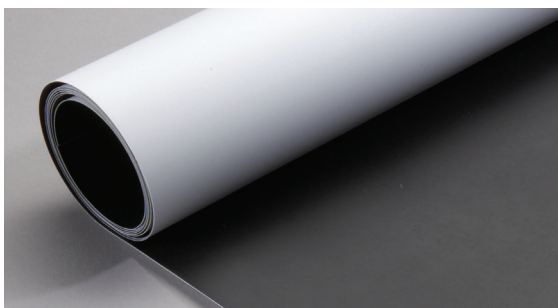


Real world performance against the elements

Application Guidelines for 3M™ Scotchshield™ Film 15T Black



3M™ Scotchshield™ Film 15T Black is a backside barrier film designed for BIPV (Building Integrated Photovoltaic) and residential applications. Similar to other commercially available backside films, it utilizes a fluoropolymer layer as a key component. Fluoropolymers are well known to have excellent resistance to degradation from sources such as UV, heat and moisture. Their weatherability exceeds that of non-fluorinated materials.

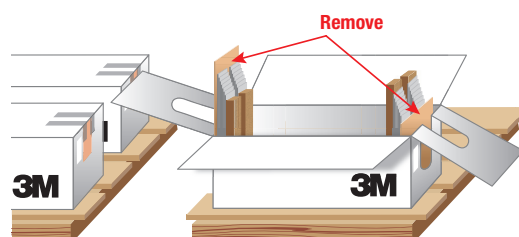
3M™ Scotchshield™ Film is designed for easy use by module manufacturers. It can be used as received with most existing production equipment and cycles, with no pre-treating required. During lamination, strong, stable bonds are formed to standard peroxide curable EVA encapsulants. When handling 3M™ Scotchshield™ Film, care must be taken to prevent damage to the film. The purpose of these guidelines is to provide basic information to users as they develop their own process for the handling of 3M™ Scotchshield™ Film.

The information provided in these guidelines is general or summary in nature and is offered to assist the user. The information is not intended to replace the user's careful consideration of the unique circumstances and conditions involved in using 3M™ Scotchshield™ Film, or to supersede any safety or site policies or procedures that a user may have.

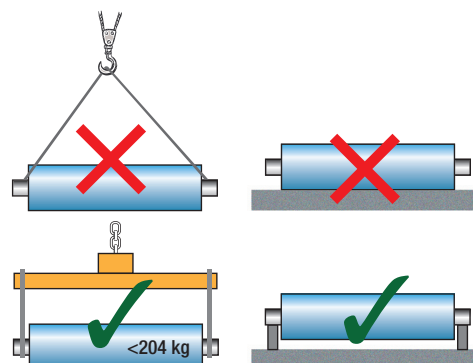
The user is responsible for determining whether the information contained in these guidelines is suitable and appropriate for the user's particular use and intended application.

Packaging and Roll Handling

- 3M™ Scotchshield™ Film is supplied as rolls with an inner core diameter of 15.3 cm (6"). There may be as many as four rolls on a pallet.
- Rolls may weigh as much as 204 kg (450 lbs)—verify lifting and roll handling equipment capability.



- Remove spacers in carton to reveal core ends.
- Shaft adaptors may be required for the 15.3 cm (6") core diameter.
- Beware of obstructions when inserting lifting bars or shafts. Pick up roll with load distributed equally on both ends and the lifting bands in a vertical position.
- After unpacking, do not place roll on flat surface—keep suspended horizontally on lift bar or shaft prior to mounting. Use clear plastic wrapping to protect the film surface.

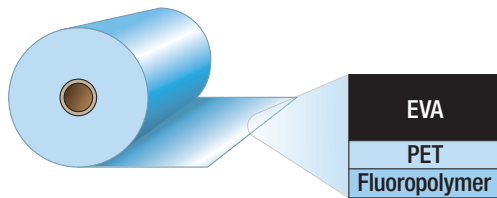




Unwinding and Cutting

Roll Direction

- Backsheet rolls are supplied with the outer fluoropolymer side on the outside of the roll. The inside of the roll features a pigmented EVA layer to provide a black cosmetic appearance.
- The outer fluoropolymer layer of the backsheet is textured and can be differentiated from the smooth EVA side by feel.



Static Discharge

- A static dissipating device, such as tinsel or deionizing bars, should be used while unwinding to dissipate built-up static charge. This will help to minimize debris pick-up.
- In general, lower unwind speeds will also help avoid static charge on the film.

Tension Settings

- The film is more flexible than other backsheet films; it may be necessary to adjust nip tension and pressure settings to ensure that the film moves smoothly over roller surfaces.
- In particular, it may be possible to use lower film tensions and nip pressures.

Cutting and Sheeting

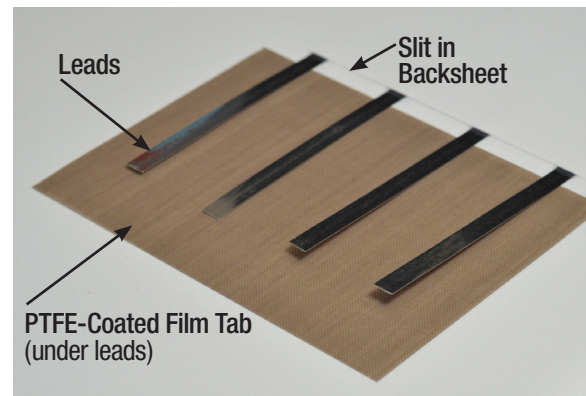
It may be necessary to make simple adjustments to the cutting process in order to optimize the quality of the cut (i.e., film orientation, cutting speed, and the pressure and travel distance of the blade).

