

FABRICATION GUIDE ›

# LUMISHIELD EX™

## CUTTING

### GENERAL RECOMMENDATIONS

If possible, leave the original masking on the sheet during cutting operations. In addition, cover working surfaces with a soft, clean cloth to prevent scratching. Use sharp, clean blades holding the sheet securely in place. Bring the blade to full speed before starting the cut and use compressed air to cool the blade and remove chips. Wear proper safety equipment including safety glasses, gloves, and protective clothing as required by local regulations.

Most saws commonly used for wood or metal should satisfactorily cut sheets made by Lumicor. These include circular saws, band saws, saber saws, jigsaws, hacksaws, or handsaws. However, circular saws and band saws usually produce smoother, cleaner, faster cuts. Routing is also a common technique.

For the highest quality cut, use a triple-chip style carbide-tipped blade commonly used for plastics. Otherwise, chipping and irregular cuts may result. Use a slow and consistent feed rate.

Several sheets made by Lumicor can only be cut by a wet saw or water-jet cutter; these are Lumicor's metallic and recycled glass collections.

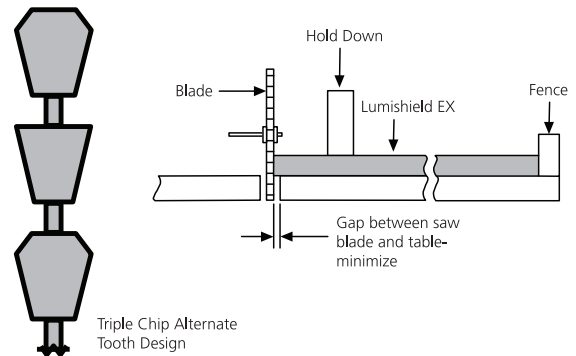
### PREFERRED CUTTING METHOD

A circular saw blade with carbide teeth utilizing the "triple chip" tooth design is the preferred method of cutting Lumishield EX. Table or overhead panel saws are normally used. Circular saws should be run in the speed range of 6000 - 8000 ft/min. Blades for cutting 3/32" and thicker material should have 3-5 teeth per inch. The hook or rake angle should be 10°-15°. When sawing thin-gauge Lumishield EX sheet, it is important to have a good supporting edge on the saw table with minimal gap between the saw blade and table supporting edge. Be sure tabletops are smooth and free from projections that might scratch or mar the Lumishield EX sheet, when cutting.

### CIRCULAR SAW TROUBLESHOOTING

	PROBLEM: Melting or Gummed Edges	PROBLEM: Chipping
Suggested Solutions	Increase blade tooth size	Decrease blade tooth size
	Reduce saw speed	Increase saw size
	Increase feed rate	Provide better clamping and/or support for sheet stack
	Use air to cool blade	Reduce feed rate
	Use blade lubricant compatible with Polycarbonate	Check blade and arbor for wobble
	Inspect blade for sharpness	Inspect blade for sharpness
	Check blade-fence alignment	
	Reduce number of sheets in stack	

## DIAGRAM



## ROUTING

Routing produces a smooth edge on Lumishield EX and may also be used to cut curved or irregular shapes. Routers with a speed of 20,000 to 25,000 rpm are preferred. Use straight (fluted 2 or 3) carbide-tipped or high-speed steel router bits. Bits should be 1/4" to 1/2" diameter for best results. Use a router with at least 1 H.P. motor. Special care must be used when routing. Use proper guarding and eye protection. Stock feed rates must be monitored closely. Feeding Lumishield EX sheet at excessive rates can cause vibration and cracking. Routing with sharp, two-flute, straight cutters produces very smooth edges. Spiral-cut router bits have also been found to work successfully depending on the application. It is especially useful for trimming the edges of flat or formed parts, or parts too large or irregular in shape to cut with a band saw. Portable, overarm, and small table routers work equally well. It is important to feed the sheet against the rotation of the router bit and to provide a fence for sizing when making straight cuts.

DO'S	DON'TS
Practice on pieces of scrap before cutting parts.	Cut Lumicor sheet without wearing proper safety equipment.
Use recommended saw blades.	Cut Lumicor sheet with a dull blade or cutter.
Use slow, consistent feed rate.	Apply excessive clamping pressure.
Hold sheet firmly while cutting to minimize vibration.	Use a blade with side-set teeth.
Use compressed air to minimize heat buildup, especially for a sheet more than 5 mm (0.195 in) thick.	Scribe-break sheet.
Use just enough clamp pressure to prevent vibration.	Remove safety guards from equipment.
Feed against the rotation of the blade or tool.	

