

Transportation Safety Division

3M[™] Reflective License Plate Sheeting

For Use on Multi-Year License Plates

Product Bulletin 3750/3750P March 2020

Replaces Product Bulletin 3750/3750P dated April 2016

1 Description

3M[™] Reflective License Plate Sheetings 3750/3750P ("Sheeting") consist of lens elements enclosed within a transparent resin. The Sheeting has been designed for use in the fabrication of multi-year reflective license plates.

When using the 3M[™] Precision Plate System Digital License Plate Printing System ("PPS"), 3750P must be used. For license plate applications other than PPS, either 3750 or 3750P may be used.

When conventionally processed, the Sheeting can be customer printed with background graphics and variable plate messages, with background graphics only, or with variable plate message only. 3M[™] Clear Protective Film 9097 is applied after printing. After application to aluminum substrate, plates may be blanked flat or with a debossed rim. Plates may optionally be embossed with plate messages and coated using 3M[™] Roll Coat Colors Series 4850 or 4950, or 3M[™] DRF 300/400 Series hot stamp foils.

When printed with the PPS, 3750P Sheeting is customer printed using 3M[™] Precision Plate System Series 1510UV ink jet inks to print background graphics and variable plate messages, background graphics only, or variable plate messages only. 3M Digital License Plate Clear Protective Film 9097 must be applied after printing. Plates may optionally be rim embossed or debossed.

Finished license plates function 24 hours a day to enhance the nighttime safety and legibility of the vehicle identification system. The Sheeting appears similar at night when viewed by reflected light and during the day, and is highly reflective when viewed at both head-on and wide entrance angles.

The backside of the Sheeting is pre-coated with a pressure sensitive adhesive for application to aluminum license plate substrates. The adhesive coating is protected by a removable liner.

2 Performance Characteristics

2.1 Reflectivity

The minimum coefficients of retroreflection for Sheeting covered with 3M[™] Digital License Plate Clear Protective Film 9097 are given in Table 1 below. Measurements should be conducted in accordance with ASTM standard test method E810. The reflectivity of the flat area of the same test plate, totally wet by rain, will not be less than 90% of the values in Table 1. Wet performance measurements shall be conducted in accordance with ASTM E810.

Table 1. Minimum coefficient of retroreflection, R_A, (cd/lux/m²) for white Sheeting overlaminated with 3MDigital License Plate Clear Protective Film 9097.

Observation Angle ^a	Entrance Angle ^b	Minimum Coefficient of Retroreflection [cd/lux/m ²]
0.2°	-4°	50
0.2°	40°	16

a. Observation Angle – The angle between the illumination axis and the observation axis.

 Entrance Angle – The angle from the illumination axis to the retroreflector axis. The retroreflector axis is an axis perpendicular to the retroreflective surface.

When measuring the reflectivity of applied Sheeting with 3M Digital License Plate Clear Protective Film 9097, test plates must be prepared as follows:

- o Test plates of the same size and format as the actual issue must be produced of the same materials, on the same equipment, and by the same general process of metal cleaning, laminating, embossing or debossing, and roll coating as the production plates.
- o Test plates must be have a single flat area of at least 36 square inches (230 sq. cm) to facilitate photometric testing.
- o Condition all test plates for 24 hours at 72 ± 5 °F (22 ± 3 °C) and 50 ± 5% R.H. prior to testing
- o Each plate must be thoroughly hand washed (see Section 3.8) prior to testing.
- o When measuring non-printed Sheeting or Sheeting with a preprinted graphic design, take measurements from an unprinted area of the Sheeting.

2.2 Adhesive

Test plates prepared according to the procedure described in Section 2.1 will resist peeling, scuffing, and marring during normal handling.

Prior to application, the protective paper liner can be removed from the adhesive by peeling without soaking in water or other solvents. The liner can be removed without soaking after being subjected to accelerated storage for 4 hours at 150 °F (65 °C) under a weight of 2.5 pounds per square inch (0.18 kg/cm²).

3 Fabrication of Reflective License Plates

3.1 Substrates

The pre-coated adhesive forms a durable bond to properly cleaned, chemically treated, passivated aluminum surfaces normally used in the manufacture of license plates. Contact your 3M application engineer for specific substrate information.

3.2 Application

The Sheeting has been designed to be applied to flat coil or sheet stock by continuous squeeze roll application and overlaminated with 3M Digital License Plate Clear Protective Film 9097. The Sheeting should be stretched to a maximum of 1% during application to the substrate. Laminated blanks must be stored on edge and used within one year of date of receipt of Sheeting.

