

Multiwall Polycarbonate Tech Guide

Polycarbonate is a thermoplastic polymer that can be extruded into multiwall cellular sheets. These multiwall sheets are extremely strong and light weight. Polycarbonate has a high light transmittance making it an ideal alternative to conventional glass products. Multiwall polycarbonate is easy to use, long lasting, and flexible in a variety of applications. The following technical overview provides basic information on the performance, handling, and installation of multiwall polycarbonate.

Physical Properties of Polycarbonate:

Vicat Softening Temperature, rate B/120 ISO 306: 293°F

Continuous-use Temperature Rating: Max 212°F

Coefficient of linear Thermal Expansion, 23-80°C ISO 11359-2: 1/°F 4.00 E-05 (A 120" sheet will expand ~ ½" over 100°F)

Performance of Multiwall Polycarbonate:

Product	Physical Properties				Light Transmittance		
	Thicknes mm(in)	lbs/sf	Max Bending Radius	R-Value	Clear	Opal	Bronze
6mm Twin Wall	6(1/4)	0.27	34"	1.6	82	40	50
8mm Twin Wall	8(5/16)	0.35	55"	1.8	81	64	30
16mm Triple Wall	16(5/8)	0.57	110"	2.5	74	40	30
25mm 5x Wall	25(1)	0.7	173"	3.9	57	49	50

Typical performance values, actual values may vary depending on specific product.

UV Protection:

Solar radiation, specifically UV rays, can be harmful to a variety of materials and building products. The panels are UV protected to prevent polycarbonate from degrading from exposure to UV rays. The UV protection prevents UV rays from getting to the polycarbonate. This ensures the panels will not yellow or weaken from sun exposure. This UV protection can be on one or both sides of the multiwall sheets. When installing multiwall polycarbonate, it is important to have the UV protection facing up or towards the sun. On one-sided protected sheets, the protective film will indicate which side has UV protection.

Hail Resistance:

Multiwall polycarbonate is extremely strong, having 200 times the impact strength of glass. This strength makes it resistant to impacts such as hail. Panels are tested using a metal dart fired by an air cannon into the panel. This test simulates the impact of golf ball size hail. While the panels may dent or scratch, a high speed dart, or hail, will not penetrate through the multiwall panel. This makes them ideal for any application where there is a possibility for such impacts. Because polycarbonate does not shatter, it is safe to be used in skylights and railings.

Transportation and Storage:

While in transportation and storage, never put the panels in direct contact with cements and paints, both of which are extremely incompatible with polycarbonate. Always utilize thick wooden boards to isolate the panels from contact with cements and paints while transporting or storing. The sheets must be stored horizontally on a flat surface and kept away from direct sunlight. Original crating is not sufficient to protect panels from solar damage. If left in the sun or excessive heat, the protective film on the sheets may become difficult to remove. Do not stack sheets covered or uncovered in direct sunlight. Stacking may cause the sheets to heat up and distort. Always keep stacked sheets in a well-protected and shaded area during storage and installation. The longest sheet should be at the bottom of stack. Prevent moisture from getting between stored sheets, as this may cause whitening. Allow for ventilation, particularly at the highest point, to minimize heat build-up and provide air circulation. Under single skin roofs of any sort and especially in cold temperature, condensation is generally unavoidable. Good ventilation will always help minimize condensation.

Protective Film:

Multiwall polycarbonate sheets come with a protective film. This film protects the panels from scratches and provides panel information. Keep the film on the panels until they are installed. If needed for fastening, remove several inches of film from the edges during installation. Remove the film as soon as sheets are fully installed.

Cleaning:

Polycarbonate resin and panels are not resistant to abrasion. Please clean polycarbonate panels in accordance with guidelines provided to maintain polycarbonate sheets for long term use.

- Gently wash sheets with a clean sponge or soft cloth, using lukewarm soapy water or mild detergent.
- Rinse sheets with lukewarm water.
- Dry sheets with soft cloth to prevent water spotting.
- Do not scrub or use brushes, brooms, or any cleaning tool that may easily cause abrasion.
- Never use corrosive chemical detergents.
- To remove adhesive agents or spots left by masking films or logos, utilize kerosene or alcohol solvents with soft cloth.
- Do not use gasoline.
- Wash sheets again after applying the above mentioned cleaning materials

Chemical Resistance:

Use only 100% Silicone sealant

Do not put polycarbonate in contact with PVC.

