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Product Technical Bulletin

ORALITE® Series 5300 Economy Grade Reflective Film Release 1, Effective February 2007

Description

ORALITE® Series 5300 reflective film is a 3-year, 4-mil film, and is available in six high impact colors including white, yellow, orange, red, green and blue. Intended for short- to medium-term outdoor use, Series 5300 film features a clear, permanent, solvent-based adhesive and an 84-lb. PE-coated paper liner. It is weather resistant and provides excellent corrosion and solvent resistance properties. Its smooth, alkyd resin surface offers high scratch resistance, impact strength and compatibility with thermal transfer printers.

This film is suitable for the manufacture of economical traffic, guidance, warning and information signs as well as reflective lettering, numbers and symbols that are not required to comply with national specifications for retroreflectivity. ORACAL Series 5300 reflective film is available in widths of 24 inches, 48 inches, 15-inch punched and 30-inch punched, and is offered in 10- and 50-yard lengths.

Product Data

Construction

This information is subject to change. Please ensure you are referencing the most recent Product Bulletin.

- **Face Film** – 3.5-mil reflective high-performance alkyd resin film
- **Adhesive** – Solvent polyacrylic permanent pressure-sensitive adhesive

Physical Properties

The information stated below is based on testing results and intended solely as an information source. These values are given without guarantee and no warranty is implied or expressed. ORACAL recommends the purchaser conduct independent tests prior to use in order to determine suitability for his/her intended application.

Outdoor Durability	3 years
Application Surface Contours	Flat, simple curves
Minimum Surface/Air Application Temperature	+46° F
Temperature Resistance	Adhered to acrylic, -68° F to +176° F no variation
Resistance to Solvents and	After 72 h adhered to aluminum at room temperature.

Chemicals	resistant to most oils and greases, weak acids, salts and alkalis
Shelf Life	2 years (68°F/50% relative humidity)
Adhesive Power	(FINAT-TM 1, after 24h average) adhered to stainless steel: 3.4 lb/in ² , tear of the film
Tensile Strength (along)	(DIN EN ISO 527) min.10 MPa
Tensile Strength (across)	(DIN EN ISO 527) min.10 MPa
Elongation at Break (along)	(DIN EN ISO 527) min. 30%
Elongation at Break (across)	(DIN EN ISO 527) min. 50%
Dimensional Stability	N/A

Compatible Substrates

ORALITE® Series 5300 film is compatible with most clean, smooth, non-porous, flat, rigid, weather-resistant surfaces. For use in manufacturing traffic signs, the most reliable and durable substrates are properly prepared aluminum sheets and extrusions. ORACAL recommends that users carefully evaluate all other substrates to determine their suitability for reflective film applications.

Substrate Evaluation

For successful application of reflective media, the following substrate properties must be tested and determined to be suitable:

- Adhesion – initial and long term
- Outgassing
- Mechanical properties
- Durability

Adhesion

Following the guidelines provided on pages 5 through 10 of this bulletin, prepare the substrates to be tested. In addition, an etched and degreased aluminum panel should be used as a control. Substrate preparation is an area to test various procedures, such as:

- Aluminum – Etch, no etch, alloy, mechanically reclaimed, surface roughness, surface coating type, panel thickness
- Plywood – Grade, sanded, not sanded, sealed edges, unsealed edges, paint type
- Plastics - Type, new, recycled, flame treated, chemically treated surface, solvent wiped

Properly apply the reflective film to the prepared substrates (including the aluminum control panel) following the instructions for each substrate as described in this bulletin.

Testing Adhesion

Prepared panels and reflective sheeting should be conditioned for 24 hours at 68°F and 50% humidity before testing. Be sure to store both the film and the substrate in the same area so that the temperatures of the substrate and the media are the same.

Adhesion can be measured on an Instron, which will provide a numerical value in pounds per square inch. References are ASTM D903 or Pressure Sensitive Tape Council (PSTC-14 or PSTC-5).