## DRILLING

Lumicor can be easily drilled using a standard drill press or handheld drill with sharp, clean drill bits. Drill bits designed for use with plastic are recommended. Bits designed for use with polycarbonate have been found to work well with Lumicor sheets. Standard drill bits can, on occasion, be used but may have to be ground or filed to reduce the depth or angle of cut. As with any plastic sheet product, it is important to keep vibration to a minimum to prevent chipping or cracking. Hold the sheet securely in place when drilling but avoid excessive clamping pressure. Regulate pressure and speed until a continuous spiraling chip is observed. Use air or water as a coolant if required. Using cutting oils may cause crazing. Be extremely careful if using taps or self-tapping screws; tapping creates notches that can result in stress cracks because polycarbonate is a notch sensitive material, like most clear plastics. Recommended drill speed is 350-1750 rpm. Move the drill bit in and out to remove plastic shards. In general, the distance between the edge of the panel and the hole should be at least 1.5 times the panel thickness.

DO'S	DON'TS
Use sharp drill bits designed for plastic.	Apply excessive clamping pressure.
Use just enough clamping pressure to prevent vibration.	Use a dull drill bit.
Use a load spreader to distribute clamp pressure evenly.	Use power tools without proper protection.
Hold sheet firmly while cutting to minimize vibration.	
Use compressed air to prevent overheating, especially if sheet is more than 4.8 mm (0.187 in) thick.	

## THERMOFORMING

Lumishield EX can be thermoformed on standard equipment. Vacuum forming, free blown forming, and line bending are the most extensively used processes. While most standard forming techniques can be used, critical process modifications specific to polycarbonate are necessary to ensure uniform and repeatable formed parts.

### HEATING CYCLE

Heating a Lumishield EX sheet for vacuum forming requires heat penetration to achieve a 350°F to 360°F. The heat required will be higher for more complex shapes. When Lumishield EX reaches forming temperature, uniform "sag" occurs. The amount of sag depends on the size and thickness of the sheet. Once uniform temperature has been achieved, timers can accurately reproduce the condition, and part-to-part consistency can be maintained.

### HELPFUL HINT

- Lumishield EX sets up very quickly compared to other thermoplastics and can be removed from the mold in a short period of time.

### CAUTION

Lumishield EX remains quite hot during this cycle and care must be observed when handling finished parts.

Throughout the vacuum forming process, it is imperative that dust and dirt be controlled. Lumishield EX has a static charge that attracts foreign particles which can create surface imperfections. Molds also attract dust particles and should be cleaned to avoid creating surface defects.

## SOLVENT BONDING

Many applications for Lumishield EX involve fabrication of sheets to construct three-dimensional shapes. The most popular method is to solvent bond. Lumishield EX solvent bonding can be achieved using methods employed in fabricating other thermoplastics such as acrylic. The two most common methods are needle type applicator capillary action and edge dipping. Both methods rely on smooth edge preparation, pressure, and curing. It should be noted that solvent bonding will significantly reduce the strength of polycarbonate.

*Note: If Lumishield EX has an interlayer, solvent should not be used as the solvent will wick inside of the Lumishield EX sheet. For decors that require an interlayer, all edges must be sealed prior to seaming. For more information please see <http://www.lumicor.com/technical-information>.*

### PROCEDURE

1. Smaller items with flat surfaces can be bonded by placing the pieces together and applying the solvent along the edges using a needle applicator or hypodermic syringe. Make sure the solvent flows along the entire joint.
2. For bonding larger items, immerse the surfaces to be joined in the solvent until the material is softened.
3. Clamp them in position and hold until the bond is set.

### HELPFUL HINTS

- Edges must be clean and free from dirt.
- Surfaces should be smooth and properly aligned.
- Apply even pressure to reduce bubbles in the bond area.

### TECHNIQUES TO REDUCE WHITENING

1. Fabricate in a climate-controlled area with low relative humidity.
2. The addition of 10% glacial acetic acid in the solvent reduces whitening.
3. Thickening the solvent with polycarbonate resin or sawdust promotes slower curing and reduces whitening.
4. Joint cure time is somewhat longer than acrylic. Be sure to retain fixture pressure until the joint is solid.

