



I n s t a l l i n g

SUNLITE®

*Multi-wall Structured Polycarbonate Sheet
for Glazing, Roofing and Cladding*

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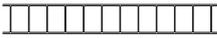
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This manual provides the basic information for working with and installing SUNLITE sheets. Due to their hollow core, prior preparation is needed before the actual installation, with additional care during it. Please read the installation instructions carefully before starting, and follow them meticulously.

I. SUNLITE Product Structures, Dimensions and Weights:

Table 1: Standard Products and Dimensions

Product	Cell Structure	Thickness		Weight		Width		Length	
		mm	in.	g/m ²	psf	mm	in.	mm	ft.
 Twin wall	Rectangular	4	5/32	800	0.16	2,100	82	2,000 to -12,000	6.70 to - 39.4
		6	1/4	1,300	0.27	1,830	72		
		8	5/16	1,500	0.31	1,250	49		
		10	3/8	1,700	0.35	1,220	48		
 Triple wall	Rectangular	8	5/16	1,700	0.35	2,100	82		
		10	3/8	2,000	0.41	1,830	72		
 Triple wall	Tunnel-shaped	16	5/8	2,700	0.55	2,100	82		
 Structured	X- Lite Reinforced	16	5/8	2,500	0.52	1,250	49		
		25	1	3,400	0.70	1,220	48		
		32	1 1/4	3,700	0.76	980	39		
		35	1 3/8	3,900	0.80				

Notes:

1. New products, updates & variants will be continuously added to SUNLITE product group. Confer with your local Palram dealer regarding the latest product list.
2. Length: Supplied according to customer need, up to 12.00m (39.40ft). Longer panels may be prepared upon stipulated special demand. Standard recommended length up to 7.00m (23ft. approx.).

II. Chemical Resistance, Compatible Sealants and Adhesives:

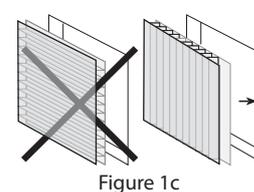
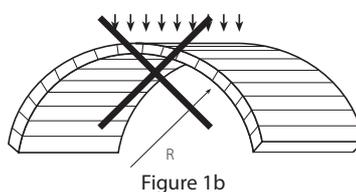
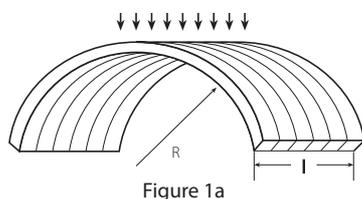
SUNLITE has good resistance to many chemicals. Some chemicals may harm the SUNLITE sheets. Detailed information about them can be found in PALRAM Industries, "Chemical Resistance of Polycarbonate Sheets". Please contact your PALRAM dealer when in doubt about any chemical.

When choosing adhesives or sealants to be used during installation of SUNLITE sheets, please consult PALRAM's brochure "Adhesives and Sealants Compatible with Polycarbonate Sheets".

For use of an adhesive or sealant not on the recommended list, consult with your PALRAM dealer to get his approval. Failure to do so will void any and all warranties.

III. Positioning the Sheets:

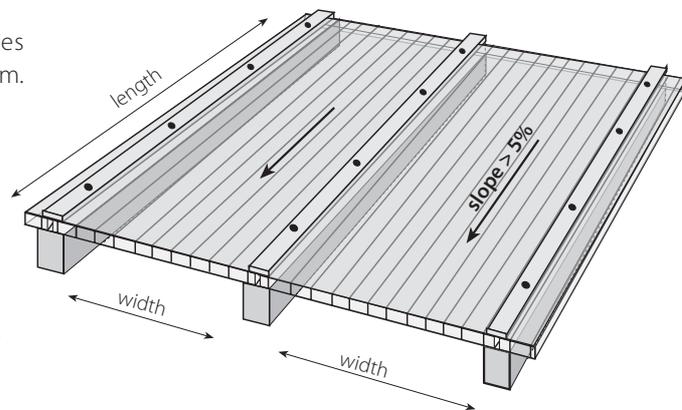
A. SUNLITE sheets should be installed with the rib channels are sloping downwards (Figs. 1a, 1c, 2). That orientation will reduce accumulation of dirt inside the sheet and ease gravity drainage of condensation moisture.



B. Sheets should be installed with the adjoining edges connected by a glazing profile suited to the glazing system.

C. For sheets installed in the flat, horizontal position, (roofs, overhead skylights), a minimum slope of 5 percent is imperative, with 10 percent and above preferable. Steeper slopes offer better rainwater drainage and self-cleaning, and lessen the risk of water and dirt infiltration through the connectors and fastening screws. They also help to diminish the visual effect of sheet deflection caused by loading.

D. Length dimension is defined as parallel to the ribs, while width is perpendicular to the ribs.



Flat, two-sided clamped glazing
Figure 2

IV. Arching Radius:

SUNLITE sheets may be cold bent, or curved up to their minimum permitted radius, using polycarbonate's natural properties, without need of a thermal process. Curving SUNLITE sheet beyond this minimum permitted radius induces undue stresses and strains in the glazing sheet, causing premature failure and will void the warranty.

Table 2. Permissible Cold Bending Radii for Arched Glazing

Product	Thickness		Minimal permissible cold bending radius		
	mm	in.	mm	ft.	in.
Twin wall	4	5/32	700	2.30	28
	6	1/4	1,050	3.40	41
	8	5/16	1,400	4.60	55
	10	3/8	1,750	5.70	69
Triple wall	8	5/16	1,760	5.80	69
	10	3/8	2,200	7.20	87
	16	5/8	2,800	9.20	110
Structured (X-Lite)	16	5/8	3,000	9.80	118
	25	1	5,000	16.40	197
	32	1 1/4	6,400	21.00	252
	35	1 3/8	7,000	23.00	276

V. Wind and Snow Load Calculation

Local building codes and standards in most countries provide details for required design loads, which should be consulted before installation. The information below is provided for general reference.

Table 3. Conversion of Wind Velocity Values into Wind (or Static) Pressure

Wind		Moderate	Strong	Storm	Hurricane
Velocity	km/h	20	40-60	80-100	120-140(+)
	m/sec	6	11-17	22-28	33-40
Static pressure	kg/m ²	2	8-17	30-50	70-100(+)
	psf	0.4	2-4	6-10	14-20(+)

Snow Load: Snow load from accumulated snow cannot be disregarded. Both structure and glazing should be suitable for this extra weight.

