

DMS-8390, Motor Vehicle License Plate Face Materials

Overview

Effective date: July 2005 - August 2006 ('Archived Versions' for previous versions).

This Specification governs for the pre-approval, sampling, and testing of materials necessary for production of license plate faces.

Units of Measurement

The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

Material Producer List

The Materials and Pavements Section of the Construction Division (CST/M&P) maintains the Material Producer List (MPL) of all materials conforming to the requirements of this Specification. Materials appearing on the [list](#) for motor vehicle license plate face materials may require sampling and testing before use. The sampling procedure for the sheeting is described in "Tex-720-I, Sampling Reflective Sheeting." The Department will sample all liquid materials at the rate of 1 qt. sample per batch.

Bidders' and Suppliers' Requirements

Before any material is considered, it must be of manufacture and product code or designation shown on the MPL.

Pre-approval

Contact the Texas Department of Transportation, Director of Vehicle Titles and Registration Division, 125 East 11th Street, Austin, Texas 78701-2483, for pre-approval. Submit sample materials to the Director of the Construction Division, 125 East 11th Street, Austin, Texas 78701-2483. Submit a lab report showing test results for all the tests specified below. The producer or a commercial laboratory must have run the tests. Products pre-approved but not used by the Department will require re-evaluation after 5 yr.

If materials fail to comply with the specified requirements and the producer requests pre-approval testing at less than 1 yr. from the date of notification of failure for the same or new materials, the producer must submit a request for pre-approved testing and a cashier's check for \$1,000 payable to the "TxDOT Fund" to cover costs of testing and evaluation.

Re-evaluation

Report changes in the composition or in the manufacturing process of any material to the Vehicle Titles and Registration Division (VTR) and to CST/M&P. Significant changes reported by the manufacturer may require a re-evaluation of performance.

The Department reserves the right to conduct whatever tests necessary to identify a pre-approved material and to determine if a change has been made in composition, quality, or the manufacturing process, which may affect its durability or performance.

Changes detected in the composition or in the manufacturing process, not reported by the manufacturer, may be cause for removal of that material from the list of pre-approved materials.

Periodic Evaluation

The Department reserves the right to periodically evaluate the performance of materials.

The Department reserves the right to conduct random sampling of pre-approved materials for testing and to perform random audits of test reports. Department representatives may sample material from the manufacturing plant, the project site, and the warehouse. CST/M&P reserves the right to test samples to verify compliance with this Specification.

Sampling and Testing

The Department will sample reflective materials in accordance with "Tex-720-I, Sampling Reflective Sheeting," and will sample all liquid materials at the rate of a 1 qt. sample per batch.

The Department will test in accordance with 'Material Requirements' for acceptance of materials submitted on a purchase order and will only consider materials pre-approved in accordance with this Specification and on the list of pre-approved materials.

Costs of sampling and testing are normally borne by the Department; however, the costs to sample and test materials failing to conform to the requirements of this Specification must be borne by the Contractor or supplier. The Department will assess this cost at the rate established by the Director of CST/M&P and in effect at the time of testing.

The Department will deduct amounts due from monthly or final estimates on Contracts or from partial or final payments on direct purchases by the State.

Material Requirements

General Requirements

All license plate face materials must meet all requirements of this Specification and be supplied by the same supplier.

Security Mark

The license plate sheeting must include a security mark. The security mark must meet the following requirements unless otherwise approved by VTR and CST/M&P. The security mark must:

- ◆ be an integral part of the sheeting;
- ◆ be similar in day color and reflected night color;
- ◆ not alter the color of the sheeting, reduce the brightness below the specified minimum levels, or interfere with the appearance and legibility of finished license plates;
- ◆ not be removable by chemical or physical means without visibly damaging the reflective sheeting;
- ◆ be visible in either diffuse daylight or retroreflected light at night at the angles and distances indicated by the producer; and
- ◆ be visible where indicated and or not visible where indicated in each picture taken at the points described in the following photo documentation procedure.

Photo Documentation Procedure

The Department will use a digital cameral to take a series of photos of a completed license plate with the plate mounted perpendicular to the floor.

For one set of photos, the Department will mount the license plate in a dark room, illuminated with a “Commercial Electric” brand work light. The work light will use two 500W, 130V, T type halogen bulbs. It will be set at approximately the same height and approximately 20 ft. from the license plate. The second set of photos will use illumination from the overhead room lights.

The Department will take the photos at the points show in 'Diagram for Photo Documentation Positions.'

