



Application of 3M™ DI-NOC™ Films A Guide for Indoor and Outdoor Dry Applications

Description

3M™ DI-NOC™ Films are durable, cleanable, flexible PVC films with 3M's Comply™ Adhesive air release channels for fast, easy and virtually bubble-free application. Use DI-NOC film in place of or to enhance natural materials. These films have excellent adhesion and flexibility, allowing them to be used indoors or outdoors on flat or complex curved substrates, walls, furniture, fixtures, etc. Some of the films can also be applied to 3-dimensional surfaces and/or thermoformed. These films are ideal for both new construction and remodeling.

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Pre-Installation Overview



Understanding how this film differs from others you may have used will help you achieve a successful application.

1. Consider how surface texture will affect film adhesion and ease of application.
2. Make sure you and your customer understand and agree on these important points:
 - Unless the substrate is very smooth, you may be able to see its texture through the film.
 - Applying compounds to smooth a textured surface permanently changes the substrate.
 - Attempting to remove the film may damage the substrate or its finish. Removal is not warranted.
3. Consider the impact of all human and environmental conditions to which the film will be exposed.
 - Temperature and humidity: constant or variable?
 - Direct UV light (sunlight)
 - Heating or cooling ducts in close proximity
 - Unsealed substrates in front of water sources
 - People, animals or cleaning equipment that will come in physical contact with the film
4. The condition of the application surface impacts adhesion. See page 3 for more details.
 - Be sure any existing paint, surface finish or wall covering has excellent bond to the substrate wherever film will be applied.
 - Repair, prime and paint the substrate, if needed.
5. Substrate primer, which increases film adhesion, may be required. See page 2 for more details.
6. Develop good application techniques for this film, which may be somewhat different from other films you have applied.
 - Clean the substrate immediately prior to applying film.
 - Use a DRY application method.
 - Apply the film with a 3M™ Plastic Applicator PA-1 wrapped with a suitable sleeve protector.
 - To finish the job properly, heat the edges of the film and re-squeegee to secure the edges.

Surface Textures and Composition

Pro's Tip

A very smooth application surface allows the best adhesion and ensures that no surface texture shows through the film.

Consider using a DI–NOC film with more visual design and/or embossed texture if the substrate is not very smooth.

Definitions

Application Surface. The actual product to which a graphic is applied. This may be the finish (paint, varnish, putty, laminate) or the bare substrate.

Porosity. Some application substrates are porous. Although the film may appear to adhere well initially, adhesion can decrease significantly over time. We recommend applying an appropriate sealer to porous surfaces.

Substrate. The supporting structure of a wall, such as wood or steel framing members covered by wallboard, or hard surfaces such as brick, concrete block, stucco, steel.

Texture. This is the tactile feeling that every surface has. Texture can range from smooth as glass or as rough as heavily textured concrete. Texture has a significant affect on film choice, ease of application, adhesion and removal. The following descriptions provide general categories for texture but are subject to interpretation.

- **Very smooth texture.** No surface variation; almost glass–like, like unpainted aluminum plate. Allows the easiest film application.
- **Fairly smooth texture.** Little surface texture, such as painted wallboard. Allows easy film application and good adhesion, but the texture may show through the film on solid colors or films have little graphic design.
- **Unsmooth texture.** Has obvious visual and tactile variations in the surface, such as concrete block, brick, textured wallpaper, etc. Application is difficult and the film may not adhere well because the film's adhesive does not come into full contact with the substrate. This type of texture will show through almost all films. If feasible, apply a coating to smooth the texture. See **Changing the Texture of the Application Surface**, page 3.

Adhesion

Initial and Final Adhesion

The adhesion of any film is defined by both the initial adhesion and final adhesion to which it builds over time. These values vary depending on the type of adhesive used on any particular film, the type and texture of the application surface, application temperature, application techniques, and exposure conditions. Any of these variables can prevent the film from achieving a full bond.

- **Initial adhesion** is the amount of bond needed to hold the film in place during application. Good initial adhesion requires that a substantial portion of the adhesive come in contact with the substrate.
- **Final adhesion**, or maximum bond, is achieved in 24 to 48 hours after applying the DI–NOC film. Good final adhesion requires that a suitable substrate was used and was in good condition and the film was firmly applied using the correct techniques.