In snow-bound areas, SUNLITE single wall corrugated polycarbonate glazing is often preferable for roofing purposes. Please consult with your PALRAM distributor.

Indicative snow load:	(per 1.0 cm, or 0.4 inch of height or thickness)
Fresh, fine, fluffy snow	from 0.8 to 1.9 kg/m ² (0.16-0.39 psf)
Wet, watery, compacted snow	from 2.0 to 8.0 kg/m ² (0.41-1.64 psf)

VI. Spacing and Load Calculations for Different Methods of Installation

A. Four Sides Clamp or Frame

This method utilizes comparatively small, separate glazing elements, cut from larger sheets. SUNLITE is put inside a four-sided frame or supporting structures, and clamped on all sides. Clamping is done by plastic, wood or metal clamping profiles, with or without rubber sealing strips, and fastened by nails, screws or bolts to the supporting frame. The frame itself can be made of wood or metal, according to the design.

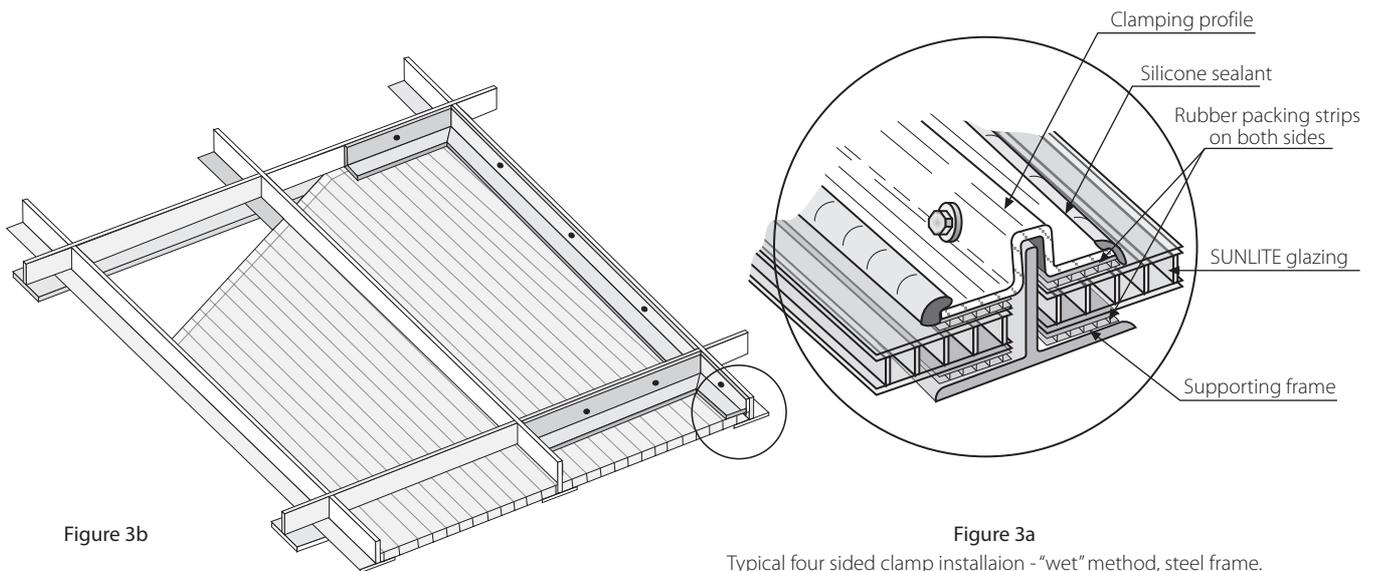


Figure 3b

Figure 3a

Typical four sided clamp installation - "wet" method, steel frame.

1. The load bearing and deflection characteristics of this glazing system are affected by the ratio between the "length" (a) and "width" (b) of the glazing sheet. The center-to-center distance between glazing supports defines the respective parameters. The ratio (a:b) of (1:1), offers the highest load bearing ability with same thickness of glazing sheet. At ratios from 1.00 up to 1.50, there is still a structural advantage to the four sided clamped system. Above this ratio, the structural properties are almost the same as in two sides clamped glazing system.
2. SUNLITE's acceptable deflection rate is 1/20-1/25 (versus 1/100-1/200 in the case of steel and glass). Even with a bigger deflection there is no real danger of a breakdown, but the thickness chosen should minimize the risk of edge pop-out due to excess deflection.
3. Four sides clamped/framed method is practical mostly in vertical installation (i.e. windows, sidelights etc.). Horizontal/sloped installation may create difficulties in rainwater evacuation and moisture penetration. The most suitable way in this positioning is the two sides clamped method.

The table on top the next page presents the recommended center-to-center spans, for each type of SUNLITE sheet at various wind or snow loads.

Table 4.
Maximum Recommended Distances between Centers- Shorter Spans (width),
under Different Ratios and Loads for Four Sides Clamped / Framed Flat Glazing.

SUNLITE Sheet		Wind/snow uniform loads		Distance between centers – shorter span, - according to ratio a:b					
				Ratio 1:1		Ratio 1.5:1		Ratio >1.5:1	
mm	kg/m ²	psf	mm	in.	mm	in.	mm	in.	
Twin wall	6	50	10	900	36	700	28	500	20
		80	16	700	28	500	20	350	14
		100	20	500	20	400	16	-	-
		120	25	400	16	300	12	-	-
	8	50	10	1150	45	900	36	600	24
		80	16	1000	40	700	28	480	19
		100	20	900	36	550	22	450	18
		120	25	750	30	500	20	-	-
	10	50	10	1250	50	1000	40	750	30
		80	16	1200	47	750	30	550	22
		100	20	1100	43	600	24	500	20
		120	25	950	37	520	21	450	18
Triple wall	8	50	10	1200	47	950	38	650	26
		80	16	1050	42	720	29	510	20
		100	20	950	37	560	22	470	18
		120	25	800	32	510	20	-	-
	10	50	10	1275	51	1050	41	800	32
		80	16	1225	49	800	32	600	24
		100	20	1125	44	650	26	550	22
		120	25	975	38	550	22	480	19
	16	50	10	1500	59	1200	47	1100	43
		80	16	1300	52	1100	43	1000	41
		100	20	1200	47	1050	41	900	36
		120	25	1100	43	950	37	850	33
Structured (X-Lite)	16	50	10	1550	61	1250	49	1150	45
		80	16	1350	53	1150	45	1050	41
		100	20	1240	49	1080	42	950	37
		120	25	1130	44	980	38	900	35
	25	50	10	2100	83	1700	67	1400	55
		80	16	1950	76	1600	63	1350	53
		100	20	1800	70	1500	59	1300	51
		120	25	1650	65	1400	55	1250	49
	32	50	10	2100	83	1850	73	1500	59
		80	16	2100	83	1700	67	1400	55
		100	20	2000	78	1600	63	1350	53
		120	25	1850	73	1500	59	1300	51
35	50	10	2100	83	1875	74	1525	60	
	80	16	2100	83	1725	68	1425	56	
	100	20	2025	79	1625	64	1375	54	
	120	25	1875	74	1525	60	1325	52	