*Note: Use extreme caution when working with solvents. Adequate ventilation is essential. Control exposure levels according to OSHA guidelines. Obtain Material Safety Data sheets from the solvent manufacturer.*

## SANDING

### GENERAL POLISHING & BASIC SCRATCH REPAIR

Lumishield EX can be sanded using both wet and dry techniques. Gumming can result from dry sanding. Wet sanding produces a smooth finish. In both instances, the part will require further finishing in order to restore its high gloss. Lumishield EX can also be buffed using a 2-wheel system. The first wheel uses a buffing compound to remove shallow scratches. The second buffing wheel is used for restoring the gloss.

**NOVUS #1 PLASTIC CLEANER AND POLISH**

Gently cleans all Lumicor material without scratching. Leaves a lustrous shine that resists fogging, repels dust, and eliminates static. This is a general purpose, daily use cleaner. Use it on all Lumicor material. Resists finger marking. Contains no abrasives or harsh chemicals. Leaves a smooth, clean, greaseless shine. If the surface is extremely dirty, apply NOVUS #1 liberally and wipe using long, sweeping strokes. Do not use pressure, as large dirt particles may scratch the resin. Re-apply NOVUS #1. Polish using short, circular strokes with a clean portion of the cloth. When surface is thoroughly clean and uniformly covered, buff to a slippery glaze with a clean cloth. Surfaces buffed to a high glaze are more resistant to dust and future scratching. Reapply NOVUS #1 regularly to maintain the antistatic, smudge and scratch resistant properties.

**NOVUS #2 FINE SCRATCH REMOVER**

Removes fine scratches, haziness and abrasions from most Lumiclear, Lumiform and Lumiguard surfaces. With repeated use, NOVUS #2 restores faded and discolored areas. Removes the damage instead of filling it in. Buffs out quickly. After restoring, seals with a coat of polish. Observe condition of the surface to be treated. The deeper the scratches, the greater the pressure required to remove them. If the surface is dirty, clean with NOVUS #1 before applying NOVUS #2. Shake well. Test in an inconspicuous area. Apply NOVUS #2 liberally. Using a clean, soft cloth, polish with a firm back-and-forth motion at right angles to the scratches. Keep the cloth saturated with polish at all times. When the worst scratches have been polished out, reapply NOVUS #2 uniformly in a circular motion to the entire surface using short, circular strokes and light pressure. Allow to dry to a light haze. Using a clean portion of the cloth, buff the surface to a slippery glaze using firm, short strokes. This procedure is imperative in achieving the best results. For heavy scratches, multiple applications of NOVUS #2 or application of NOVUS #3 may be required. Follow with NOVUS #1 for best results.

**NOVUS #3 HEAVY SCRATCH REMOVER**

Removes heavy scratches and abrasions from most surfaces. Not recommended for use on Embossed finishes. Use when damage is too severe to be restored with NOVUS #2 polish. Requires use of NOVUS #2 for final finishing. Shake well. Test in an inconspicuous area. Apply NOVUS #3 liberally. Using a clean, soft cloth, polish with a firm back-and-forth motion at right angles to the scratches. Keep the cloth saturated with polish at all times. Continue polishing until only fine scratches remain. Using cloth, remove all remaining polish; this is very important! Using a clean cloth, apply NOVUS #2 in a circular motion uniformly to entire surface. Polish using light pressure until NOVUS #2 dries to a light haze. Using a clean portion of the cloth, buff the surface clean. Follow with NOVUS #1 for best results.

DO'S	DON'TS
Use a soft cotton cloth. The type of polishing cloth you use will make a difference. Ideal cloth is nonabrasive, absorbent, and lint free.	Reuse cloths. Reusable cloths can retain abrasive particles, but you won't know for sure until the damage is done.

**GLAZING INFORMATION**

**INSTALLATION GUIDELINES**

Lumishield EX sheet may be installed using wet or dry glazing systems. However, Lumicor warns against the use of PVC gasketing.

The material may also be used for double-glazing or over-glazing applications for added insulation and security. Maintain adequate separation between the glazing panels to prevent touching during high humidity and/or high heat conditions.