When laboratory equipment is not available, adhesion can be rated as the film is physically removed. Using a putty knife, attempt to pry the film from the substrate while subjectively rating the difficulty of removing the film, the size of the piece removed and the location of the failure. This method is highly subjective and results will vary from person to person. Long-term adhesion performance can only be tested after actual weathering.

Outgassing

To properly test for outgassing, the test time should equal the amount of time normally involved between production of the substrate and application of the film in full-scale production. Application to polycarbonate substrates should be made as soon as possible after the substrate material reaches room temperature after drying and oven bake for 24 hours at 150°F. Apply a small piece of film to the polycarbonate substrate. If bubbles form after 24 hours, outgassing is still occurring. Either treat the plastic with a heat source or store it for an extended period at room temperature to cure the substrate prior to application of the reflective film.

For durable sign applications, actual weathering and accelerated exposure of 500-2,000 hours at 150°F should also be used to identify potential outgassing problems.

Mechanical Properties

Reflective film performance is affected by mechanical properties such as warpage, delamination, stress fatigue or flexing. Sign substrates should be at least as rigid as typically supported 0.080" thick aluminum (alloys 6061T6 or 5052H38). In addition, such properties should remain functional over the desired life and not deteriorate due to such factors as embrittlement. A potential list of mechanical properties to be tested:

<u>Property</u>	<u>ASTM Test</u>
Tensile Strength	D 638
Tensile Modulus	D 638
Flexural Strength	D 790
Flexural Modulus	D 790
Compression Strength	D 695
Compression Modulus	D 695
Coefficient of Linear Thermal Expansion	D 1435
Weather Resistance	D 1435
Fire Resistance	D 635
Impact Resistance	D 4508

Durability

Artificial accelerated tests can be used to compare either materials of similar composition and construction or different lots of the same material. These comparisons must only be made between materials exposed at the same time in the same device. Negative results in artificial accelerated tests can be an indication of poor field performance. Exterior exposures conducted according to ASTM G7 or D1435 should always be done in addition to artificial accelerated tests. Most potential substrate problems could be screened by a qualifying user through a two-year exterior south-facing exposure program at 45° from the horizontal. All samples should contain applied retroreflective film with half of the samples exposing the substrate side. Longer exposure may reduce the risk of failure if extended durability is required. If there is a composition change by the manufacturer, ORACAL recommends that the qualifying user specify resubmission of substrate samples for test.

The following tests should be used to evaluate substrate and sheeting performance after exposure:

Impact Strength	ASTM D 3841
Flexural Strength	ASTM D 790
Retained Retroreflectance	ASTM E 810
Color	ASTM E 811
Adhesion	ASTM D 903

Results for substrates should always be compared to those of 5052-H38 or 6061-T6 alloys of aluminum.

General Surface Testing

Properly treated sign blanks must be clean before application. Blanks should not be dusty or contact greases, oils or other contaminants before application of reflective film. Use the following tests to detect surface contamination:

Tape Snap Test

If you suspect that the surface of the sign blank may be dirty or that the conversion coating was improperly applied, firmly apply a strip of transparent tape to the dry surface, then snap it up at a right angle. Any loose material on the tape or a visual change in color or sheen where the tape had been applied indicates a heavy, loosely coated or otherwise contaminated surface that may not be suitable for film application.

Water Break Test

Test for oil or wax contamination by pouring water onto the surface. The water should NOT bead, but should flow out to form a uniform film on the surface.