Notes:

1. Data in table according to load tests on typical multi-wall sheets and additional extrapolations.
2. Recommended spans are calculated on the basis of 1/25 maximum deflection (4%) of sheet's width (In this case crosswise, perpendicular to the rib channels).
3. A SUNLITE glazing sheet may withstand even higher loads without buckling, however, excessive lateral shortening, created by higher deflection, may cause the edges to slip out of their supports (pop-out).

B. Two-Sided Clamped Glazing:

This is a simpler glazing system to install, requiring no mid-sheet fastening, using long glazing sheets, and held in place by two glazing profiles on both longitudinal edges. It is not as strong, and permitted width is limited (the width direction of a multi-wall sheet is a more vulnerable to loads, span-wise, especially the thinner, square ribbed 6, 8 and 10 mm sheets).

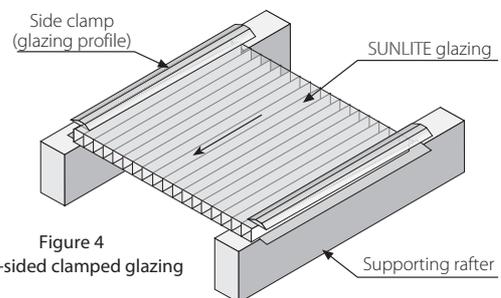


Figure 4
Flat, two-sided clamped glazing

Table 5. Maximum Installation Distance for SUNLITE Sheets Using Two Sides Clamped Flat Glazing

SUNLITE sheet		Twin wall						Triple wall						X-Lite							
Uniform load		6		8		10		8		10		16		16		25		32		35	
kg/m ²	psf	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
50	10	450	18	540	21	680	27	575	19	700	25	990	39	1100	44	1400	55	1500	59	1525	60
80	16	320	13	430	17	500	20	450	15	525	18	900	36	950	38	1200	47	1400	55	1425	56
100	20	-	-	400	16	450	18	400	14	475	17	800	32	850	34	1150	45	1200	47	1225	48
120	25	-	-	-	-	400	16	-	-	425	14	700	28	750	30	1100	43	1150	45	1175	46

Note: The notes attached to Table 4. above also pertain to Table 5. here.

C. Two-Sided Clamped Arched Glazing:

1. SUNLITE sheets can be curved into arches within the permitted radius (see paragraph V above), with no damaging effect to mechanical performance. Moreover, internal stresses induced by curving give it extra strength and rigidity in both directions, like pre-stressed concrete elements.
2. Rigidity and the support spans increase as the curve radius is reduced (down to the minimal permitted radius). Shallow curve should be considered to be the same as flat panels, while a deep curve adds significantly to the bridging ability.

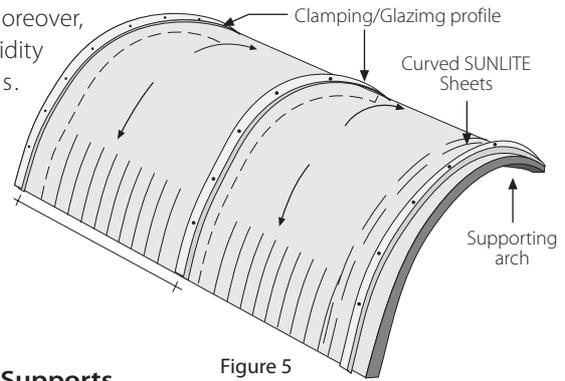


Figure 5

The following table shows the growing rigidity from the curving of SUNLITE, at various uniform loads.

Table 6. Maximum Recommended Spans between Arched Supports, According to Radius of Curve and Load for Two Sides Clamped Glazing

SUNLITE sheet	Thickness	Sheet curvature Radius		Recommended (center-to-center) Distance between Supporting arches according to wind/Snow loads below.											
				mm		in.		mm		in.		mm		in.	
				Uniform wind/snow loads											
				kg/m ²	psf	kg/m ²	psf	kg/m ²	psf	kg/m ²	psf	kg/m ²	psf		
	mm	mm	in.	50	10	80	16	100	20	120	24.60				
Twin wall	6	1050	41	2000	79	1730	68	1420	56	1020	40				
		1500	59	1470	58	1090	43	890	35	660	26				
		1800	71	1140	45	860	34	690	27	580	23				
		2200	88	810	32	690	27	-	-	-	-				
		2800	110	500	20	350	14	-	-	-	-				
		4000	158	500	20	350	14	-	-	-	-				
	6000	236	500	20	350	14	-	-	-	-					
	8	1400	55	1650	65	1450	57	1320	52	1170	46				
		1800	71	1420	56	1270	50	1070	42	890	35				
		2200	88	1090	43	890	35	710	28	600	24				
		2800	110	840	33	620	19	450	18	-	-				
		4000	158	600	24	500	19	-	-	-	-				
		6000	236	570	23	480	19	-	-	-	-				
	10	1750	69	1630	68	1420	56	1170	46	1020	40				
		2200	88	1320	52	960	38	810	32	660	26				
		2800	110	890	35	650	26	600	24	550	22				
		4000	158	750	29	550	22	500	20	450	18				
	6000	236	700	27	520	21	500	20	420	18					
Triple wall	8	1760	70	1320	52	1170	46	980	39	750	30				
		2200	87	1025	41	780	31	580	23	520	21				
		2800	110	750	30	570	23	400	16	-	-				
		4000	158	500	20	450	18	-	-	-	-				
		6000	236	480	19	400	16	-	-	-	-				
	10	2200	88	1220	48	880	35	720	29	580	23				
		2800	110	780	31	580	23	500	20	450	18				
		4000	158	620	25	500	20	450	18	400	16				
		6000	236	550	22	450	18	400	16	-	-				
	16	2800	110	1850	73	1650	65	1450	57	1200	48				
		4000	158	1450	57	1220	48	940	37	850	34				
		6000	236	1050	42	1000	40	850	34	800	32				
Structured (X-Lite)	16	3000	120	1750	69	1600	63	1500	59	1400	55				
		5000	200	1350	53	1200	47	1100	43	1000	39				
	25	5000	197	1650	64	1450	57	1400	55	1350	53				
		6000	236	1550	61	1350	53	1300	51	1250	49				
	32	6400	252	1650	64	1550	61	1350	53	1300	51				
		8000	315	1550	61	1450	57	1250	49	1200	47				
	35	7000	276	1650	65	1550	61	1350	53	1300	51				
		8200	322	1550	61	1450	57	1250	49	1200	47				

