

Nikkalite®

Retroreflective Products

PB NO.7100/8100

**Nikkalite® BRAND ENGINEERING GRADE(EG)
7100 AND 8100 SERIES**



1. INTRODUCTION

Nikkalite® Brand Engineering Grade(EG) retroreflective sheeting is a beaded plastic material that renders high retroreflectivity at night. It is designed for use mainly on traffic signs and is highly resistant against the extremes of hot, cold, dry, and humid weathering conditions. Traffic signs faced with Nikkalite® Brand sheeting and transparent process colors are attractive in appearance and highly visible during both day and night, and contribute greatly to driving safety. This sheeting is available in seven standard colors with two types of precoated adhesives: Heat-activated (HA) or Pressure-sensitive (PS).

2. TYPES OF ADHESIVES

The Nikkalite® 7100 and 8100 Series are, coated on their backs with different types of adhesives and require different application methods.

A. The 7100 Series sheeting is pre-coated with HA adhesive and must be applied to the substrates with a vacuum-heat applicator. Immediately after application and cooling, the 7100 Series sheeting becomes permanently bonded to the substrate. Since the adhesive is not tacky, the sheeting can be repositioned easily before final bonding.

B. The 8100 Series sheeting is pre-coated with PS adhesive that will bond the sheeting to the substrate with the application of pressure only. The pressure can be applied with a hand-roller, a squeegee, or a roller-applicator. Permanent bonding will take place approximately 48 hours after application. DO NOT ALLOW THE ADHESIVE TO FREEZE DURING THE 48-HOUR CURING PERIOD.

3. COLORS

Nikkalite® EG sheeting is available in the standard colors as listed on the Table 1 below and conforms with practically all specifications of traffic control signs and devices throughout the world.

Table 1

| Color | Heat Activated | Pressure Sensitive |
|--------|----------------|--------------------|
| White | 7112 | 8112 |
| Yellow | 7104 | 8104 |
| Red | 7105 & 7135 | 8105 & 8135 |
| Blue | 7106 | 8106 |
| Orange | 7107/7177 | 8107/8177 |
| Green | 7108 | 8108 |
| Brown | 7109 | 8109 |

4. RETROREFLECTIVE INTENSITY

Nikkalite® Brand EG sheeting is designed and manufactured to render high head-on and wide-angle retroreflectivity.

A. Retroreflectivity of the various colors of EG sheeting meets most retroreflective sheeting standards world-wide, such as ASTM D 4956(U.S.A.), EN12899-1(European Standard), JIS Z 9117(Japan), etc.

B. Typical coefficient of retroreflection of EG sheeting.

Typical coefficient of retroreflection of each color, when

measured with methods specified in the various country standards of retroreflective sheeting and expressed in candelas per lux per square meter, appears in Table 2 below. The figures in the brackets show the highest minimum retroreflectivities among all the standards we collected from the countries world-wide.

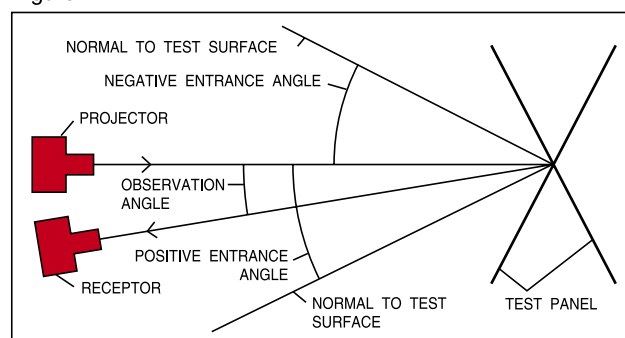
Table 2 Typical Coefficient of Retroreflection