Application

Important Notes

- The high-quality adhesives used on ORACAL pressure-sensitive films create an excellent bond with most clean, smooth, weather-resistant surfaces that are free of grease, dust or any contaminants. For a long-lasting bond, the target surfaces must be properly prepared. ***Be sure to check the directions provided by the manufacturer of the substrate you are using to determine the recommended cleaning method for that surface.*** Gas bubbles may form between the film and the surface if any solvent residue remains as a result of improper cleaning or if paint on the surface is too fresh. Freshly lacquered or painted surfaces should be allowed to stand for at least three weeks after complete curing before adhering the film. *The compatibility of selected lacquers and paints should be tested by the end-user prior to use.*
- ORALITE® Series 5300 film should be conditioned prior to application to provide a minimum film temperature of 65°F throughout the roll. Be sure to store both the film and the substrate in the same area so that the temperatures of the substrate and the media are the same.
- For best results, use a mechanical applicator to apply reflective film. Mechanical applicators apply even pressure and ensure a bubble-free and wrinkle-free application, whereas hand application can result in bubbles and/or wrinkles that cannot be removed from the finished sign.
- Never use a wet application method with reflective film as the moisture between the face stock and the substrate can cause the reflective metal particles to oxidize. Use of a wet application method will invalidate the standard warranty on this product.
- Clean, lint-free gloves should be used to prevent contamination when handling blanks and film.

Preparing the Surface

Aluminum

If properly prepared, aluminum sheets of 6061-T6 or 5052-H38 alloy or specially designed sign extrusions are suitable for fabrication of traffic signs. Before film application, aluminum sheets and extrusions must be degreased, etched and free of white rust. Many users also choose to add a conversion coating treatment to the substrate to provide resistance to corrosion and white rust formation. Mechanically reclaimed aluminum must have a surface finish produced with 100-grit or finer abrasive and be degreased before sheeting application.

Degreasing (Large Volume)

Following manufacturer's instructions on time, temperature and concentration, degrease using a tank-type bath with controlled alkaline solution. Immersion time will depend upon the amount of soil and solution strength. Rinse blank thoroughly by high-pressure spray with clean water, or use a commercially available agitated rinse tank. Allow to dry completely.

Aluminum Etching (Large Volume)

For large-volume aluminum etching, you will need specially designed tanks lined with special alloy stainless steel, wood or plastic.

Acid etch in a 6% to 8% phosphoric acid solution at 100°F, or in a commercially available acid etching solution. Rinse thoroughly by high pressure spray with cold water, or use a commercially available agitated rinse tank. Allow to dry completely.

OR

Alkaline etch with a controlled alkaline solution. Follow solution manufacturer's instructions on time, temperature and concentration. Rinse thoroughly with clean water. Remove any smut with an acidic chromium compound such as a chromic acid solution. Rinse thoroughly. Allow to dry completely.

One-Step Hand Degreasing and Etching (Small Volume)

Scrub the aluminum surface thoroughly using medium to fine steel wool and abrasive cleanser in water. Rinse thoroughly with clean water. Dry the metal completely immediately following rinse.

Solvent Wiping

To remove greasy fingerprints and other contaminants from surface, wipe degreased and etched blanks with solvent before applying reflective film.

- Saturate a clean cloth with a solvent such as VM&P naphtha, xylol (xylene), lacquer thinner or commercial equivalent and wipe surface thoroughly. Be sure to clean along edges.
- Using a clean, lint-free cloth, wipe the surface clean before the solvent evaporates.

Chromate Conversion Coating of New Aluminum

(Based on recommendations from chemical coating manufacturers)

- Coating must be applied according to manufacturer's instructions in conformance with ASTM B449 Class 2, and should range in color from silvery iridescent to pale yellow. The coating weight should be 10 to 35 mg/ft² with a median of 25 mg/ft² as the optimum coating weight.
- Reflective film durability can be reduced if the coating is dusty and not tightly bonded within itself or to the aluminum substrate, or shows excessive buildup at edges as a result of improper processing.

Non-Chrome Conversion Coating

- The non-chrome coating shell must be adherent and non-powdery. Adhesion of an air-dried acrylic coating applied to a non-chrome coated aluminum must pass the requirements of ASTM D 3359 (Test Method for Measuring Adhesion by Tape Snap Test). Or, the adhesion of the air-dried acrylic coating measured according to ASTM D 4541 (Test Method for Pull-Off Strength of Coatings Using Portable Adhesion

Testers) on non-chrome coated aluminum must be equivalent to that of the coating on chromate-coated aluminum of the same alloy.