When fabricating plates using conventional processes, store plates with newly applied Sheeting for at least 48 hours before embossing legends.

3.3 Embossing and Rim Debossing for Conventional Plate Fabrication

The Sheeting, as applied to a flat metal substrate, is sufficiently flexible to permit the embossing or rim debossing requirements of most conventional license plate designs. The Sheeting may be embossed to a height of up to 1.7 mm (0.067 inches) using standard embossing equipment and dies used for license plate production. Minimum embossing temperature is 70 °F (21 °C).

To enhance the printability and quality of embossed or debossed license plates, they must be roll coated within 24 hours of embossing or debossing.

3.4 Imaging with Precision Plate System

Using the PPS, background graphics and plate messages are applied to 3750P Sheeting in a single print step by the customer.

3.5 Imaging with Conventional Plate Fabrication

When producing embossed plates, background graphics are applied to the Sheeting using the customer's printing press, and overlaid with 3M Digital License Plate Clear Protective Film 9097. The customer then embosses the plate message and roll-coats them using one of the 3M recommended inks or foils described below, Sections 3.6 and 3.7, respectively.

Note: Care should be taken when choosing color combinations to ensure maximum legibility. This is especially true with graphic design Sheeting. To assure suitable contrast for maximum legibility and safety, 3M recommends the use of darkly colored digitally printed or coated characters on white or yellow Sheeting backgrounds. If coated, license plates must be cooled to room temperature before they are packaged.

3.6 Oven Dried Inks for Conventional Plate Fabrication

Use 3M[™] Roll Coat Inks Series 4850 Opaque and 3M[™] Roll Coat Inks Series 4950 Transparent.

For specific color availability or for assistance with roll coat processing and oven drying, refer to <u>3M Product</u> <u>Bulletin 4850/4950</u> or contact your 3M application engineer.

3.7 Dry Roller Coat Foils for Conventional Plate Fabrication

Use 3M[™] Dry Roller Coat Foil Series DRF300/400.

For specific color availability or for assistance with roll coat processing and oven drying, refer to <u>3M Product</u> <u>Bulletin 100/HSF200 and DRF 300/400</u> or contact your 3M application engineer.

3.8 Cleaning Finished License Plate Surface

For maximum service life, do not use harsh, abrasive, or chemically concentrated cleaners. Clean license plates using the same care taken when cleaning the paint surface of the vehicle. The license plate surface can be cleaned of normal use dirt accumulation by washing it with a mild detergent and water using a soft bristle brush or cloth.

To remove tar, oil, or road dirt, cautious use of mild solvents such as mineral spirits, turpentine, or kerosene may be employed. Use of aromatic solvents and ketones, or solvent mixtures containing either should be avoided. Following cleaning, rinse plates thoroughly with water.

3.9 Storage of Sheeting and 3M[™] Digital License Plate Clear Protective Film 9097

Both the Sheeting and 3M Digital License Plate Clear Protective Film 9097 must be stored in their original packages in a cool, dry area and be used within one year of date of receipt. For best printing results, print Sheeting within 6 months of date of receipt.

4 Appearance, Splices, and Packaging

The Sheeting, as supplied, will be of good appearance, free from ragged edges and cracks, and packaged according to commercial standards. The Sheeting will be spliced for continuous roll application. Additional Sheeting is supplied to compensate for splices.

5 Specifications

The information contained herein regarding Sheeting is considered to describe the typical minimum requirements for effective reflective license plate sheetings. As such, the information may be incorporated into a product purchase specification to be used in conjunction with a specification for finished retroreflective license plates.

6 System of Matched Components

Table 2. System of Matched Components for Sheeting.

Matched Components				
	Conventional Process	PPS Process		
Overlaminate	3M™ Digital License Plate Clear Protective Film 9097	3M™ Digital License Plate Clear Protective Film 9097		
Roll Coat Inks	3M™ Series 4850 Opaque and Series 4950 Transparent	N/A		
Digital Inks	N/A	3M™ Precision Plate System Series 1510UV		
Reflective Sheeting	3750/3750P	3750P		
Dry Roller Coat Foil	3M™ Series DRF300/400	N/A		

7 Health and Safety Information

Read all health hazard, precautionary, and first aid statements found in the Safety Data Sheets, and product labels for all chemical products prior to handling or use.