Multiwall polycarbonate sheet is generally unaffected by acids, alcohol, glycols, mineral oil, animal and vegetable fats, kerosene and non-abrasive cleaners.

Multiwall polycarbonate sheet is affected by benzene, petrol, ketones, acetone, phenols, chlorinated and aromatic hydrocarbons, petroleum-based paints, abrasive cleaners and solvents Acetaldehyde, acetate acid, acetone, acrylonitrile,

ammonia, hydrogen fluoride, hydrogen sulfide, benzene, benzoic acid, benzoic alcohol, calcium nitrate boromoxynil, phenol, carbon disulfide, carbon tetrachloride, 5% potassium hydroxide. Solutions, 5% sodium hydroxide solutions or caustic soda, chlorobenzilate, chloroform, cresol, cyclohexanone, cyclohexene, dimethyl formamide, dioxane, ethylamine, ethyl ether, 2-ethylhexane, glycerol, gasoline, methyl methacrylate, nitrobenzene, benzoic ethylalcohol, phenol, phosphorus trichloride, prionic acid, styrene, 1,1,2,2-tetrachloro ethane, tetrahydrofuran, toluene, 10% trichloroacetic acid, xylene, ammonia hydroxide, ketone, methylethylketone, dichloromethane, polyvinyl chloride, potassium hydroxide, sodium hydroxide and nitric acid.

Installation:

Multiwall polycarbonate can be installed on a variety of structures and applications. When used as a roofing material, it is important to make sure conditions where different building materials meet are properly flashed to prevent leaks. Many off-the-shelf roofing and flashing materials are appropriate for this. Connecting multiwall sheets can be done with polycarbonate or aluminum systems.

Because polycarbonate expands and contracts with temperature change, panels should be installed between 55°F and 70°F. Panels installed in extreme cold or hot weather conditions (even if the holes are pre-drilled) may crack or warp when the temperature fluctuates between the seasons.

Thermal Expansion:

Due to the thermal expansion of polycarbonate it is important to allow for movement. The coefficient of thermal expansion of polycarbonate is $1/°F \ 4.00 \times 10^{-5}$. Example: A 10'-0" length will expand $\sim 1/2"$ over a 100°F change. It is important to allow room for movement at sheet edges and when fastening sheets. This expansion may also cause noise as the panel expands and contracts. This is especially true for bronze or dark colors as they heat up at a faster rate than clear.

Sawing:

Multiwall polycarbonate sheets can easily be cut with fine-toothed band saws or circular saws with fine tooth blades at least 10 teeth per inch. While cutting, the sheets should be clamped to avoid vibration. When making pointed turns in the direction of the cut, drill a hole where the two cuts are to intersect, and then cut through the hole. Clean the powder or debris off of sheet prior to installation.

Drilling and Screwing:

Because of thermal expansion, allowance must be made for thermal movement when fastening sheets. Pre-drill fixing holes to allow for expansion and contraction by at least $5/64"$ larger than screw. Screws with a $3/4"$ neoprene bonded washer are recommended. Sheets can be drilled by using any kind of metal drill bit. Sheets should be drilled at a low speed, while supporting the sheet underneath to avoid vibration. The panel thickness and structure material will determine the type of screw used. The pattern and frequency of screw attachment is dependent on loading requirements.

For general installation screws should be placed at every support and 12" to 18" on-center. See chart below for recommended Screws and Washers:

Screw	Length	Tip/Head	Material Thickness	Structure	Washer
#10	2"	Sharp Tip	6-16mm	Wood	.75"
#10	2.5"	Sharp Tip	25mm	Wood	.75"
#12	2"	Pan head	6-16mm	Treated Wood	.75"
#12	2.5"	Pan Head	25mm	Treated Wood	.75"
#12	1.5"	Self-Drill	6-16mm	Steel	.75"
#12	2"	Self-Drill	25mm	Steel	.75"
#12	1.5"	Self-Drill	6-16mm	Aluminum	.75"
#12	2"	Self-Drill	25mm	Aluminum	.75"

Sheet Edge Conditions/Engagement:

Sheet engagement is critical to a multiwall polycarbonate system. Engagement is the amount of material held by a frame or resting on a support. While multiwall polycarbonate is extremely strong, it is also flexible. The panel will not break but may bend and slip out of its frame or off its supports. A minimum $\frac{3}{4}$ " engagement with at least one rib in the engagement area is recommended. The system used and loading conditions can influence this engagement distance. To allow for thermal expansion capture system should hold the panel but not be so tight as to prevent movement.