- The non-chrome coated aluminum must meet the requirement for ASTM B449 Class 1 chromate coatings. This translates to 500 hours ASTM B117 salt spray for 5052H38 and 336 hours for 6061T6. Three 4" x 6" panels must be tested. No panel can have more than five spots or pits that can be detected by the unaided eye, with no spot greater than 1mm in diameter. There can be no more than a total of eight of these spots for all three panels. Spots within 10mm of the edge of the panel are not counted.
- Non-chrome panels must be compared to chromate-coated and etch-and-de-smut panels of the same alloy in a marine exposure test location recognized as an aggressive site for corrosion testing for a period of at least six months. In the USA, these exposures should be conducted at the 25 meter lot at the Kure Beach, NC site operated by LaQue Corrosion Test Center. For this exposure, cover the top half of the panel with retroreflective film, with the bottom half bare aluminum. After exposure, the appearance of the bare section of the non-chrome coated panel must be judged at least equivalent to that of the chromate-coated aluminum and superior to that of the etch-and-de-smut aluminum. There can be no difference in edge lifting or appearance of the retroreflective film on the non-chrome aluminum compared to either the chromate-coated or etch-and-de-smut aluminum. Retained retroreflectance of the film applied to the non-chrome aluminum must be at least equal to retained retroreflectance of the film applied to the chromate-coated or etch-and-de-smut aluminum.

Plywood and Wood Products

The wood products listed below require several finishing steps before application of retroreflective film. Procedures provided are based on technical information provided by the American Plywood Association.

Surfaces must be smooth, impermeable and weatherproof. Edge sealing is very important. All voids must first be filled with wood filler or other suitable sealer, then sanded and completely coated with a quality edge sealing coating such as multiple coatings of an aluminized urethane edge sealer or polysilicone paint. Users are urged to carefully evaluate any reflective film applications to such surfaces under actual use conditions to determine suitability and performance life for the intended use.

Simpson Highway™ High Density Overlay (HDO) or equal – This APA-trademarked HDO conforming to U.S. Product Standard PS 1 has an overlay on both faces prepared at the time of manufacture so that sanding and solvent wiping are not required before applying reflective film.

- Seal edges
- Remove loose contamination with a tack cloth

High Density Overlay Plywood – General use or sign-grade conforming to U.S. Product Standard PS 1.

- Seal edges – To ensure a good bond, prepare the surface by one of the following conditioning treatments.
 - Scuff-sand with fine grit sandpaper (150-200) and thoroughly remove sanding residue with a tack cloth.

OR

- Thoroughly scrub with a nylon abrasive pad saturated in VM&P naphtha or equivalent solvent. The liquid solvent should then be wiped off with a dry cloth to completely remove any surface contaminants. Ensure complete evaporation of all solvents by exposing to good air circulation at least overnight. Time will depend on temperature and air movement.

Other wood products – Medium Density Overlay (MDO) plywood, exterior-grade plywood (fir only, not oil treated), hardboard, lumber and other wood products.

- Seal edges
- Both faces of the above substrates must be face primed and top coated with a compatible paint. To ensure good adhesion, use primer and finish materials produced by the same manufacturer and formulated as companion. ORACAL recommends using high-quality, oil-based exterior paints formulated for wood.

Steel

Continuous Coat Mill Galvanized Phosphate-Coated Steel

Direct applications can be made to clean, dust-free substrates. If necessary, degrease or solvent wipe (xylol). Remove white rust with steel wool soaked in 6-8% phosphoric acid solution and rinse with clean water. Hydrogen occlusion may cause blistering of applied film. This can be reduced by oven curing the phosphate-coated galvanized steel at 300 °F before application. Such dehydrogenation should be in accordance with steel manufacturer's recommendations.

Hot Dipped (Spangled) Galvanized Steel

Applications must be made to clean galvanized steel that has been phosphate coated. Use steel wool soaked in 5-8% phosphoric acid solution and rinse with clean water.