Notes:

1. (-) A hyphen sign in the table appears when a certain sheet type cannot be used at the relevant range.
2. Generally a span of less than 600 mm (24 in.) is impractical for this installation configuration.
3. The lowest radius dimension (first in the column) appearing in the table, for each type of sheet, is the minimum permitted cold bending radius of that specific type.

D. “Roofing and Cladding” Installation Method:

This is a simpler, more practical method, resembling the one used for single-wall, corrugated plastic (or metal) sheets. It employs longer strips, with wider dimension. Length is as long as possible without excess deformation by thermal expansion. SUNLITE sheets are laid on top of the purlins, with rib channels directed down the slope, perpendicular to the purlins. Span between purlins is determined by the load and deflection characteristics of the specific SUNLITE sheet.

1. The sheets are connected to each other by long connecting elements.

2. The wide variety of these connection methods falls into two main categories: “wet” or “dry” installation systems. The connecting elements (made of aluminum, sheet metal or plastic- rigid PVC or polycarbonate) are designed as connectors, not as load supporting members. They connect the sheets to each other, achieving one unified watertight exterior shell. Additional strength and rigidity achieved through them is an added bonus.

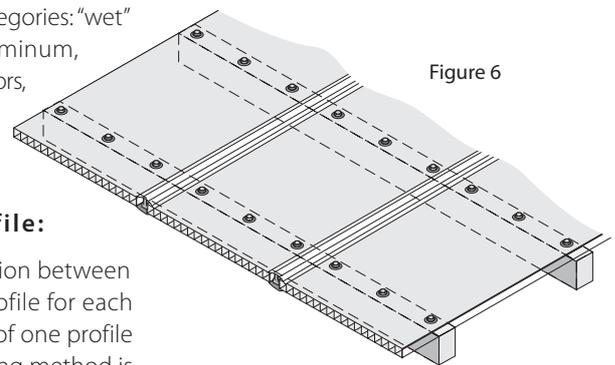


Figure 6

a. A basic inverted “H” polycarbonate connecting profile:

An old and simple form enabling a lengthwise (side by side) connection between twin/multi-wall sheets. It is sometime offered with a specific size profile for each sheet thickness, or in versatile, more flexible design enabling the use of one profile with 2 consecutive thicknesses (4 - 6 & 8 - 10 “H” profiles). This connecting method is practically inappropriate for the thicker SUNLITE panels.

1) “Dry” method: The edges on both sides are inserted into the profile, holding the sheets by “dry” mechanical friction, with the sheets on both sides fastened to the structure, along the purlins, by fixing screws, about 500-600 mm (20-24 inches) apart.



Figure 7. Basic, inverted H polycarbonate connecting profile

2) “Wet” method: both the profile channels are half-filled with silicone, which acts, after installation and curing, both as sealer and adhesive. It may offer better weatherproofing at shallower slopes, than the “dry” system, but is very difficult to install properly and cleanly (Fig 7).

Notes:

- a) The connector itself is not fixed to the purlins.
- b) Both systems are basic and disclose several shortcomings: difficult and bothersome installation, plain looks, weak and imperfect connection and sealing. Installation may prove to be lengthy and messy for inexperienced hands. They are, however, considered the cheapest.
- c) We would limit the use of “H” connector system to vertical, short sheets, as in wall cladding or windows.

b. A two-part polycarbonate connecting profile comprised of:

1) A lower base profile, usually the more rigid of the two, on which the edges of the adjoining sheets are placed. Usually the base profile is fastened to the purlins by screws through the middle, with both edges free, letting the sheets slide easily due to the thermal expansion and contraction process.

2) The upper part, usually more flexible than the base, clips on the base profile by hand pressure, holding both sides of the adjoining sheets in place by mechanical pressure.

This type is easier to install, more reliable in holding the sheets and sealing the connection. It is used, mostly, in “dry” installation, but could be assisted by silicone on the upper and lower profile. “Wet” installation like this is difficult to keep clean during installation and with long sheets may lose its effectiveness due to excessive expansion.

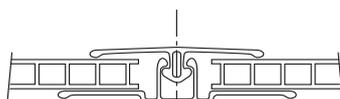


Figure 8a

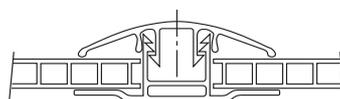


Figure 8b

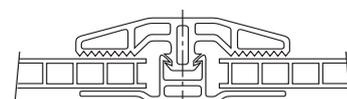


Figure 8c

Figure 8. Drawing of typical two-part polycarbonate connecting profiles currently used

c. Combination of Metal and Plastic Two-Part Connecting Profile offers added strength and rigidity. The lower part of the profile is made of metal- (mostly aluminum), and the upper part is made of plastic (rigid PVC or polycarbonate), clipped on top of the metal profile, pressing on the edges of the two adjoining sheets.

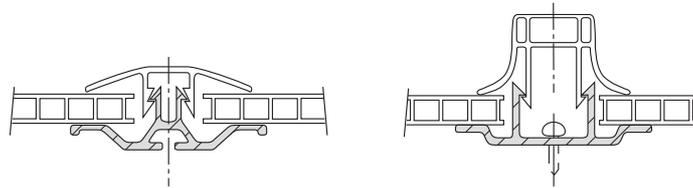


Figure 9. Depiction of Typical Two-Part Plastic and Metal Connecting Profiles Currently Used

d. Wood Connecting Profiles, developed from wooden window frames, support the installed SUNLITE sheets. They are usually used together with the “wet” system, with rubber packing strips and silicone sealant. Lengths are generally limited by the nature of wood. If long, laminated wooden rafters are used, they usually come with one or more of the other connecting solutions below.