Substrate Primer

A substrate primer may be appropriate for some applications. See below.

Stretching the Film

Film that is stretched during application may later shrink, which decreases adhesion to the substrate and the film may fall off prematurely. Using a primer minimizes shrinkage and increases adhesion.

Effect of Overlamine on Adhesion

The film must retain some flexibility in order to achieve maximum adhesion. If an overlamine is required, use only 3M™ DI–NOC™ Protect Film DPF–100.

Primer Recommendations for DI–NOC Film

Pro's Tip

Using a substrate primer can significantly increase the film's adhesion, making it easier to apply film to challenging surfaces.

A primer applied to the substrate before applying film helps achieve a good bond between the substrate and film. However, the increased adhesion also makes it difficult to reposition the film during application and may damage the substrate below the primer. Be sure you consider this before using a primer. 3M is not responsible for damages.

When to Use a Primer

Primer should always be used at any overlap, at the end or edge of the film—such as under a butt joint—and wherever the material is stretched—such as at a sharp radius. It is also recommended if the surface energy of the substrate is low.

If the application surface temperature is below 50°F (10°C), allow the primer to dry 2 to 3 hours before applying film. At warmer temperatures, allow the primer to dry for 15 to 30 minutes before applying the film.

Continued on the next page

Selecting a Primer

Primer	Substrate
DP-900N Solvent based	Gypsum board Calcium silicate (with sealer coating) Plywood MDF board Painted or coated metals Films (including DI-NOC films) PVC laminated steel Mortar (with sealer coating) Painted or coated metals
WP-2000 Water based	Gypsum board Calcium Silicate (with sealer coating) Plywood
EC-1368NT Solvent-Based Adhesive	Gypsum board Calcium silicate (with sealer coating) Plywood MDF board Aluminum Stainless steel Painted or coated metals

Note: A primer is usually not needed on flat surfaces or high energy substrates such as metal or paint.

Primer Properties

Property	Solvent Based Primer DP-900N	Water Based Primer WP-2000	Solvent Based Primer EC-1368NT
Type	Polyurethane based	Synthetic rubber	Synthetic rubber
Substrate features	Refer above	Calcium silicate and Plaster boards	Refer above
Container size	1 liter	4 liter	5 gallons
Usage	Do not dilute	Mix with maximum 4 parts water	Dilute with maximum 3 parts lacquer thinner, 1 part EC-1368NT
Coverage	20 – 30 square yards	15 – 30 square yards	10 – 15 square yards
Color	Slightly Yellow <i>(will turn brown if exposed to UV light)</i>	Blue	Yellow
Solids	13%	48%	40%
Viscosity	4.5 m Pa.s	2400 m Pa.s	500 m Pa.s
Shelf life	Use within 1 year of purchase		

Inspecting, Repairing and Preparing Substrates



Inspecting and repairing substrates before you apply DI-NOC film eases installation and helps improve removability, where needed.

Changing the Texture of the Application Surface

There are many substrate-specific products available that can be applied over textured surfaces to make them smooth. Be aware that this permanently changes the substrate/surface.

Contact your building products supplier for assistance in identifying a product that is compatible with your substrate and surface finish. Apply the product as directed by its manufacturer. Allow the material to dry and cure thoroughly and then prime and paint as appropriate before applying the film.

Common Interior Wall Problems

Each of the following problems can contribute to poor film adhesion if not addressed prior to film installation.

- Too much surface texture.
- Poor bond between the paint, finish or wall covering and the substrate.
- Inconsistently applied surface finish.
- Surface finish that is outgassing. As a wall finish dries, it releases certain gases until it is fully dried and cured. Applying film before the finish has cured can result in lifting, bubbles and premature film failure.
- Patched areas that are not smooth and/or have not been primed.
- Moisture behind the substrate, which can cause the film's adhesive to release. Watch for substrates that back up to cooling systems, water pipes, overhead windows or water pipes that could drip on the film, and boarded up windows. These areas are subject to condensation that may not be obvious at the time of installation.
- Any type of contamination on the substrate, including dust, dirt, oil, food, vehicle exhaust, etc. that has not been properly cleaned.

Repairing Damaged Substrate

Repair any substrate damage such as holes, loose wallboard joints, and chipped or peeling paint.