Electro-Galvanized Steel

Prepare as for hot or cold rolled steel.

Cold Rolled or Hot Rolled Pickled Steel and Black Iron

Do not apply film directly to unpainted steel. Contact metal treatment suppliers for recommendations on treatment and finishing to accomplish degreasing and surface conversion to tight crystalline phosphate coating. Follow with prime and finish coating of exterior oil-based enamel.

Plastics

Because plastics, including fiberglass laminates, vary as to type, composition and manufacture, their use as a substrate for reflective film requires careful evaluation under actual use conditions. Successful applications have been made; however, some plastics become brittle when exposed to outdoor conditions, while other plastics contain migrating constituents that may contaminate the adhesive or cause film discoloration and adversely affect performance. Also, some plastics are affected by ingredients in the film adhesives that migrate into the panel. Any reflective film that is applied to a transparent substrate **MUST** be evaluated because the adhesive may degrade when exposed to UV radiation. Opaque substrates prevent this exposure.

Users are urged to carefully evaluate any reflective film application to a plastic substrate under actual use conditions to determine suitability and performance life in the intended use.

One or more of the following steps are generally required to obtain maximum initial adhesion. Like aluminum, the plastic substrate should pass the water break test described on page 4.

- Solvent wipe
- Flame treating

Flame treating makes plastic surfaces receptive to various types of adhesive. This process changes the surface molecular structure of polyethylene and some other plastics by using an oxidizing flame to produce a polar surface state that allows for good adhesive bonding in preparation for labeling, printing or decorating.

The plastic should be clean and free of dirt and oil prior to treatment. For most effective flame treating, the tip of the outer blue envelope of flame should just touch the surface of the material being treated (the inner cones of flame that appear yellow or red contain products of incomplete combustion and do not treat as effectively as the outer tip).

Most processors use burners designed to provide a continuous "ribbon of flame," either straight or curved, depending upon the shape of the objects to be treated. A series of small burners can be used to accomplish the same result.

To obtain the correct "atmosphere" at the tip of the flame, there should be a slight excess of oxygen. This is accomplished by slightly exceeding the recommended air-to-gas ratio. For natural gas, the usual recommended air-to-gas ratio is 10 air to 1 gas on a volumetric basis. By setting an air-to-gas ratio of 11-12 to 1, the treating flame is assured of a hot oxidizing tip. For propane gas, the recommended ration is 24 to 1; therefore, setting of 25-26 to 1 should be sufficient.

Time exposure to the treating flame may be very short. In many cases, a one-second exposure to the flame is adequate if all other factors are correct. Overexposing the plastic to the flame may tend to deform or soften it, which can create problems.

After treating, do not touch the surface before application. To check for proper treatment, pour a small amount of water on the treated surface. If the water beads, the surface is not adequately treated. If the surface has been properly treated, the water should wet the surface with a film of water.

- Chemical Plastic Surface Preparations

Surface Treatment Recommendations

Fiberglass Reinforced Plastic (FRP) Sign Panels

FRP panels designed for signing applications must be free of surface contamination. Generally all that is required is wiping with a tack cloth to remove surface dust.

Fiberglass

Fiberglass may outgas. Apply a small piece of film and allow it to condition for 24 hours, or oven bake at 150°F for 2 hours. If bubbles appear under the film, outgassing is occurring. Cure fiberglass for one week and retest (refer to page 3) NOTE: Do not use solvents as surface cleaners for fiberglass substrates. Remove oily surface contaminants with a mild detergent solution, rinse and dry thoroughly before application.

Acrylics, Plexiglass ABS – Solvent wipe

Polyethylene and Polypropylene

Use only polyethylene that has been flame treated. Solvent wipe with isopropanol and wipe with a clean cloth before solvent evaporates.