(cd/lux/m²)

| O.A. | E.A. | White | Yellow | Red | Blue | Orange | Green | Brown |
|------------|--------|-----------|-----------|-----------|------------|-----------|-----------|-----------|
| 12'(0.2°) | -4°/5° | 108 (80) | 70 (50) | 21 (14.5) | 8.2 (5.0) | 54 (25.0) | 28 (9.0) | 5.4 (1.0) |
| | 15° | 90 (55) | 64 (35) | 19 (10.0) | 7.2 (3.0) | 48(—) | 26 (3.0) | 5.0(—) |
| | 30° | 57 (34) | 48 (22) | 13 (6.0) | 5.0 (2.0) | 35 (7.0) | 18 (3.5) | 3.0 (0.3) |
| | 40° | 30 (11) | 30 (7) | 8 (2.0) | 2.4 (1.0) | 20 (2.0) | 10 (1.5) | 1.4 (0.1) |
| 20'(0.33°) | -4°/5° | 83 (50) | 53 (35) | 16 (10.0) | 6.4 (3.0) | 41 (15.0) | 21 (7.0) | 4.2 (0.7) |
| | 15° | 80 (45) | 50 (20) | 15 (8.0) | 6.0 (2.0) | 36(—) | 20 (3.0) | 3.9(—) |
| | 30° | 47 (29) | 40 (16) | 11 (4.0) | 4.2 (1.0) | 29 (8.5) | 15 (3.0) | 2.7 (0.5) |
| | 40° | 26 (11) | 26 (6) | 7 (2.5) | 2.0 (0.8) | 16 (2.0) | 9.4 (1.2) | 1.2(—) |
| 0.5° | -4°/5° | 44 (30) | 33 (25) | 11 (7.5) | 3.8 (2.0) | 26 (13.0) | 13 (4.5) | 1.3 (0.3) |
| | 30° | 34 (15) | 29 (13) | 8.7 (3.0) | 3.1 (0.8) | 21 (4.9) | 11 (2.2) | 1.0 (0.2) |
| 1.0° | -4°/5° | 20 (5.0) | 16 (3.0) | 5.0 (1.5) | 1.8 (0.6) | 11 (—) | 5.3 (1.0) | 1.1(—) |
| | 15° | 19 (3.0) | 15 (2.0) | 4.8 (1.0) | 1.7 (0.3) | 9.2(—) | 5.0 (1.0) | 1.0(—) |
| | 40° | 11 (1.5) | 9.5 (0.5) | 2.8 (0.3) | 1.1 (0.1) | 6.2(—) | 3.2 (0.2) | 0.8(—) |
| 2.0° | -4°/5° | 6.2 (5.0) | 6.0 (3.0) | 2.1 (0.8) | 0.6 (0.2) | 4.2 (1.5) | 1.9 (0.6) | 0.6(—) |
| | 30° | 5.4 (2.5) | 4.7 (1.5) | 1.5 (0.4) | 0.5 (0.1) | 3.2 (0.8) | 1.6 (0.3) | 0.5(—) |
| | 40° | 4.2 (1.5) | 3.8 (1.0) | 1.2 (0.3) | 0.4 (0.06) | 2.7 (0.7) | 1.2 (0.2) | 0.4(—) |

Note: O.A. = Observation Angle and E.A. = Entrance Angle See Figure 1, below.

Figure 1



5. TECHNICAL DATA

A. Physical Properties of Nikkalite® EG Sheeting

Table 3

| Property | Test Method | Results |
|-------------------|------------------------------|--------------|
| Average Thickness | Micrometer | 0.175mm |
| Average Gloss | Glossmeter 85° | 96 |
| Tensile Strength | Instron at 30cm (12")/minute | 5.0kg (11lb) |
| Elongation | Instron at 30cm (12")/minute | 24% |

B. Physical Properties When Bonded to Aluminum Panels

The data below are based on tests conducted on EG sheeting applied to acid-etched aluminum panels and conditioned for 48 hours or more at a room temperature of 23°C(74°F).