- Smooth the surface by using an appropriate filler and/or sanding. If using a filler, be sure it is fully cured before proceeding.
- Seal the surface with primer and a finish such as paint or other sealant. Two coats may be needed. Follow the chemical manufacturer's recommendations for surface preparation and chemical application.
- If you are painting a surface, use a high quality, semi-gloss paint. Do not use matte paint or paint with silicone, graffiti-resistant or texturizing additives.
- Allow the paint or surface finish to cure thoroughly before applying the film.

Poor Bonding of Surface Finish or Wall Covering to Substrate

If the bond of the surface finish or wall covering to the substrate is not excellent, the film may not adhere well, it may have a poor appearance, and it may fall off prematurely.

Repairing a poor paint or finish bond may be as simple as sanding, priming and painting.

If a poorly bonded wall covering is the problem, the best solution is to remove it, clean and repair the substrate, and apply primer and paint or another finish.

Film Processing

DI-NOC film is available in a wide variety of designs, patterns and colors and typically is not printed or used in electronically cut applications.

Some of the films can be conformed to raised areas or protrusions by using a heat gun during the installation, or by thermoforming.

Note: Occasionally you may encounter a splice in a roll.

Overlaminating

Overlamine DPF-100, a glossy transparent film, can be applied to any of the DI-NOC base films to provide additional scratch and damage protection. It will, however, increase the gloss level of most base films and/or diminish the texture of the textured films. Designs with deeply embossed patterns may have an inconsistent appearance due to the adhesive not wetting-out in the embossed areas.

Do not use any other overlaminates as they will decrease the flexibility and adhesion of the film.

Screen Printing and Clear Coating

This film can be screen printed with 3M™ Screen Printing Ink Series 1900 and cleared with 3M™ Screen Print Gloss Clear 1920DR but the results may not meet your needs or expectations. We recommend testing and approving each type of film before specifying it in a job.

Health and Safety

Caution

When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information.

To obtain MSDS sheets for 3M products:

- By fax, call 1-800-364-0768 in the US and Canada or 1-650-556-8417 for all other locations.
- Electronically, visit us at www.3m.com/msds.
- By mail, or in case of an emergency, call 1-800-364-3577 or 1-651-737-6501.

When using any equipment, always follow the manufacturers' instructions for safe operation.

Caution

Any activity performed for a long period of time in an awkward position or with a high amount of force is potentially a risk for causing musculoskeletal strain, pain or injury. When applying films, follow these practices to improve comfort and avoid injury:

- Alternate your tasks during the application.
- Schedule regular breaks.
- Perform stretches or do exercises to improve circulation.
- Avoid awkward reaching.

Air Quality Regulations

State Volatile Organic Compound (VOC) regulations may prohibit the use of certain cleaning solutions or primers. You should check with your State environmental authorities to determine whether use of this solution is restricted or prohibited.

Substrate Cleaning and Preparation

Dust and other contaminants can collect quickly on the substrate and prevent the film from adhering properly. **Clean the substrate immediately before applying film.** Pay extra attention to cleaning wall edges and corners.

- For most surfaces, wash the substrate with a solution of detergent and lukewarm water. Rinse thoroughly and dry. Avoid soaps or preparations that contain waxes, oils or lotions.
- Tri-sodium phosphate cleaner may be needed for stubborn grease or exhaust contamination.
- Smooth poured concrete walls may require power washing or hand washing with a stiff brush and a detergent cleaner followed by a clean water rinse to remove grease and/or exhaust contaminants. Allow the surface to dry thoroughly (at least 24 hours) before applying the film.
- Even if the substrate is freshly painted/finished, dust it immediately before film application using a soft, clean, lint-free cloth.

Special Film Considerations

Avoid applying film in locations that face direct sunlight and are surrounded by glass. Increased temperature may cause damage to the glass, for which 3M is not responsible.

The following symbols indicate special restrictions or considerations for some DI-NOC films. Please refer to the DI-NOC film catalog to determine which symbols are associated with the film you are applying.

- ☀ Suitable for outdoor use as well as PVC coated steel.
- ☀ Suitable for outdoor use. Cannot be applied on PVC coated substrates. Film color will change over time as it is exposed to UV light.
- W Film will shrink over time. Apply a substrate primer at all film overlaps. Do not use butt joints.
- ☐ ! Do not use on 3-dimensional surfaces or for thermoforming.