**INSTALLATION PROCEDURES**

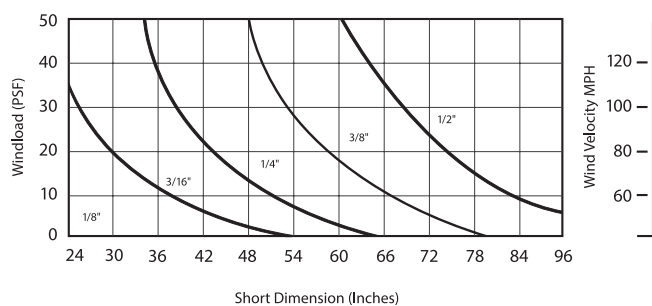
1. Clean sash and prime if necessary. For replacement glazing, make sure all old sealant and projections are removed. Rabbet should be free of burrs and of the proper depth to allow for expansion of the Lumishield EX sheet glazing panel.
2. Carefully measure the sash opening. Determine the appropriate edge engagement and expansion allowance from table (on next page). Cut Lumishield EX sheet to the exact size required, making sure cut edges are smooth and free of chips and notches.
3. Glaze Lumishield EX sheet with the proper compatible sealant. While smaller lites allow for the use of nonhardening oil-based and acrylic-latex caulks (up to 24" x 24"), the thermal and load movements in larger sheet sizes require high performance, low modulus elastomers such as silicones.

**RECOMMENDED SEALANTS, GASKETS, AND TAPES**

Product Type	Product Name	Manufacturer
Silicone	Dow 795 Dow 999 Trademate <sup>®</sup>	Dow-Corning Corp Midland, MI (517) 496-4000
Silicone	Silpruf <sup>®</sup> Construction 1200 <sup>®</sup>	General Electric Co. Waterford, NY (800) 255-8886
Silicone	Spectrem	Tremco Columbus, OH (800) 321-7906
Gasket	EPDM (60,70D)	Tremco Columbus, OH (800) 321-6357
Tape	440	Tremco Beechwood, OH (800) 321-7906
Gasket/Tape	Norrene <sup>®</sup> Foam V-2100 Urethane	Norton Company Granville, NY (518) 642-2200
Butyl Tape	Isocryl 5600	Schnee-Morehead Irving, TX (214) 438-9111

Many other glazing materials are commercially available which are compatible with Lumishield EX sheet. Please contact those manufacturers for their recommended products. Trademate is a registered trademark of Dow-Corning Corp. Silpruf is a registered trademark of General Electric Company Norrene is a registered trademark of Norton Company

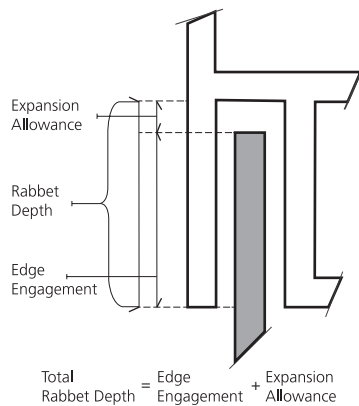
**WIND LOAD PERFORMANCE**



**EXPANSION ALLOWANCES-EDGE ENGAGEMENTS**

Sheet Size	Expansion Allowance	Edge Engagement	Rabbet Depth
24" x 24"	1/8" x 1/8"	3/8"	1/2"
24" x 36"	1/8" x 3/16"	1/2"	11/16"
36" x 48"	3/16" x 1/4"	9/16"	13/16"
48" x 60"	1/4" x 5/16"	3/4"	1-1/6"

**DIAGRAM**



**EXPANSION ALLOWANCES**

As a general guideline, glazing systems should be designed to allow 1/16" per foot of length and width as the expansion in the sash.

**COMPARATIVE EXPANSION RATE**

Material	in/in °F
Glass	.0000050
Lumishield EX	.0000375
Aluminum	.0000129
Steel	.0000063
Acrylic	.0000410

**CLEANING AND MAINTENANCE**

Thoroughly rinse with warm water using a soft cloth or sponge. Wash with mild soap or detergent and rinse thoroughly with clean water. To prevent water spots, thoroughly dry the glazing with a chamois or moist sponge. Do not use abrasive cleaners. Avoid cleaning in direct sunlight to prevent streaking.

**COMPATIBLE CLEANERS**

The following cleaning agents are compatible with Lumishield EX products when used according to the manufacturer's recommendations:

- Formula 409<sup>®</sup>
- Top Job<sup>®</sup>, Joy<sup>®</sup>
- Palmolive Liquid<sup>®</sup>
- Windex D with Ammonia D<sup>®</sup>

*Formula 409 is a registered trademark of Clorox Company  
Top Job and Joy are registered trademarks of Proctor & Gamble  
Palmolive is a registered trademark of Colgate Palmolive  
Windex D is a registered trademark of Drackett Products Company*

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