Table 4

| Property | Test Method | Results |
|------------------------|---|--|
| Humidity Resistance | 100% humidity at 27°C(81°F) for 72 hours | No effect |
| Cold Resistance | 72 hours at -56.6°C(-70°F) | No effect |
| Heat Resistance | 72 hours at 71.1°C(160°F) | 0.4 mm (1/64") maximum shrinkage from edge of panel |
| Adhesion | 180° pullback at 30 cm (12") /minute at 23°C (74°F) | Minimum 2 kg/2.5 cm (4.4 ppi) |
| 90° Peeling Test | 0.8 kg (1.8lb) weight suspended for 5 minutes | 3 mm (7/64") maximum peeling |
| Accelerated Weathering | Sunshine Weather-O-Meter for 2,000 hours | <ul style="list-style-type: none"> – No visible cracks, bubbles or puckering – Less than 0.2 mm (0.008") shrinkage – Reflectivity up to 50% greater than minimum required of all known specifications – No significant color changes |
| Salt Spray Effects | 3% concentration at 35°C (95°F) for 500 hours | No effect |

C. Resistance to Chemicals

Table 5

| Property | Test Method | Results |
|--------------------------------|-------------|-----------|
| Water | 1 month | No effect |
| 10% Hydrochloric Acid Solution | 10 minutes | No effect |
| 10% Sodium Chloride Solution | 1 month | No effect |
| Methyl Alcohol | 10 minutes | No effect |
| Kerosene | 10 minutes | No effect |
| Turpentine | 1 minute | No effect |
| Xylol | 1 minute | No effect |

6. DURABILITY

The most important properties of retroreflective sheeting are reflectivity, color, and durability. Of these, durability may be the most important, so special attention was directed toward the selection and use of raw materials and production technology that would render maximum durability. Continuous efforts are being made to attain even greater durability for all Nikkalite® products. From countless tests conducted, it has been determined that

Nikkalite® EG applied as recommended can be expected to meet the durability standards given below without any clearcoating. Under certain weathering conditions, small hair cracks may appear in the sheeting, but such cracks do not significantly reduce the day or night performance of the signs.

Table 6

| Type of Nikkalite® | Length of Durability |
|---------------------------------|----------------------|
| 7112, 8112 (White) | 7 years |
| 7104, 8104 (Yellow) | 7 years |
| 7105/7135, 8105/8135 (Red) | 6 years |
| 7106, 8106 (Blue) | 7 years |
| 7107, 7177, 8107, 8177 (Orange) | 6 years |
| 7108, 8108 (Green) | 7 years |
| 7109, 8109 (Brown) | 7 years |

Note: The data above are based on the tests conducted in the United States as well as in Japan. These tests included outdoor exposure and Emmaqua* tests in Phoenix, Arizona, outdoor exposure in Miami, Florida, and Sunshine (carbon arc) weatherometer tests. It was found that durability is affected by the type of substrate, surface treatment of the substrate, exposure conditions, and types of maintenance.

*Emmaqua is an equatorial mount with mirrors for accelerated weathering, which includes the spraying at one hour intervals during daylight of distilled water on the test specimen. This type of test is conducted at DSET LABORATORIES, Inc. of Phoenix, Arizona, U.S.A.



Japan Weathering Center exposure site



Nikka Polymer Co., Ltd. exposure site

7. COLOR MATCHING

When it is necessary to use more than one sheet of Nikkalite® sheeting on one sign, it is recommended to use sheeting cut from the same roll. If, however, sheets from different rolls are used, care must be taken to ensure that the daytime and nighttime colors of the sheeting used are matched. Color matching should be done in daylight away from colored walls or other objects that can affect the

color of the sheeting. To match night color, examine the sheeting in a dark room or area with a light directed on the surface. The light source (flashlight, spotlight, etc.) should be held at eye level and observation should take place from behind the light, as far away from the sheeting as practical.

8. APPLICATION

Nikkalite® is precoated with an adhesive that will bond the sheeting firmly and permanently to clean and smooth surfaces of tested and approved metal, coated metal,

plastic, plywood, etc. Two application methods are employed to bond Nikkalite® sheeting to these surfaces: the vacuum-heat method and the pressure method.

A. Vacuum-Heat Application

Nikkalite® 7100 Series must be bonded to the sign substrate by means of the vacuum-heat application method.