Standard Application Techniques

Pro's Tip

Read all instructions before you start: these application techniques may be different from other film applications you have done.

Who Can Install DI-NOC Films?

DI-NOC film has air release channels, making it one of the easiest types of films to apply. However, because this film is often applied over complex structures such as door frames, it requires advanced applicator skills for all but the simplest flat applications. A skilled installer will understand how to plan and execute difficult angles and wrap the film around different planes.

The installer, working with the designer and other construction professionals, also needs to understand and agree on how to prepare any substrate that may need to be smoothed.

Tools and Supplies

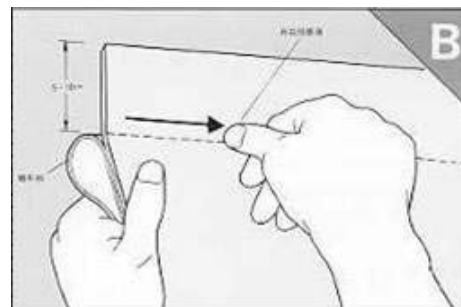
- Scotch™ Masking Tape
- 3M™ Plastic Applicator PA-1
- Suitable sleeve for the applicator
- 3M™ Air Release Tool 391X
- Straight edge (minimum of 1 meter)
- Measuring tape
- Band Paper
- Cutting tools, such as a razor blade with a safety holder
- Primer and brush
- Industrial heat gun; must be capable of attaining and sustaining 260°C to 399°C, or equivalent

*Available from 3M Commercial Graphics Division

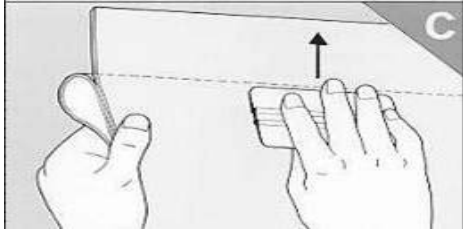
Application Procedure

The following steps provide the general method for applying film to a substrate. If you are an experienced installer, your technique may vary. However, due to the unique qualities of DI-NOC film, we encourage you to review the additional information in this Bulletin before installing the film.

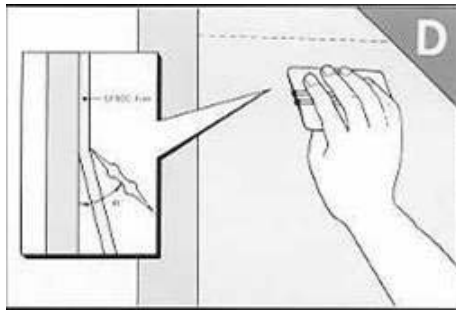
1. Always use only a dry application method.
2. For the most successful film application, the environment and substrate should be 60°–82°F (15°–38° C).
3. Roll back a few inches of the liner from the top of the film. To avoid stretching the film, always remove the liner from the film, not the film from the liner.
4. Align the film and use a finger to tack the film to the substrate.



- Starting in the center of the film and using firm pressure, squeegee the film, stroking to the closest edge. Work across the film to each outside edge.



- Remove several more inches of liner, and maintaining about a 45 degree angle with the squeegee, stroke downward. Work across the film to each outside edge.
- Continue in this manner to apply the rest of the film.



Finishing the Film Edges

Usually, the area with the least adhesive bond is the outer few inches of the film. To finish the job properly, we recommend heating the edges of the film and re-squeegeeing to secure the edges.

To do this, set a heat gun to 150° F (70° C). Hold the gun about 1 inch from the film and heat it for 1 to 2 seconds. Immediately re-squeegee the edge. Continue until all edges are well sealed.

Non-Standard Application Techniques

Pro's Tip

When applying the film, always look ahead and plan how you will approach and apply the film to complex architectural surfaces so that you take advantage of the film's air release channels and avoid wrinkles and bubbles.

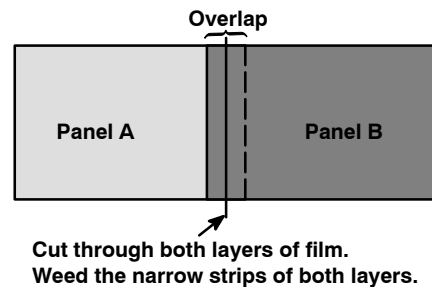
Color Matching and Seaming Adjacent Panels of Film

Whenever you are applying two or more panels of the same DI-NOC film adjacent to one another, use the following techniques to match them to ensure uniform day time color and transmitted night time appearance.