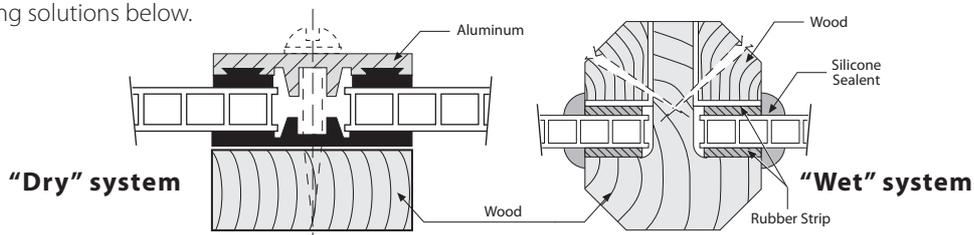


Figure 10. Depiction of Typical Two-Part Wood Connecting Profiles Currently used in the Market

e. Metal Connecting Profiles comprise the largest group of connecting profiles. They come in wide variety of designs, are made from aluminum or steel, in “dry” or “wet” systems, and in plain or sophisticated detailing and finish. Some profiles are equipped with built-in drains, EPDM rubber weather strips, concealed fixing screws, and high-end finish, for more luxurious structures.

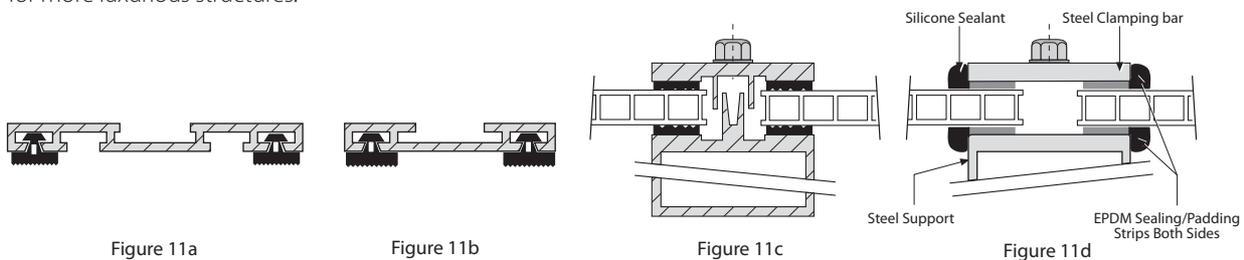


Figure 11. Depiction of Typical Two-Part Metal System Connecting Profiles Currently Used

f. Mid-Sheet Fasteners: (Not recommended for D.I.Y Applications)

1) A wider sheet has to be fastened to the supporting structure by additional fastening along its width, as the connectors on both longitudinal sides are not enough to hold the sheet down, against the uplift force it has to withstand.

2) Fastening is usually done by screws, inserted along the supporting internal purlins, spaced about 500 mm (20 in.) apart.

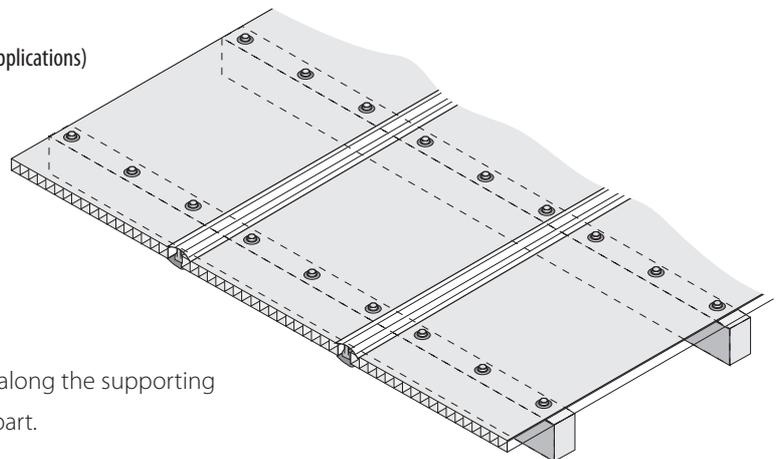


Figure 12. Schematic Isometric View of Partial Roof Installation with Mid-sheet Fasteners

- 3) Along the edge purlin, the fastening screws should be inserted about 300 mm (12 in.) apart.
- 4) A hole must be pre-drilled into each screw location. The diameter of that hole should be 2 mm larger than that of the screw, to allow for thermal expansion movements.
- 5) An electric screwdriver with an adjustable clutch should be used to tighten the screws. Avoid excess overtightening, which might induce undue internal stresses, causing premature failure and buckling of the sheet. Pay attention to insert the screws perpendicular to the material face, as inclined insertion could damage the sheet and/or result in leaks.