Edge Sealing/Tape:

The ends of multiwall sheets must be covered/protected to prevent dust, bugs, or excess moisture from entering the flutes. This can be done using sealing tapes and polycarbonate U-profiles. On the top or high-end of the panel, aluminum tape should be used to seal off the top edge. The tape will help prevent moisture from entering the flutes. On the lower or bottom edge, a fabric vent tape should be used. Vent tape will prevent bugs and dust from entering the flutes but allow the flutes to breath. This air movement is important to allow any possible moisture to vent out of the flutes. In addition to the tapes, the panels should be either captured in a frame system or have the edges trimmed in a polycarbonate U-Profile. The profile further protects the sheet edges. The lower edge should have 3/16" weep holes every 12" to allow moisture to drain.

Some systems use an aluminum profile that tightly fits the edges of the panels. In the case of these tight fitting aluminum profiles, the aluminum and vent tape may not be necessary. See specific instructions for their installation including fastening and need for weep holes.

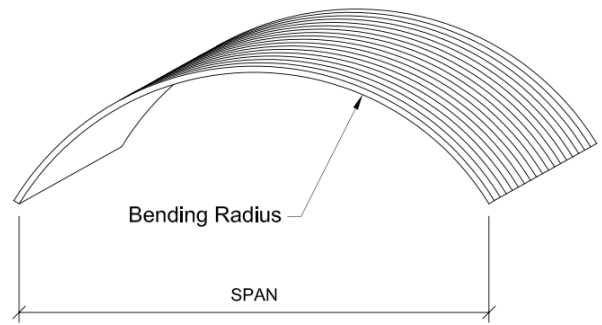
Slope:

To ensure proper drainage a minimum slope of 2:12 is recommended for multiwall polycarbonate. The ribs and flutes of the multiwall polycarbonate must be running downward to allow for proper draining.

Bending

Multiwall polycarbonate sheets can be cold bent to a variety of diameters. It is important to not bend the panel past the minimum diameter as this will cause excess stress in the panel. The ribs/flutes of the panel must follow the bending of the panel. This maintains the strength of the panel and ensures the ribs/flutes are sloped downward for proper drainage.

Product	Thicknes mm(in)	Max Bending Radius
6mm Twin Wall	6(1/4)	34"
8mm Twin Wall	8(5/16)	55"
16mm Triple Wall	16(5/8)	110"
25mm 5x Wall	25(1)	173"



Loading:

Loading requirements need to be determined based on local conditions and codes. The framing structure holding the multiwall polycarbonate must be constructed to support these loads and its details are independent of this document. The maximum sheet deflection is often the limiting factor for multiwall polycarbonate sheet. The chart below indicates maximum spans for a max 1" deflection at several different loads. The details of this loading and the max spans will be project specific. Other loading documents are available if the conditions require.

Maximum Purlin/Girt Spacing in Inches, 48" & 72" wide sheet						
Load in lbs./sf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf
8mm	30"	27"	27"	24"	24"	24"
10mm	36"	33"	30"	27"	27"	24"
16 & 25 3-Wall	48"	45"	42"	39"	36"	30"
25mm 5x	60"	55"	48"	44"	42"	39"

See local building codes and agencies for your projects loading requirements.

Maximum Rafter Spacing in Inches,						
Load in lbs./sf	20 psf	30 psf	40 psf	50 psf	60 psf	70 psf
8mm	20"	16"	na	na	na	na
10mm	24"	20"	na	na	na	na
16 & 25 3-Wall	32"	24"	20"	na	na	na
25mm 5x	48"	42"	36"	30"	24"	16"

See local building codes and agencies for your projects loading requirements.

Overglazing:

It is possible to use multiwall polycarbonate in addition to existing glass windows. This process of over glazing can offer increased impact protecting, thermal performance, or visual improvements. When overglazing, provide a 1" to 2" gap between the multiwall polycarbonate and existing glass. Allow for proper thermal expansion and provide weep holes for drainage.

Additional Information:

If additional technical, loading, or system information is needed, please contact AmeriLux International. If you have specific question about requirements in your region, contact your local code office or building inspector. The information provided in this document is intended to be an overview of recommendations. Specific requirements may differ depending on location and construction type.

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