

License Plate Validation Decal Requirements

Bidders are required to submit samples of the stickers and/ or stock materials offered. Bidders must indicate on the Bid Schedule what sheeting will be used. Bidders must submit all required technical specifications, test results, and other supporting information with their bid so that a determination can be made by the procurement officer.

General:

Specifications for the manufacture of validation decals required for the annual registration of passenger, commercial, motorcycle, and other vehicles are contained herein.

The validation decal shall be made of weather-resistant retroreflective sheeting (hereinafter referred to as reflective sheeting) having a smooth, flat, printable outer surface. The sheeting shall have pre-coated pressure-sensitive adhesive on the back side, protected by a removable liner, for convenient and durable attachment to the license plate or upon a previously applied decal.

The reflective sheeting shall be free from ragged edges, cracks and blisters, and be free of cracking or flaking. All sheeting shall be free of foreign matter. A validation decal applied to a clean/dry license plate shall not be removable intact.

The pre-coated adhesive on all decals shall be of a pressure-sensitive type which shall permit the decal to be applied to the surface of the license plate or upon a previously applied validation decal while license plates are attached to the vehicles. The use of additional adhesive coats, water solvents, or heat techniques to apply the decal shall not be required. The adhesive shall have no staining effect on the reflective material and shall permit application of the decal to a clean/dry license plate or previously applied decal at temperatures of minus ten degrees Fahrenheit or warmer.

The validation decal shall be manufactured in a manner that insures that it shall not become brittle, flaky, discolored, or acquire a powdery surface for a period of at least five years and that permits the stacking of at least five decals on a license plate.

The validation decal under normal service use shall adhere to the surface of the license plate and, when stacked up to five (5) decals high, shall adhere to the decal to which it is applied for a minimum of five (5) years.

Decals applied in accordance with sheeting manufacturer's instructions shall not blister, lift, or delaminate when subjected to gasoline, kerosene, diesel oils, water, steam, and cleaning detergents normally encountered in non-commercial cleaning and washing service, nor shall decals fade, disintegrate, or come off from normal expected exposure within a period of five years.

Decal Material and Print Durability

1. The Contractor must warrant that the reflective materials and adhesion of the decals will last a minimum of five (5) years from the date the decal is issued.

2. Contractor will utilize only black printing (positive or reverse) for all validation decals, ensuring maximum print life of decals.
3. The Contractor must warrant that printing on the decal will have a minimum of two (2) years' service life with solvent exposure (test procedure contained herein) from date the decal is issued.
4. Decal adhesion must be warranted to remain durable and last a minimum of five (5) years under normal road conditions. During that five-year period, the decal must not crack, become brittle, flaky, discolored, or acquire a powdery surface.
5. When decals are applied to the vehicle license plate:
 - A minimum of five (5) decals should be able to be applied on top of each other when bottom decal is clean and dry.
 - Under normal service use, decals must adhere to the surface of the license plate, for a minimum of five (5) years without fading, disintegrating, detaching from the license plate or a previous clean/dry decal to which it has been affixed.
 - After a decal has been applied to a license plate, it must not be able to be removed intact.
 - Decals applied correctly must not blister, lift, or delaminate when subjected to gasoline, kerosene, diesel oils, water, steam, and cleaning detergents encountered in non-commercial cleaning and washing service.
 - Printing on the decal must have a two-year service life if exposed to the following solvents:
 - Gasoline
 - Kerosene
 - Mineral Spirits
 - VM&P Naphtha
 - Diesel
 - Turpentine
 - 409 Original Formula
 - Ammonia
 - Bug and Tar Remover
 - Windex
 - Thinner
 - Lava soap
 - Methanol/Methyl Alcohol (Racing fuel)
 - Isopropyl Alcohol 92% or 90%