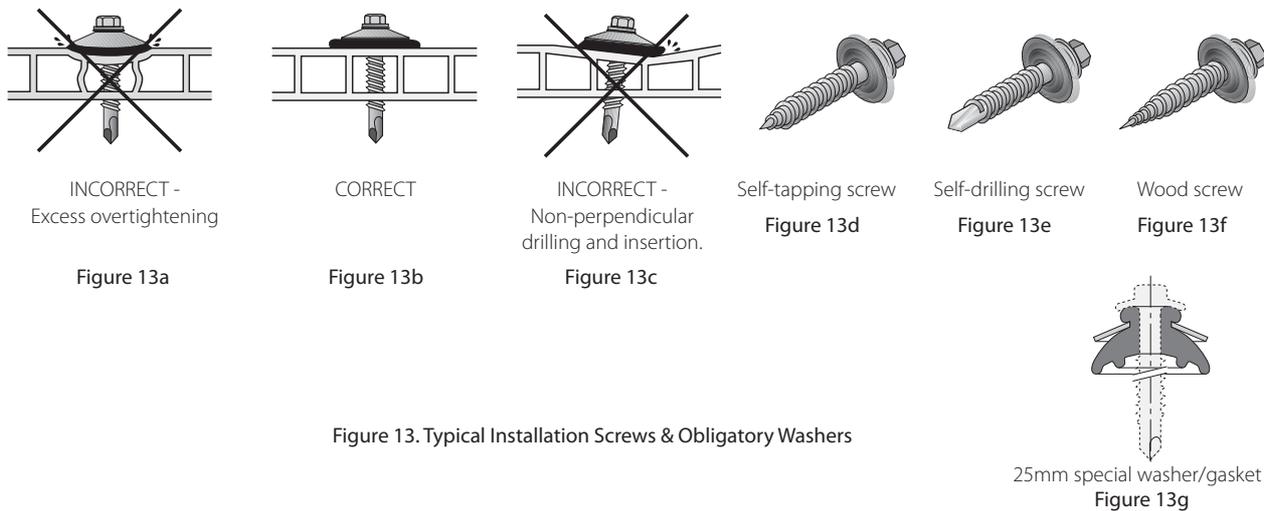


Figure 13. Typical Installation Screws & Obligatory Washers

- 6) Use of self-tapping or self-drilling screws is recommended. In case of wooden structures, suitable wood-screws should be used. All the screws should be corrosion resistant, with at least heavy-duty hot-dipped galvanized finish, or stainless steel (if used in an extremely corrosive environment). The screws should be 6 mm (1/4 in.) diameter, with length according to sheet thickness, type of washer and type of supporting structure.
- 7) Each screw should be fitted with a conical corrosion resistant steel washer, with specifications as the screws above or of aluminum, at least 1 mm (0.04 in.) thick, 25 mm (1 in.) diameter, with a Specially Shaped integral rubber gasket, EPDM (see PALRAM special washer/gasket fig. 13g). The screw should be tightened carefully, with no distortion of the washer and rubber gasket, or the flat face of the sheet PALRAM will supply the suitable fasteners and washers with the SUNLITE sheets unless required otherwise.

8) Screw buttons: Improved performance can be obtained by replacing the washers with special plastic screw buttons, fitted with a suitable rubber gasket, with or without a closing cap. They fit the thickness of each type of sheet (6, 8, 10, 16 mm, and possibly 25 mm), differing by sleeve length. Their advantage: the sleeve prevents excessive tightening and local squashing around the screw, and is softer on the sheet, reducing risk of tear or shear around the screw's stem. They also offer a seal between the fastener hole and the open channels of the sheet, preventing possible infiltration of water and dirt into the internal space of the sheet. Screw buttons work with the same screws mentioned above (6 mm, 1/4 in.), maybe a little longer due to the higher thickness of the button.

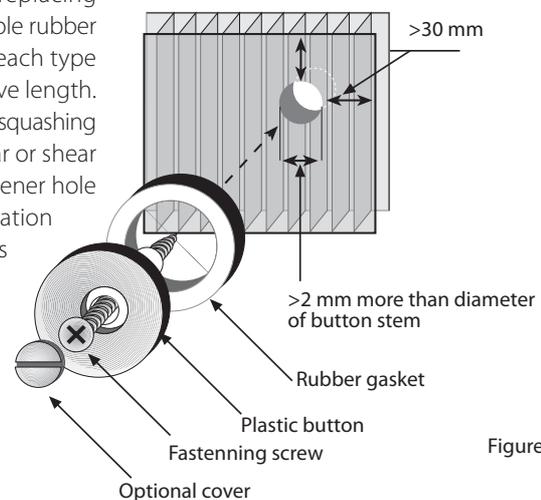


Figure 14

PALRAM recommends perforating SUNLITE for fastening as little as possible, and prefers the use of clamped edge installation. PALRAM recommends that the use of fastening screws in a glazing system, even with plastic buttons, should be limited to economical, price conscious projects only. Two or four-sided clamped glazing is a preferred choice.

g. Design spans between Supporting Purlins According to Designated Loads for the Roofing and Cladding

Method:

Table 7. Max. Recommended Spans between Support Purlins- Flat / Slightly Curved Roofing/Glazing

Product	Thickness	Distance (center-to-center) between Supporting Purlins							
		mm		in.		mm		in.	
		Uniform wind/snow loads							
		kg/m ²	psf	kg/m ²	psf	kg/m ²	psf	kg/m ²	psf
		50	10	80	16	100	20	120	25
Twin wall	6	900	36	800	32	650	26	500	20
	8	1150	46	1000	40	850	34	650	26
	10	1250	50	1150	46	1050	42	900	36
Triple wall	8	1120	44	970	38	820	32	620	25
	10	1220	48	1125	45	1020	41	870	35
	16	1600	64	1450	58	1250	50	1130	45
Structured (X-Lite)	16	1650	65	1500	59	1300	51	1180	46
	25	1850	74	1700	68	1550	62	1425	56
	32	2050	82	1900	76	1750	69	1600	63
	35	2075	82	1925	76	1775	70	1625	64

Notes:

- Span calculation is based on general professional know-how, previous experience & specialized expertise with this type of products.
- Spans depicted are educated estimations & extrapolations based on $L/20$ deflection (5%) at the specific span and load using continuous multi-span supports. The values refer to mid-spans. Edge-spans (lower & upper ends) should be approx. 20% smaller.
- SUNLITE panels can withstand higher loads and/or wider spans without failure, but then deflections will increase up to $L/10$ (10%) of the span, unacceptable in most cases.

Curving SUNLITE sheets gives them higher strength and rigidity, as in the case of two-sided clamped described below:

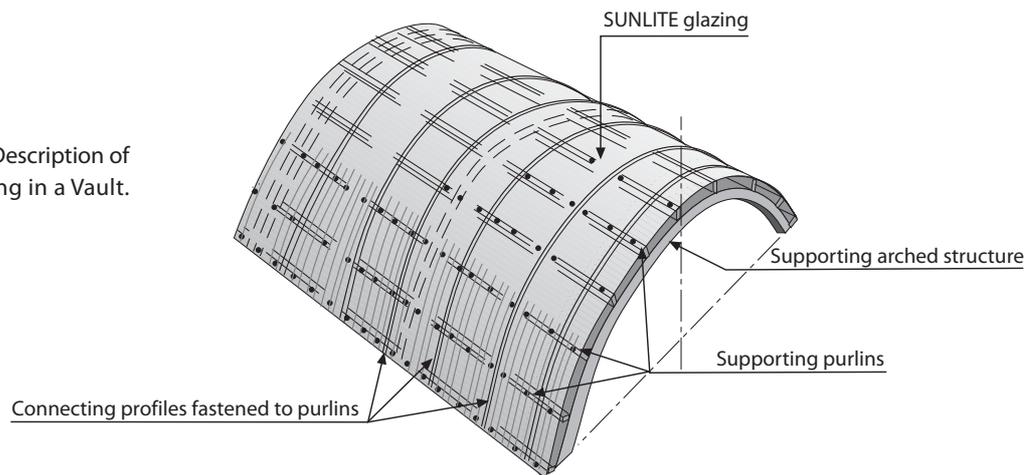
Table 8. Max. Recommended Distances between Support Purlins, for Curved Roofing/Cladding, According to Curvature Radius and Load.

