the key test fail, after the surface profiling work, the Inspector shall give immediate notice for the Contractor to remedy at Contractor's expense and prior to receiving acceptance notice.

The Contractor shall not be held responsible for the repair of any pre-existing failed surface conditions, under or adjoining the pavement markings. If discovered, the Contractor shall notify the Engineer of the defect to take corrective action as specified under the contract plans.

Tape Pull Test:
This test is used to determine surface cleanliness prior to the pavement marking application. Cut a 10" length of duct tape and hand tamp the adhesive side to the prepared area. Quickly peel the tape off the surface and reposition the tape with the adhesive side up. Measure the captured dirt/debris and record the results. If dirt covers more than 1", representing 10% of the overall coverage area, the surface requires additional cleaning. Continue cleaning until the Inspector gives a passing "P" grade.

Surface Profile Comparison:
Confirm that the desired profile SP# (1-10) of the surface has been achieved by visually inspecting and comparing the prepared surface and outlying areas to the profiles depicted by replica profile pads, replica putty, replica tape, or SP photos. Record all findings in a journal. Should the profiles not meet the specified range, the Inspector shall give immediate notice for the Contractor to remedy at Contractor's expense.

Cut Depth Test
Measure the slot cut depths using depth plates or a dial depth gauge. Take several measurements to obtain an average to accurately measure the depth of the slot. Should the slot dimensions and surface conditions not be met, the Inspector shall give immediate notice for the Contractor to remedy at Contractor's expense.

Observation Period, Method of Measurement, Acceptance and Payment.

Upon acceptance of the properly prepared grooved slot, the Contractor shall immediately install all final markings prior to opening the road to traffic. The observation period shall begin with the satisfactory completion and acceptance of the work and end prior to the installation of the markings. The quantities to be paid for will be the area, in square feet, of prepared surfaces for markings removed and accepted by the Engineer. A separate unit price shall be provided for the repair of any preexisting failed surface conditions, under or adjoining the pavement markings. For each percentage of removal required, a separate unit price shall be provided. The unit prices shall be full compensation for all work specified to include furnishing all material, labor, equipment, tools and incidentals, waste disposal work and for necessary to complete the item to the percentage specified and to the satisfaction of the Engineer. Payment will be made under the items specified in the Bid Price Proposal.