Retroreflective Characteristics

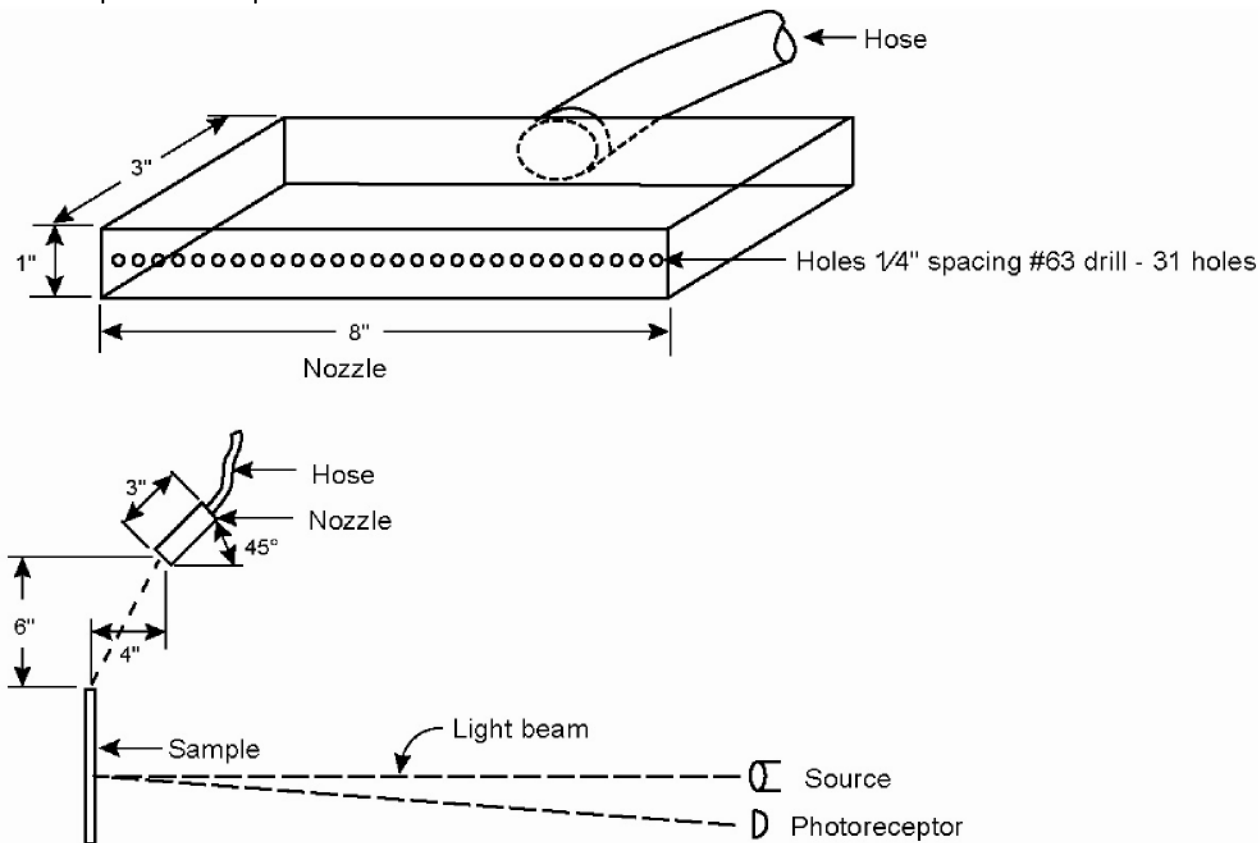
The unprinted reflective sheeting shall have the following minimum coefficients of retroreflection expressed as candlepower per foot candle per square foot of material (candelas per lux per square meter). Test samples shall be oriented as specified in the manufacturer's instructions. The coefficient of retroreflection shall be measured in accordance with ASTM E-810, "Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting".

Minimum Coefficient of Retroreflection Candlepower per foot candle per Square Foot Candelas per Lux per Square Meter		
0.2° Observation (Divergence) Angle ¹		
Sample Color	Entrance (Incidence) Angle ²	
	-4°	40°
White	50	15
¹ Observation (Divergence) Angle - The angle between the illumination axis and the observation axis.		
² Entrance (Incidence) Angle - The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.		