B. Pressure Application

Nikkalite® 8100 Series is bonded to the sign substrate by application of pressure with a roller applicator or a squeegee. When applying Nikkalite® PS sheeting to large surface areas, the best results can be obtained by use of a mechanical roller applicator.



9. STORAGE AND SHELF LIFE

All Nikkalite® retroreflective sheeting must be stored in a cool, dry, and clean area. Avoid exposure to direct sunlight

and storage in excessively humid areas. The shelf life of the sheeting is 12 months after delivery.

10. MAINTENANCE

Nikkalite® sheeting surfaces covered with dust or small particles of sand should be cleaned with water containing a mild, neutral cleaning solution. To avoid scarring the surface, use a soft, clean cloth or sponge when washing

and drying.

To remove tar and oily substances, rub lightly with a soft cloth soaked with a mild solvent such as kerosene or turpentine.

All the aforementioned figures in the tables are based on our experience and actual measurements based on our own tests. However, these figures may not be guaranteed.

Reliability of Information

All recommendations and technical information contained herein are based on experiences and tests, which the manufacturer believes to be reliable; however, their accuracy and completeness are not warranted.

The user is requested to conduct their own test/tests to determine the fitness of this product for the intended application.

Warranty

Nikkalite® Products are warranted to be free from defects in materials and workmanship at the time of their sale, except herein expressly warranted. NCI's (Nippon Carbide Industries Co., Inc.) liability is limited to replace the defective materials solely as

stated herein. NCI shall not be liable for any loss, damage or injury, direct or indirect or incidental, arising from the use or inability to use said products, and the warranties of merchantability or fitness for a particular purpose as well.

Warning

Failure to comply with the explicit instructions in this bulletin will result in voiding all warranties express or implied for use of this product. If retroreflective sheeting is to be applied to a surface other than conventional

sign blank materials, prospective users should contact technical representatives of Nippon Carbide Industries Co., Inc. for advice before such application.

Safety and Health Information

Read carefully in advance the labels, instruction manuals, material safety data sheets (MSDS), and first aid measures of the retroreflective sheetings supplied by Nippon Carbide Industries Co., Inc. (hereinafter referred

to as "NCI"), the auxiliary materials such as inks and solvents used for NCI's products, and proprietarily used chemicals such as substrate cleansers.



NIPPON CARBIDE INDUSTRIES CO.,INC.

■Japan(Head Office)

Nippon Carbide Industries Co., Inc. : 11-19, 2-chome Konan, Minato-ku, Tokyo
108-8466, Japan
Telephone : 81-3-5462-8206 Telefax : 81-3-5462-8271

■U.S.A.

Nippon Carbide Industries (USA) Inc. : 3136 East Victoria St., Rancho Dominguez, CA, 90221, U.S.A.
Telephone : 49-(0)21 54 42 86 05 Telefax : 310-632-1959

■Germany

Nippon Carbide Industries (Europe) GmbH : Halskestraße 27, D-47877, Willich, F.R.Germany
Telephone : 49-(0)21 54 42 86 05 Telefax : 49-(0)21 54 42 86 80

■France

Nippon Carbide Industries France S.A. : 5 bis, rue du Petit Robinson 78353 Jouy-en-Josas Cedex France
Telephone : 33(0)1 34 65 00 00 Telefax : 33(0)1 30 70 64 55

■Spain

Nippon Carbide Industries España S.A. : Rocafort, 250, bajos, 08029 Barcelona, Spain
Telephone : 34-93-419.79.90 Telefax : 34-93-410.01.61

■Netherlands

Nippon Carbide Industries (Netherlands) B.V. : Eisterweg 5, 6422 PN Heerlen, The Netherlands
Telephone : 31-(0)45-542 95 00 Telefax : 31-(0)45-542 96 39

■China

Nippon Carbide Industries (Hangzhou) Co., Ltd. :
No.99 Hongda Road Qiaonan-Qu, Xiaoshan Economic & Technology Development Zone, Hangzhou, Zhejiang, China
Telephone : 86-(0)571-82696666 Telefax : 86-(0)571-82696473