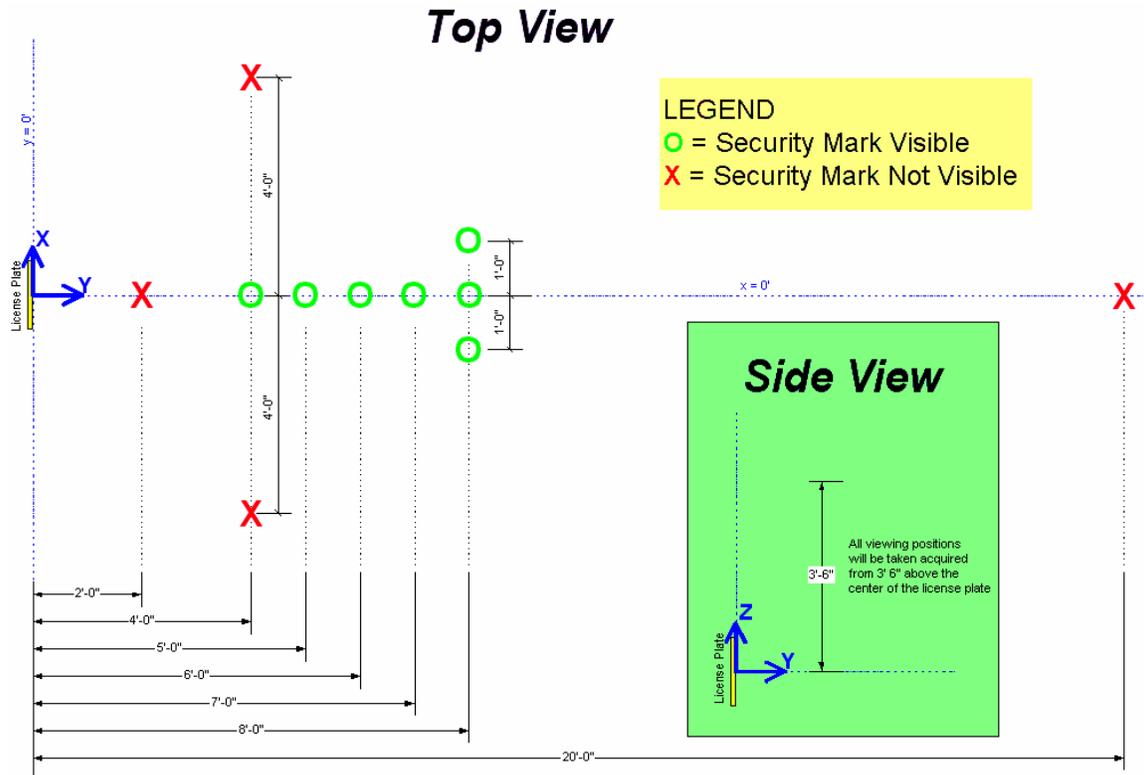


Figure 1. Diagram for Photo Documentation Positions.

Retroreflective Sheeting Materials

The finished or unfinished sheeting surface must be similar in day color and reflected night color.

The finished or unfinished sheeting surface must be readily roll coated and compatible with transparent and opaque colors recommended by the sheeting manufacturer.

◆ Adhesion

- The adhesion of the reflective sheeting to aluminum, cold rolled steel or galvanized steel must be such that it is impossible to pull or peel the sheeting from the substrate in pieces greater than 2 in.² in size.
- Condition samples at 140°F for 48 hr. and then cool at room temperature 68 to 80°F for 12 hr. before testing for adhesion. The only adhesive allowed is the precoated adhesive on the back of the sheeting at the time of manufacture.
- The adhesive must have a protective liner that will protect the precoated adhesive and the sheeting face from contamination by the adhesive. This liner must be of a type that will permit easy and automatic removal during sheeting application.
- The protective liner attached to the adhesive must be easily removed by peeling without soaking in water or other solvents and must be easily removed after accelerated storage for 4 hr. at 150°F under weight of 2-1/2 lb. per square inch.

License Plate Design

The completed license plate must conform to all details and dimensions required by VTR.

License Plate Appearance

Reflectorized license plates (new and after exposure) must demonstrate a smooth surface uniform in color and retroreflectivity. In any license plate, variations in color or retroreflectivity noticeable at a distance of 50 ft. or more under normal day and night conditions will be cause for rejection of the license plate.

Completed license plates must be free from ragged edges, cracks, scales, blisters, extraneous materials, and similar undesirable defects.

Color

The diffuse background color, before and after 1,200 hr. exposure in an Atlas Weather-Ometer, must comply with the following specified color requirements as described in the 'CIE Chromaticity Coordinate Corner Points and Y Reflectance Limits' table.