Rainfall Performance

The coefficient of retroreflection of the same sheeting, totally wet by rain, shall not be less than 90% of the above values. The photometric performance during rainfall shall be determined as follows:

Test set-up for rainfall performance:



Place source and photoreceptor in horizontal plane

Place the test panel in an upright position 6 inches (15.2 cm) below and 4 inches (10.1 cm) in front of the nozzle as shown below:

Apply sufficient water pressure so that the upper surface of the spray envelope strikes the top of the panel.

With water falling on the panel, measure the coefficient of retroreflection. Wet performance measurements shall be conducted at 0.2 observation and -4 entrance angles in accordance with ASTM E-810.

Diffuse Daytime Color

Through instrumental color testing, the diffuse daytime color of the reflective sheeting shall conform to color requirements as determined spectrophotometrically utilizing either 45/0 or 0/45 degree illumination/viewing conditions for retroreflective materials.

Test Procedure: Illuminant D65 with a 2° Observer, 45/0 or 0/45 Geometry, with an average of 8 reads, each read oriented 45° apart. White must have a minimum of 35.

Chromaticity Coordinate			
Corner Points			
Color	x	y	Luminance Factor Y (%)
White	.303	.290	35 min.
	.365	.354	
	.340	.378	
	.278	.316	

Adhesive and Protective Liner

The pre-coated pressure-sensitive adhesive shall form a durable, vandal resistant bond to clean, dry, reflective sheeting license plate surfaces or decal surfaces of the same material.

Frangibility Test

Decals shall be applied to a clean aluminum panels at ambient room temperature and allowed to remain affixed for a minimum period of 24 hours before testing is conducted.

The following procedures shall be performed, one panel for each condition:

- Exposed in 150 degree F oven for two (2) hours
- Expose in 32 degree F refrigerator for 12 hours
- Attempt to remove decal by scraping with sharp razor blade
- Place water-soaked blotter over decal for 15 minutes

After performing the above procedures the decal must not be removed without being destroyed.

The pre-coated pressure sensitive adhesive shall not exude from sheeting edges when processed into finished decals so as to not cause pieces to stick together during printing, handling or while packaged in shipment and distribution.

Adhesive Ooze Test

Test Procedure: The pre-coated pressure-sensitive adhesive must form a durable bond to bare aluminum and when mounted to properly-prepared (smooth, dry, clean) reflective license plate sheeting surfaces and validation decals. The adhesive must not exude from sheeting edges on finished decals and does not cause pieces to stick together during printing, handling, or while packaged in shipment distribution.

The protective liner of adhesive shall be removed by peeling without soaking in water or other solvents after exposure to the Liner Removability Test described below.

Liner Removability Test

Decals shall be subjected to a pressure of 2.5 psi in an air-circulating temperature chamber at 150 degrees F (66° C) for four (4) hours. After returning to room temperature and normal pressure the decals must be easily removable from the protective liner by peeling without soaking in water or other solvents.

Cleanability

The sheeting processed into finished decals and applied in accordance with the recommendations of the reflective sheeting manufacturer shall be readily cleansed of normal dirt accumulation by washing with water and mild detergent.

The surface shall also be sufficiently solvent-resistant to permit normal, non-commercial cleaning with solvents commonly used to clean vehicle finishes. Accordingly, the surface printed shall show no wear after exposure to the Cleanability Test described below.

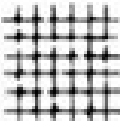
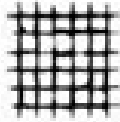
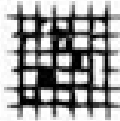
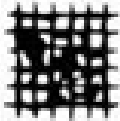
Cleanability Testing

Mount printed decals to an aluminum panel and saturate a cotton swab with products listed below and lightly rub over decal for 25 strokes holding the swab at a 45° angle. A stroke is considered to be when one of the cotton swabs goes from one end to the next. The decal surface shall be examined for any appreciable change when compared to a new, clean decal surface. The sample passes if the solvent or cleaner does not deteriorate the print sufficiently to wear through to the substrate.

