

CONSTRUCTION BULLETIN 15-01

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Pavement Marking Layout & Testing *(Supersedes Construction Bulletin 11-03)*

Purpose

1. To reiterate the purpose of Construction Bulletin 05-02, *Pavement Markings* and Standard Specification 925-3, *Construction Surveying and Layout*. The centerline layout for the final surface course requires instrument survey by the contractor prior to the placement of the final pavement markings.
2. To clarify and standardize ADOT's acceptance testing practices related to the inspection of the retroreflectance and thickness of thermoplastic and dual component (epoxy) pavement markings.

Background

1. The requirements in Standard Specification 925-3 and guidance in Construction Bulletin 05-02 address adequate survey control for the placement of temporary and permanent striping. Survey control is not being provided uniformly.
2. Guidelines for testing striping in Construction Bulletin 11-03 have been modified and expanded after input from the pavement marking industry, ADOT Traffic Operations, ADOT Materials Group and ADOT Construction Group.

Process

Pavement Marking Survey and Layout

The striping subcontractor and the contractor's surveyor shall be invited to a pavement marking preactivity meeting which may be held in conjunction with the paving preactivity meeting. Construction Bulletins 05-02 and 14-03 shall be reviewed with the contractor at the pavement marking preactivity meeting. The preactivity meeting shall be conducted a minimum of two weeks prior to any paving activity. The meeting shall emphasize that the Contractor is responsible for providing instrument controlled survey points for permanent pavement markings and pavement marking application will not begin until this criteria is met (Std. Spec. 925-3.01).

On projects that include no-passing zones, ADOT's Traffic Operations' No Passing Zone (NPZ) crew is responsible to layout related markings. The specifications, unless superseded by the plans, require the contractor to contact the NPZ crew at least 5 days prior to placement. However, the RE should provide the NPZ crew a schedule of planned operations at least two weeks prior to the application of any temporary, initial or final striping.

Thickness Testing

The Resident Engineer is responsible for verifying that pavement markings meet the minimum thickness requirements.

Thermoplastic

Thickness shall be tested at a minimum of two locations, randomly selected in any given mile, using the "Dried" method. This is done by placing a flat sheet of metal or duct tape ahead of the striping apparatus [reference 704-3.02(G)]. Thickness measurement includes glass beads. The gaps created by thickness sampling do not require reapplication of thermoplastic.

Thickness will be measured with a digital caliper capable of measuring to the nearest thousandth of an inch. Each Construction Org is responsible for the purchase of this piece of equipment. If you have any questions regarding this equipment contact the Structural Materials Testing Section at (602) 712-7418.

For thermoplastic measured 0.088" or less in thickness, a second application of extruded 0.080" thick thermoplastic (meeting all the requirements of the specifications) shall be placed over the original application.

Bag and label each sample separately (include all thermoplastic from the plate/tape). The label should include the TRACS number, date and location. Also include the surface and air temperatures, and wind

conditions. Do not discard failing samples until final acceptance is documented (should disputes arise regarding thickness or material properties).

Dual Component (Epoxy)

In accordance with the Standard Specifications and the Material Sampling Guide, random wet film thickness checks are required [Std. Spec 709-3.02, (F) (1) & (2)].

Retroreflectance Testing

Retroreflectance shall be measured with a LTL-X Delta Retroreflectometer or similar device approved by Construction Operations. Each district will ensure a minimum of two employees are trained to use this device – Construction Group will assist by providing training. A device will be housed with each of the Regional Traffic Engineers. Each device requires calibration by the manufacturer annually. Usage needs to be coordinated through the Regional Traffic Engineer. Construction Operations has one device and will initially assist the districts with measurement as schedule permits. Construction Operations' role is primarily Independent Assurance. The following link contains a video on the operation of the LTL-X Delta Retroreflectometer:

<http://www.ennisflintamericas.com/by-category/retroreflectometers/ltl-x-markii>

Prior to testing with the retroreflectometer, a nighttime visual inspection shall be done by the Construction Org to identify any areas of concern. These areas of concern should be part of the retroreflectance acceptance testing.

Retroreflectance should be tested within 30 days of application, but no sooner than three days after application, unless loose beads are hand swept from test locations. Raw test results shall be provided to the contractor within 24 hours of testing.

In addition to the MUTCD traffic control requirements, the use of law enforcement is recommended and encouraged when testing.

Testing will be performed every 0.2 miles, with four readings (averaged) taken at each location. After each reading, the retroreflectometer is picked up and moved forward before taking another reading; the four readings shall be taken randomly within a 10 foot section. The average of the four readings shall be the result for that location. Should the average of these readings not meet the required retroreflectance values, a second test of four readings will be performed 50' forward from the failing test. The higher average value of the two tests will determine the results for that location.

Retroreflectance testing is always in the direction of traffic. On roadways where yellow stripes separate opposing traffic, testing is done in both directions (two locations per 0.2 miles, one in each direction for each line). This will ensure that minimum retroreflectance values are met in both directions.

Example: for one mile on a two-lane highway, five tests are required on each edge line and 20 tests are required for a double yellow centerline (five each direction per line). Since each test consists of four readings, a total of 120 readings are required in this one mile segment.

Longitudinal lines less than 0.2 miles (such as 12" white turn lanes), regardless of length, must be tested. A single test of four readings shall be taken at the approximate midpoint of each line. Should the average of these readings not meet the required retroreflectance values, a second test of four readings will be performed at the approximate half way point between the midpoint and end. The higher average value of the two tests will determine the results for that location. Retroreflectance is not tested on transverse markings, symbols or legends. **Note:** All long line pavement markings (longitudinal striping) must be applied with a truck-mounted unit. Push carts are allowed for all other applications (transverse markings, symbols).

The retroreflectance values detailed in the contract specifications for thermoplastic, 704-2.03(C), and dual component (epoxy), 709-2.02(J), are minimum values. Markings that fail to meet these minimums will require reapplication and retesting of striping materials. Reapplication shall start from the location of a passing test, across the failure area(s), to the next passing test location. For thermoplastic sections applied on asphalt determined to be deficient in retroreflectance, a second application of 0.080 inches shall be applied. For epoxy applied on asphaltic pavements determined to be deficient in retroreflectance, a second application of 0.025 inches thick shall be applied. In both cases the reapplication does not require removal of the deficient section. For both thermoplastic and epoxy sections applied on PCCP or concrete bridge decks that are determined to be deficient in retroreflectance - the failing application must be removed and reapplied.

Depending on the extent of failing pavement markings, it may not be practical to retest with the reflectometer. In that case, the Construction ORG may perform a visual nighttime inspection. If the striping appears as bright as or brighter than the adjacent striping that meets the required retroreflectance, the engineer may accept the reapplication. This visual inspection must be documented.

Should retests for the reapplication of either thermoplastic or epoxy pavement markings fail to meet the required minimum retroreflectance, the contractor shall be required to remove the reapplied striping. Prior to removal the contractor shall demonstrate to the Resident Engineer that the removal can be done without scarring the pavement.

In situations where striping is the final item of work prior to substantial completion of the project, contract time shall be stopped upon completion of the striping. Contract time shall resume when testing commences. Substantial completion will not occur until all testing meets the specified requirements.

Traffic Control and associated costs needed for restriping are the responsibility of the contractor.