The Sheeting does not require a Safety Data Sheet, however, an Article Information Letter is available upon request.

8 Warranty Information

8.1 3M Warranty

3M warrants ("3M Warranty") that Sheeting imaged as recommended by 3M in this product bulletin and overlaminated with 3M[™] Digital License Plate Clear Protective Film 9097 ("Overlaminate") as recommended by 3M, will:

- o Remain legible by resisting excessive fading, cracking, blistering, or peeling and
- o The unprinted areas of Sheeting (those without preprinted graphics or customer-printed graphics) on a license plate ("Plate") will retain a coefficient of retroreflection for the number of years ("Warranty Period") as given in Table 3, measured from the Plate fabrication date ("Fabrication Date").

Table 3. Sheeting colors and Warranty Period for 3750/3750P.

Base Sheeting Color	Retained Coefficient of Retroreflection ^a [cd/m ² /lux]	Warranty Period (Years)
White	18	5

a. All measurements taken at 0.2° observation angle and -4° degrees entrance angle. All measurements shall be made after cleaning the Plate according to 3M recommendations and in accordance with ASTM E810 "Standard Test Method of Coefficient of Retroreflective Sheeting," except that the coefficient of luminous intensity shall be determined in accordance with ASTME808-01 Para. 3.2.2 and ASTME809-02 Para. 12.3.

8.2 Warranty Terms and Conditions

- A failure to meet the 3M Warranty must be solely the result of design or manufacturing defects in the Sheeting and not of (a) outside causes including improper fabrication, handling, maintenance, or installation; (b) use of roll coat pastes, overlay films, or sheetings not listed herein; (c) Plate exposure to temperatures beyond 3M's recommendations; (d) use of a reflective Sheeting applicator, stretch control mechanism, brake table, or corresponding registry feed controls not provided and installed by 3M; (e) failure of Plate substrate; (f) exposure to chemicals, abrasion, or damage from fasteners used to mount the Plate; (g) collisions, vandalism, or malicious mischief; or (h) an act of God.
- Claims made under this warranty will be honored only if the Plates have been marked with a Dynamic Security Script mark that includes the month/year date that the material originated from 3M or there is a clear record of the Fabrication Date either on the Plate or in an auditable records database; records must be maintained showing that the profile settings and procedures used in the production of the Plates conform to 3M recommendations.
- Sheeting must be stored, applied, installed, processed, and used in accordance with all 3M application procedures found in 3M's product bulletins, information folders, manufacturing manuals, Digital License Plate System User Manual, and technical memos (which will be furnished upon request), including the appropriate use of components listed in Table 2 of this product bulletin and recommended application equipment.
- Claims made under this warranty will be honored only if 3M is notified of a failure within 30 days, reasonable information requested by 3M is provided, and 3M is permitted to verify the cause of the failure.

8.3 Exclusive Limited Remedy

If the Sheeting on a Plate is shown to not meet the 3M Warranty during the Warranty Period, 3M's sole and exclusive remedy is, at 3M's option, to replace the Plate or reimburse the Plate's issuing agency ("Agency") at a rate of no more than \$5.00 per Plate. Reimbursement to the Agency will be in dollars and/or materials, as determined by the needs of the Agency. Replacement Sheeting will carry the unexpired warranty period of the Sheeting it replaces.

8.4 Disclaimer

THE 3M WARRANTY IS MADE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING OR OF PERFORMANCE, CUSTOM, OR USAGE OF TRADE.

8.5 Limitation of Liability

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9 Other Product Information

Always confirm that you have the most current version of the applicable product bulletin, information folder, or other product information from 3M's Website at <u>http://www.3M.com/vehicleregistration</u>.

10 Literature References

<u>3M PB 100/HSF200</u>	3M™ Dry Roller Coat Foil Series HSF 100/200 and DRF 300/400
and DRF 300/400	
<u>3M PB 1510UV</u>	3M™ Precision Plate System Series 1510 UV Ink Jet Inks for 3M Precision Plate System
	Printer
<u>3M PB 4850/4950</u>	Roll Coat Inks Series 4850/4950
<u>3M PB 9097</u>	3M™ Digital License Plate Clear Protective Film 9097 for Use on Multi-Year License
	Plates

ASTM Test Methods are available from ASTM International, West Conshohocken, PA.

For Information or Assistance Call: 1-800-553-1380 In Canada Call: 1-800-3M HELPS (1-800-364-3577)

Internet:

http://www.3M.com/vehicleregistration

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