Product	Thickness	Radius of sheet curvature		Maximum recommended distance (center-to-center). between support Purlins according to Wind/Snow Loads Below.																			
				mm		in.		mm		in.													
		mm	mm	in.	Uniform wind/snow loads																		
					kg/m ²	psf	kg/m ²	psf	kg/m ²	psf	kg/m ²	psf											
			50	10	80	16	100	20	120	25													
Twin Wall	6	1050	41	1730	68	1730	68	1730	68	1730	68												
				1500	60	1570	62	1570	62	1200	48	1200	48										
				1800	72	1420	56	1420	56	1150	46	1150	46										
				2200	86	1380	55	1380	55	1150	46	1150	46										
				2800	110	1260	50	1260	50	1100	44	1100	44										
				4000	158	1150	46	900	36	850	34	780	31										
	8	1400	55	1570	62	1570	62	1570	62	1570	62	1570	62										
														1800	72	1880	74	1420	56	1420	56	1420	56
														2200	86	1730	68	1380	55	1380	55	1380	55
														2800	110	1470	58	1470	58	1250	50	1100	43
														4000	158	1250	50	1150	46	1050	40	900	32
														6000	236	1150	46	1000	40	850	34	650	26
	10	1750	69	1885	74	1885	74	1885	74	1885	74	1885	74										
														2200	86	1725	68	1725	68	1725	68	1725	68
														2800	110	1750	69	1750	69	1750	69	1450	57
														4000	158	1570	62	1400	56	1250	50	1250	50
														6000	236	1260	50	1200	48	1100	43	925	37
														Triple Wall	8	1760	70	1420	55	1420	55	1380	53
2200	86	1380	53	1380	53	1380	53	1250	49														
2800	110	1380	53	1380	53	1250	49	1070	42														
4000	158	1150	46	1050	42	1050	42	750	30														
10	2200	72	1885	74	1885	74	1885	74	1885	74	1885	74											
													2200		86	1725	68	1725	68	1725	68	1725	68
													2800		110	1750	69	1750	69	1750	69	1465	58
													4600		158	1570	62	1570	62	1260	50	1260	50
16	6000	236	1260	50	1180	47	1075	42	900	36	900	36											
													2800		110	2100	83	2050	81	2000	79	1950	77
													4000		158	1750	69	1700	67	1650	65	1600	63
													6000		236	1600	63	1400	56	1250	50	1150	46
Structured (X-Lite)	16	3000	118	2125	84	2075	81	2025	79	1975	77												
				4000	158	1800	71	1750	69	1700	67	1650	65										
				6000	237	1650	65	1450	57	1300	51	1200	47										
	25	5000	197	2300	90	2050	80	1770	70	1500	59												
												6000	237	2100	69	1850	73	1570	62	1300	51		
	32	6400	252	2200	86	2050	80	1770	67	1500	59												
												8000	315	2100	82	1950	76	1670	65	1400	55		
	35	7000	276	2200	86	2050	80	1770	67	1500	59												
												8200	323	2100	82	1950	76	1670	65	1400	55		

Note:

1. The specified spans are based on $1/20$ deflection (5%) at the specific span and load, using continuous multi-span supports. The values refer to mid-spans. Edge-spans (lower & upper ends) should be approx. 15-20% smaller.
2. Spans depicted in all but the largest radii (6.00-8.00 m) derive from division of a full 180° barrel vault of the specific radius into equal size sectors. (For instance - an arch of 1.10m radius is divided into 2 equal parts of 1.73 m length. An arch of 1.50 m radius is divided into 3 parts each 1.57 m long, and so on.)
3. Curved SUNLITE is more rigid with a much wider span than in flat installation, especially in smaller radii. Rigidity & strength are reduced as the radius as the radius is increased (for same type of panel). A lightly curved panel behaves almost the same as a flat one.

Figure 15. Schematic Description of standard curved roofing in a Vault.



h. General Notes for Structural Design:

- 1) The recommended support spacing, as specified in the load/span tables, should not supersede the requirements of local structural and construction codes. The final values are to be dictated by actual conditions on site and engineering design.
- 2) The end spans, i.e. the distance between the edge support (or purlin) and the first internal purlin should be up to 80 percent of the commonly recommended span for this load and type of sheet, or the value dictated by the design engineer.

VII. Positioning of Clamping Profiles and Fastener Location:

- A.** Using the four-sided clamped glazing system, the support bars should be underneath (or inside), and the glazing clamps on top (or outside). SUNLITE must be installed with the clamping profiles covering all four edges of the sheet. (These are load-bearing elements, which connect the glazing to the supporting structure, transferring loads from the glazing to it.)
- B.** Using the two-sided clamped glazing system, the support bars (and glazing clamps) should be installed covering the two longitudinal edges of the sheet, parallel to the rib channels. (Again, these are load-bearing elements, connecting the glazing to the supporting structure, transferring loads from the glazing to it.)
- C.** Using the roofing/cladding method, glazing connectors (of any version) should be installed on both long sides of each sheet (parallel to the rib channels). Their main duty is connecting adjoining sheets. They may assist transferring loads to the structure, but here the fastening screws transfer most of the load to the supporting structure (the purlins). The screws, with their metal washer and rubber gaskets, should be inserted along the length of the supporting purlins, about 500-600 mm (20-24 in.) apart and 300-400 mm (12-16 in.) at the edge purlin. When using metal glazing connectors, they are positively fastened to the purlins.

When using polycarbonate connecting-profiles, some types are fastened and others do not. In that case, the fastening screws will be placed on both sides of the connector, about 200-250 mm (8-10 in.) on each side.