- Gasoline
- Kerosene
- Mineral Spirits
- VM&P Naphtha
- Diesel
- Turpentine
- 409 Original Formula
- Ammonia
- Bug and Tar Remover
- Windex
- Thinner
- Methanol/Methyl Alcohol (Racing fuel)
- Isopropyl Alcohol 92% or 90%

Print Adhesion

A supplied printed sample decal shall be mounted to an aluminum panel and conditioned for 24 hours in ambient conditions. A lattice of 11 horizontal and vertical cuts approximately 20mm long and spaced 1 mm apart shall be made on the decal over a printed area using an unused razor blade. Each cut shall penetrate the ink and contact the substrate beneath. A length of Scotch 610 tape shall be adhered over the lattice and firmly rubbed with a pencil eraser to ensure good contact. The tape shall be removed within 90 seconds of application, by gently but rapidly pulling back onto itself as close to an angle of 180° as possible until the tape is removed. The tape shall be applied to white paper for inspection and photographing. Results should be reported using the chart below. Rating of # 3, 2, or 1 is required for 'pass' rating.

	Surface
1	None
2	
3	
4	
5	
6	Greater than 65%

Wet Abrasion

Two (2) decals shall be adhered to an aluminum panel and allowed to stand for 48 hours at a constant ambient room temperature and humidity. The panel shall be secured to a Gardner Abrasion (GA) machine, or equivalent. A Chinese hog bristle brush shall be soaked in lukewarm water for 30 minutes and then removed and shaken out. Dreft detergent shall be added to the water to create a 0.5% detergent solution and the brush soaked for an additional 5 minutes. Brush shall be removed from the solution and installed on the GA machine. The GA machine shall be activated for 1000 back-and-forth scrub cycles. The decals shall be kept wet using a titration column filled with the 0.5% detergent solution dripping at a rate of ~12 drops per minute. At the conclusion of the test the decals shall be rinsed and dried. Decals shall be compared to new, clean decals, and shall show no significant wear that would affect the decals intended use.

Resistance to Heat and Cold

Four (4) White unprinted decals shall be mounted to a 3"x6" aluminum panel and hung vertically in an air-circulating temperature chamber. The samples shall be exposed to a 71°C for 24 hours, allowed to stabilize at 20°C for 2 hours, exposed to -57°C for 72 hours, allowed to stabilize again at 20°C for 2 hours. After stabilization, the samples are to be examined.

The samples must show no signs of cracking, peeling, chipping, or delamination from the test panel.

Performance Life

Unprinted decals shall be exposed for 1500 hours in a Xenon Accelerated Weathering unit. Printed decals shall be exposed for 2000 hours in a Xenon Accelerated Weathering unit. The unprinted decals must be examined for retroreflectivity and colorfastness. The printed decals must be examined for physical appearance in accordance with "Diffuse Daytime Color."

<u>Retroreflectivity Testing</u>		
Requirement:	50% of initial required values	
Test Method:	ASTM E810 - Test Distance of 100 (30.5 m) with a 0.2° Observation Angle	
Projector:	Hoffman GPS-102 (Illuminant A, 1.15 fc, 30" diameter)	
<u>Sample Color:</u>	<u>-4° Entrance angel</u>	<u>40° Entrance angel</u>
White	25 Cd/Fc/ft ²	7.5 Cd/Fc/ft ²

The decals shall then be tested for colorfastness with a Hunterlab Colorflex A60 Spectrocolorimeter, or equivalent, and the decals must pass the following requirements with a test of observer annular 45/0 Geometry average of 8 reads, each read oriented 45° apart.

- White minimum 35 no maximum

Samples must not exhibit appreciable cracking, scaling, pitting, blistering, edge lifting, curling, or shrinkage.