Creating a Butt Seams

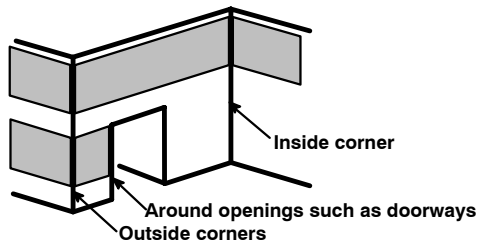
Note: This technique is not recommended for 3-dimensional surfaces or curved substrates. Use a standard overlap for those applications.

- If the same film will be used on each side of the butt joint, be sure to use film from a single roll or lot.
- Pay attention to the direction of designs and the "grain" of embossed patterns, which should always go in the same direction. Failure to do this may cause obvious shifts in color, gloss and design.
- Use a butt joint only when visibility is important and you are working on a flat surface. Films with a **W** designation in the product catalog should not use butt joints.
- Apply substrate primer to the substrate for 1/2 inch (5 cm) on either side of where the joint line will fall. Allow to dry.
- On the side of the film where the joint will be, leave 1/2 inch (5 cm) of the liner on panel 1.
- Apply panel 1.
- Apply panel 2 overlapping panel 1 by 1/3 to 1/2 inch (3-5 cm).
- Use a straight edge to cut through the center of the overlap.
- Remove the liner and all excess film.
- Firmly squeegee the joint and then continue applying panel 2, always working from the joint to the unapplied opposite edge.



Trimming

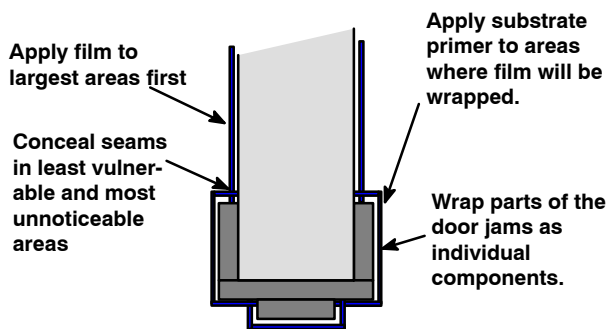
Certain areas of your film applications are more subject to damage than others from people or equipment rubbing against the edges. This includes areas around doors, openings such as vents, outside corners of walls and inside corners. To reduce the risk of damage and lifting, trim the film from the edge. After application, re-squeegee all edges of the film to help ensure good edge adhesion.



Wrapping Film Around Door Jams and Other Complex Structures

DI-NOC film is often applied to complex architectural structures such as door jambs. Here are some guidelines to help you achieve a good appearance.

- Apply film to the walls first.
- Apply substrate primer to any surface that requires you to wrap the film around an edge.
- Wrap strips of film around individual parts of the door jam one at a time. Trying to wrap a larger piece over a very complex profile usually results in wrinkles that cannot be worked out.
- Be sure you cut the strips wide enough: wrapping always takes more than you expect.
- Overlap the joints on the inside corners.



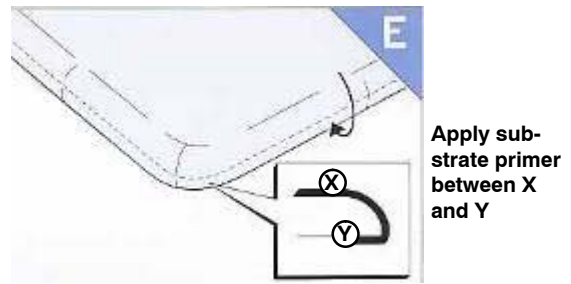
Using Heat to Conform Film Around Difficult Features

You can improve the conformability of many DI-NOC films by heating the film with a heat gun for 1 or 2 seconds and then immediately working the area with a squeegee. This is also a good technique for getting good edge adhesion on overlaps.