Polycarbonates (such as Lexan®)

All polycarbonate substrates must be dried prior to application of any reflective film to help prevent outgassing. It is the responsibility of the user to obtain and follow the recommendations of the polycarbonate manufacturer for drying the polycarbonate. Solvent wipe with isopropanol and wipe with a clean cloth before solvent evaporates. Test for outgassing by applying a small piece of film as soon as the polycarbonate substrate reaches room temperature after drying and oven bake for 24 hours at 150°F. If bubbles appear under the film, outgassing is occurring. Since outgassing continues for extended periods of time, application is not recommended. Re-dry polycarbonate and repeat the test. NOTE: Pieces of plastic that are under stress may craze or crack after film is applied.

Polystyrene – Not recommended for exterior exposure applications.

Porcelain Enamel and Glass

Extreme variability of these surfaces requires that users carefully evaluate on a test basis any film application to determine the suitability for the intended use. Any reflective film applied to a transparent or translucent substrate MUST be evaluated using the techniques described on page 3 of this bulletin because the adhesive may degrade when exposed to UV radiation. Opaque substrates prevent this exposure. Before applying film, clean the substrate thoroughly with abrasive cleanser and a steel wool pad. Follow with a thorough water rinse and dry.

Application Techniques

Application Temperatures

ORACAL films should never be adhered at temperatures below 46°F. Newly fabricated sign faces should remain in the application environment for at least 24 hours to promote uniform adhesion and allow any residual moisture to evaporate. A significant drop in temperature should be avoided during the first 24 hours after adhesion.

Removing the Synthetic Release Liner

Lay the cut film on a flat surface with the film side down. Pull back only as much release liner as required to begin mounting. Always draw the release liner from the film, never the other way around.

Interstate Squeeze Roll Application

The interstate squeeze roll applicator is designed for continuous machine application of reflective films to flat panels, including extruded panels and panels fabricated with extruded ribs. Please refer to the equipment manufacturer's instructions for detailed information on operating this machine.

Dry Adhesion (Manual)

For dry adhesion, ORACAL recommends using a high-tack application tape.

- Arrange the cut film on the surface to which it is to be adhered and press it firmly to the surface at one corner.
- Adhere the remainder by sweeping a plastic squeegee across the film in an overlapping motion.
- Depending on the size of the cut film being mounted, the release liner may be removed completely before bonding or gradually during the adhering procedure.
- When using ORATAPE® masking tape, pull slowly away from the film at a 180° angle. If needed, the top of the masking tape can be lightly sprayed with water to allow for easier release from the graphic.

Cutting

Reflective film either can be cut by hand or die cut one sheet at a time, or it can be band sawed or guillotined in stacks. If two or more pieces are used side by side, they must be matched to assure uniform day color and night appearance. ORALITE® Series 5300 Reflective Film is designed for use on electronic cutting plotters. To reduce the possibility of stress cracking, the inside corners of cut out letters and symbols should be rounded using the largest radius consistent with acceptable appearance. Minimum radius should be 1/8" on a 3" letter.

Edge Sealing and Clear Coating

Clear coating of ORALITE® Series 5300 Reflective Film is not recommended because it will reduce the normal effective performance life. Edge spotting of cut letters that will be exposed to de-icing salts or will be installed in highly industrialized areas can be minimized by coating the sign with edge sealer.

Cleaning

For maximum retroreflectivity and performance, signs should be kept clean and free of dirt, road tar, oil and bituminous material.

Cleaner

A wet, non-abrasive cleaner suitable for high-quality painted surfaces is recommended. Use a mild cleaner with a pH range of 6 to 8 that does not contain damaging solvents. If there is any doubt as to the suitability of the cleaner, test it on a separate piece of reflective film or on a small section of a sign.

Equipment

For best results, use equipment that has been designed specifically for cleaning signs. Do not use high-pressure sprayers or brushes with stiff bristles and avoid unnecessary scrubbing as this can abrade the sign.

Cleaning Procedure

- Flush the entire surface with water to remove loose dirt.
- Wash the sign face from the top down with a soft brush, rag or sponge, using detergent or any suitable commercial cleaner. Once cleaner has been applied, keep a steady stream of water flowing on the surface to wash away dirt.
- Rinse the entire sign face with clean water and allow to air dry.