Sheeting must meet color requirements defined by an enclosed area formed by using the following CIE Chromaticity coordinates as corner points and the listed Y reflectance limits.

CIE Chromaticity Coordinate Corner Points and Y Reflectance Limits					
White	0.300 - 0.290	0.280 - 0.310	0.360 - 0.360	0.340 - 0.380	Y = 40 Min

Determine color in accordance with "Tex-839-B, Determining Color in Reflective Materials."

Reflectivity

Each license plate must meet the following retroreflective requirements.

The background of the license plates must average the following minimum specific intensities with no single plate having less than 87.5% of these minimum values when tested according to "Tex-842-B, Measuring Retroreflectivity."

New,, Unexposed Brightness Values 0.2 Divergence Angle			
Angle of Incidence	Specific Intensity in lumens/lux/m ² (candlepower/foot-candle/ft. ²)		
	-4°	30°	50°
White	502 (40)	314 (25)	94 (7.5)

Accelerated Weathering Test

All license plate face materials must meet requirements specified after exposure in an Atlas Weather-Ometer. Weather-Ometer exposure will be in accordance with ASTM "G 155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials." Exposure cycle will be 18 min. of water spray for every 120 min. of light exposure. Exposure uses a Type S Boro outer filter and quartz inner filter.

The exposure period will be 1,200 hr. for multiyear license plate material and 280 hr. for 1-yr. license plate material. The Department will notify the supplier after evaluation of material is completed.

- ◆ After exposure for 1,200 hr. for multiyear license plates or 280 hr. for 1-yr. license plates in an Atlas Weather-Ometer, completed license plates must exhibit a minimum of 50% of the reflectance for new unexposed license plates, as shown in the 'New, Unexposed Brightness Values 0.2 Divergence Angle' table.
- ◆ In addition, the face of the license plate must not exhibit crazing, cracking, peeling, loss of message coating, or significant change in color of the message coating and graphics.

Resistance to Thermal Change

Completed license plates tested must show no apparent change in appearance, color, or retroreflectivity after testing for resistance to thermal change. Testing uses the following thermal cycle for 3 repetitions:

- ◆ Condition the sample to room temperature and then placed in an oven set at $150^{\circ} \pm 5^{\circ}\text{F}$ for approximately 1 hr.
- ◆ Remove the sample from the oven and immediately (within 2 min.) place in a cooling chamber set at $30^{\circ} \pm 5^{\circ}\text{F}$ for approximately 1 hr.

Chemical Resistance

Completed license plates tested must show no apparent change in appearance, color or retroreflectivity after testing for chemical and salt resistance.

The Department will follow this procedure to test license plates for chemical and salt resistance:

- ◆ wipe the test panels with mineral spirits (meeting ASTM "D 235, Standard Specification for Mineral Spirits [Petroleum Spirits] Hydrocarbon Dry Cleaning Solvent)" and let the panels sit for 15 min.;
- ◆ rinse the test panels for 3 to 5 min. and allow the panels to dry for a minimum of 1 hr.;
- ◆ wipe the test panels with a sodium chloride solution (5.0% in water) and let the panels sit for 15 min.; and
- ◆ rinse the test panels for 3 to 5 min. and allow the panels to dry for a minimum of 1 hr.

The Department will ignore changes within 1/4 in. of any edge of the panel.

Effective Performance Life

Reflective sheeting applied and processed into license plates according to the sheeting manufacturer's instructions must perform effectively for the service life expected by showing no fading, cracking, blistering, or peeling, which significantly impairs the intended visibility or legibility of the plate.

Physically undamaged clean rear plates on vehicles in normal use must retain at least 60% of the retroreflectivity minimum values specified for new plates for 5 yr. Measurements will be made at 0.2° observation angle and -4° entrance angle.

Abrasion Resistance

The adhesion and abrasion resistance of roll coated legend will be tested in accordance with ASTM "D 968, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive," falling sand method.

A finished plate subjected to 2.6 gal. of falling sand directly applied to the legend portion of the plate must show no appearance of the background color through the abraded portion of the roll coated legend at the end of the test.

Archived Versions

The following archived versions of "DMS-8390, Materials for Motor Vehicle License Plates" are available:

- ◆ [8390-0898](#) for the Specification effective August 1998 through April 2003.
- ◆ [8390-0503](#) for the Specification effective May 2003 through July 2004.
- ◆ 8390-0804 for the Specification effective August 2004 through June 2005.
- ◆ 8390-0705 for the Specification effective July 2005 through August 2006.