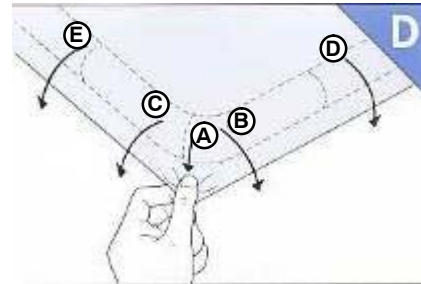
Applying Film to a 3-Dimensional Curved Surface

Note: This technique is not for circular forms.

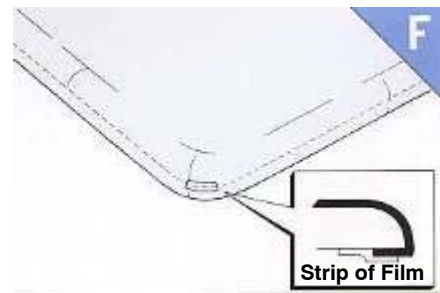
1. Be sure you have enough film to wrap around the edges to the bottom of the surface.
2. Apply substrate primer to the edges, starting about 1/2 inch from where the shape changes (reference **X**) and extending to the back side of the surface for at least 1/2 inch (**Y**). Allow the primer to dry. This will provide excellent adhesion and prevent the film from shrinking.




3. Apply the film at the corner first and then along the straight edges in this sequence: **A**, then **B & C**, then **D & E**, etc.



4. Neatly trim excess film on the back side of the surface.
5. To secure the edges, especially at corners where the film is probably heavier, apply substrate primer, allow to dry, and then apply a small strip of film to the cut edge. This provides additional stabilization and further helps prevent shrinkage.



Thermoforming

Many DI-NOC films are thermoformable, except for film with the symbol  as shown in the product catalog. Excessive stretching may deform the design of DI-NOC film series WG.

Cleaning Applied Film

1. Use commercially available synthetic detergent and water. Avoid using organic solvents or strong detergents that are either highly alkaline (pH>11) or acid (pH<3).
2. Use a soft cloth or sponge without abrasives.

Removing Film

Although DI–NOC films may be removable, the application techniques and the recommended substrate primers increase adhesion so that clean removal without substantial substrate damage is unlikely. The better alternative is to applying new film or surface covering over the DI–NOC film.

The following removal techniques can be tried, but the effort and results will vary.

1. Make cuts in the film about 4 inches apart, making sure not to damage the substrate.
2. Use a hair drier or heat gun set to 200°F to soften the film's adhesive.
3. Immediately pull the film down at about a 150 degree angle.
4. Heat more of the film and continuing pulling.

Warranty

The information contained and techniques described herein are believed to be reliable, but 3M makes no warranties, express or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose. 3M shall not be liable for any loss or damages, whether direct, indirect, special, incidental or consequential, in any way related to the techniques or information described herein.

3M Related Literature

Before starting any job, be sure you have the most current Product and Instruction Bulletins.

The information in 3M Product and Instruction Bulletins is subject to change. Current Bulletins, as well as a list of all Bulletins updated within the last three months, are available at www.scotchprint.com or through our Fax–on–Demand system. Any warranty, if offered, is based on information in the appropriate Bulletin(s) that was current at the time you purchased the 3M products. The following Product and/or Instruction Bulletins provide the information and processes you need to properly make the graphics described in this Bulletin.

Fax–on–Demand phone numbers:
United States or Canada: 1-800-364-0768
International: 1-651-732-6506

Subject	Bulletin No.	FOD No.
Product Bulletins		
3M™ DI–NOC™ Films	D1	1027
Warranties		
Worldwide 3M Graphics Center Warranty Brochure		9503



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3M Center, Building 220-12E-04
PO Box 33220
St. Paul, MN 55144-3220 USA
General Info. 1-800-374-6772
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3M Canada

P.O. Box 5757
London, Ontario
Canada N6A 4T1
1-800-265-1840
Fax 519-452-6245

3M México, S.A. de C.V.

Av. Santa Fe No. 55
Col. Santa Fe, Del. Alvaro Obregón
México, D.F. 01210
52-55-52-70-04-00
Fax 52-55-52-70-22-77

3M Puerto Rico, Inc.

Puerto Rico Industrial Park
P.O. Box 100
Carolina, PR 00986-0100
787-620-3000
Fax 787-750-3035