Tar, Oil, Diesel Smut, Bituminous Material

If this material remains after the initial cleaning described above, moisten a soft cloth with kerosene, mineral spirits or VM&P naphtha and lightly wipe the area. Next, wash with detergent and water, rinse with clean water and allow to air dry. Do not use strong solvents. Do not spray cleaning products directly on the film surface. Avoid the film edges. CLEANING THE SIGN SURFACE WITH SOLVENTS MAY CAUSE DAMAGE TO THE SIGN FACE.

Graffiti

Vandalized reflective signs typically cannot be successfully restored because the type of paint, length of exposure and type of remover used may adversely affect the performance life of the reflective film. To determine whether the graffiti can be removed without damage to the process color or reflective film, test a small area with a cloth moistened with a mild solvent such as mineral spirits or VM&P naphtha.

NOTE: Some cleaners do not affect daytime appearance but do cause loss of retroreflectivity. View the cleaned area with a light source to ensure that retroreflectivity has not been affected.

If mild solvents do not remove the graffiti, progressively stronger solvents may be tried (such as lacquer thinner, methyl ethyl ketone toluene, xylene, acetone and commercial graffiti removers). It may be possible to remove the graffiti before continued rubbing damages the reflective film or removes the process color. Continued cleaning with these

solvents will result in loss of reflectivity, removal of screened color and reduced durability.

Storage

Shipping, Storage, Shelf Life

- Film must be stored at 68°F/50% relative humidity.
- For optimal product quality and performance, film must be stored in a dry, clean area, out of direct sunlight.
- Shelf life of ORACAL® Series 5300 must not exceed two years from the date it is received from ORACAL USA.
- Store rolls horizontally in the shipping carton.
- Store partially used rolls in the shipping carton or suspend horizontally from a rod or pipe through the core.
- Unprocessed sheets should be stored flat.
- Finished signs should be stored on edge.
- Screen processed faces or signs must be protected with resin-coated paper or the liner from Series 5300 used as slipsheeting. Place the glossy side of the slipsheeting against the sign face. Double-faced signs must have the glossy side of the slipsheet against each face of the sign.
- Avoid banding, crating or stacking because this puts signs and faces under pressure. Package for shipment in accordance with commercially accepted standards to prevent movement and chafing, which may cause damage during handling.
- Store sign packages indoors on edge.
- Do not allow panels or finished signs to become wet in shipment or storage. Should packages signs become wet, unpack immediately and allow signs to dry.

General Performance Considerations

The durability of ORALITE® Engineering Grade Reflective Film depends upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions and maintenance. The stated maximum durability rating of Series 5300 film can be expected in applications that are subject to vertical exposure on stationary objects when processed and applied to properly prepared aluminum according to ORACAL recommendations.

The user must determine the suitability of any non-metallic sign backing for its intended use. Applications to unprimed, excessively rough or non-weather-resistant surfaces, or exposure to severe or unusual conditions can shorten the durability of such applications. Signs in mountainous areas that are covered by snow for prolonged periods may also have reduced durability.

Warranty

ORACAL USA warrants its pressure-sensitive vinyl films to be free of defects in materials and manufacture, and to perform as stated in published product technical information bulletins if properly stored and applied. ORACAL USA will, at its discretion, either replace defective material or refund the purchase price of any ORACAL®, ORAJET®, ORAGUARD®, ORALITE® or ORAMASK® materials that do not meet this warranty within the specified effective performance life. The customer assumes responsibility in determining product suitability for intended use. ORACAL USA shall not be liable for any direct, indirect or consequential damages arising from the use or inability to use the product. This warranty is declared in lieu of any other claim, whether expressed or implied, and is not subject to interpretation. If you are in extreme climate zones (Southwestern United States, desert, tropics, etc.), South America, Latin America or the Caribbean, contact ORACAL USA for specific warranty information for your area.

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