Module Lay-Up for Lamination

Avoiding Impressions from Leads

Due to the flexible nature of the backsheet, the lamination process should be optimized to ensure that it proceeds without creating unwanted impressions in the film surface.

- It is recommended that a small tab be placed **under the leads** prior to lamination as shown below. PTFE-coated release film used in typical laminators is a suitable material.
- These tabs can also help in positioning the leads for insertion in the junction box.
- After removal, the tabs can typically be reused.



Protection of the backsheet from impression from leads during lamination. A small tab of a release material is placed under the leads prior to lamination.

Cosmetic/Insulation Films

In general, an EVA-PET-EVA film should be used in place of the backsheet for cosmetic and insulation applications in the module interior.



Module Lamination

Expected Lamination Cycles

The use of 3M™ Scotchshield™ Film is compatible with cure profiles of typical encapsulants.

- Due to the flexible nature of the film, care should be exercised at lamination temperatures significantly higher than the typical values of 155°C.
- In some cases, using a secondary release sheet may aid the lamination process at higher temperatures.

It is important to verify the appropriate cross-link density and other relevant properties of the encapsulant that may accompany changes made to lamination recipe, as insufficient curing of the encapsulant can lead to observed defects in the backsheet (i.e., wrinkling).

Typical Lamination Temperatures

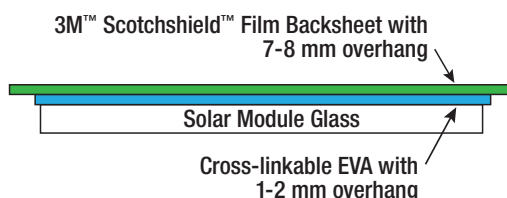
Cycle	Fast Cure	Ultra-Fast Cure
Vacuum	3-5 Min @ 150°C	3-5 Min @ 150°C
Press	10-12 Min @ 150°C	7-9 Min @ 150°C

Upper Chamber Pressure~700–1000 mbar

Note: These cycles are representative only and should not be used for specification purposes.

Laminator Release Sheet

Successful lamination may require some attention be paid to the cleanliness of the laminator release sheet to avoid the buildup of excess EVA debris that can be transferred to the module. For the best result, use of a release sheet without anti-static additives is recommended.



- Minimize debris accumulation by cutting the backsheet wider than the encapsulant to contain EVA squeezed out during lamination (i.e, cut the encapsulant 1-2 mm wider than the glass, and the backsheet film 7-8 mm wider than the glass).

- The use of 3M™ Scotchshield™ Film may enable the use of lower pressures in the laminator. **The improved flexibility of the backsheet allows it to conform well to the module backside, even at lower lamination pressures.** This can also help minimize debris from the squeezeout of EVA and possibly reduce cell breakage.
- Release sheets should be cleaned or replaced regularly to avoid the buildup of debris.

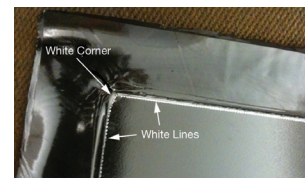
Post-Lamination

Handling

- For best results, avoid handling modules until they have cooled sufficiently (below ~80°C). This will ensure that the backsheet-encapsulant laminate is not deformed.
- Optimize the process by staging modules after the lamination to provide sufficient cooling time or using active cooling.
- When handling warm modules, use the glass to lift and avoid contacting the backsheet surface.

Cosmetic Appearance

- After lamination and trimming, a fine white line may be visible on the edges and corners of the module. In a typical module design, this cosmetic feature will be under the frame and will not affect the overall uniform appearance of the module.
- The use of 3M™ Scotchshield™ Film 15T Black is not recommended for frameless module designs.



Trimming

Modules can be easily trimmed manually or with standard automated equipment (i.e., with heated blades). Due to the flexible nature of the film, trimming may be simpler than other comparable backsheets. **Trimming the module above 80°C is not recommended.**

Cleaning

Isopropyl alcohol (IPA) is recommended for light cleaning, with gentle application of a cleaning cloth, sponge or 3M™ Scotch-Brite™ Handpad to remove dirt from the surface. For stains, allow IPA or a ketone solvent (i.e., acetone) to soak into the spot for 30 seconds, then gently apply the cloth, sponge or handpad.

Note: Follow local air quality regulations.

Overview

Roll Handling



>400 m splice-free rolls minimize roll changeover.



Handle rolls with lifting equipment.

Lamination



More conformable backsheet allows for a good seal, faster air bleed cycle and reduced EVA contamination.

Optimize process steps:

- Unrolling, cutting and sheeting
- Module lay-up
- Lamination
- Post-lamination handling

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For more information on our solar manufacturing product line, contact 3M Renewable Energy at 800 755 2654 or visit us at www.3M.com/scotchshieldfilm.

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