VIII. Preparation for Glazing:

A. Determination of Rabbet Depth and Thermal Expansion Allowance:

These parameters depend on the SUNLITE sheet dimension, and relate to the four sides of the sheet (four-sides clamped system), or to the two edges parallel to the rib channels (two-sides clamped system).

1. Allowance for expansion:

SUNLITE expands about 3 mm for every meter (1/8 in. per 3 1/3 ft.) of length (or width) for a service temperature range of about 50 °C (90 °F), the practical working range in most cases. For a sheet of 1.00 m (or 40 in.) wide, 1.50 m (60 in.) long, a net allowance of 3 mm (width) and 5 mm (length) should theoretically suffice. We recommend doubling this allowance for practical reasons. Allowance should be divided between both sides of the sheet.

2. Edge Engagement: (the overlap of the glazing over its frame).

3. Rabbet Depth: (expansion allowance + edge engagement). PALRAM recommends a rabbet depth of at least 20 mm (0.8 in.) for widths up to 1.0 m (40 in.) and a depth of 25-30 mm (1.0-1.2 in.) for wider spans.

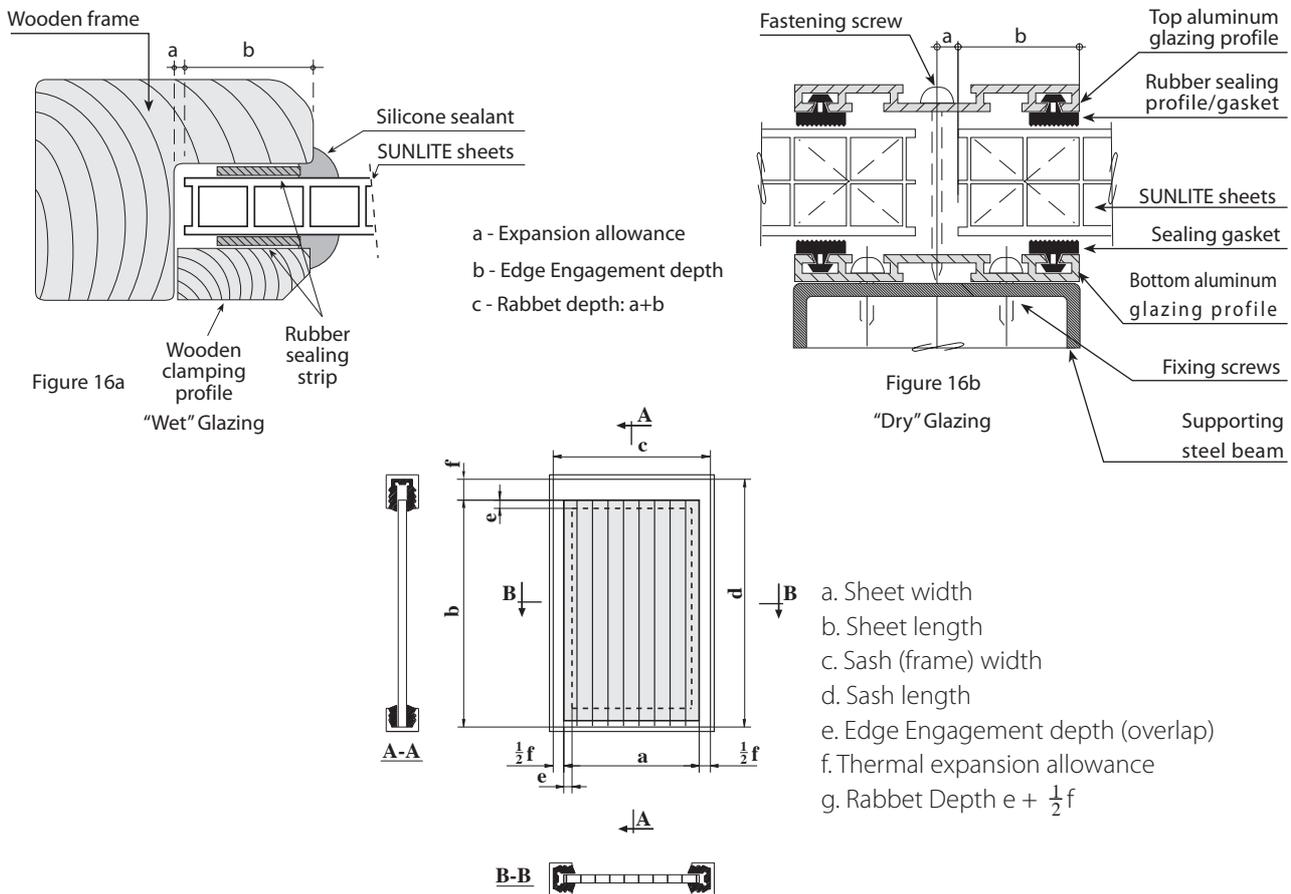


Figure 16 c. Schematic Sketch of Rabbet depth and Expansion Allowance. ("wet" and "dry" methods)

IX. Preparations Prior to Installation:

A. Peel off the protective film at both open ends of the sheet (the width sides) to about 80-100 mm (3.5-4 in.) from the edges of the sheet, to enable taping of the aluminum sealing tape. If a factory installed temporary seal is taped over the open ends, it should be removed prior to the installation of the aluminum tape. Tape the sealing tape straight along the open-end side, so it will cling well and evenly to both sides of the sheet, making sure that all the open ends of the rib channels are properly sealed.

- B. Peel off the masking along the edges of length sides, both sides of the sheet, for about 80-100 mm (3.5-4 in.) from the edges, preparing the sheet for the insertion into the connecting profiles or the glazing frame.
- C. Remove the underside masking just prior to the actual installation on the roof. Premature removal of protective film may result in damage to the sheet during handling.
- D. Remove the upside, exterior protective film as soon as the installation of the whole glazed area is completed, or very short time afterwards. Failing to do so, exposing the protective film to direct sunlight, may fuse it to the sheet's face and cause difficulties in removal, due to deterioration of the film, and void the warranty.



Figure 17a.
Partial or Complete
Removal of Protective Film
Prior and after Installation

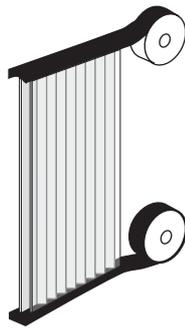


Figure 17b.
Installation of Sealing Tape
on Open Ends of Sheet

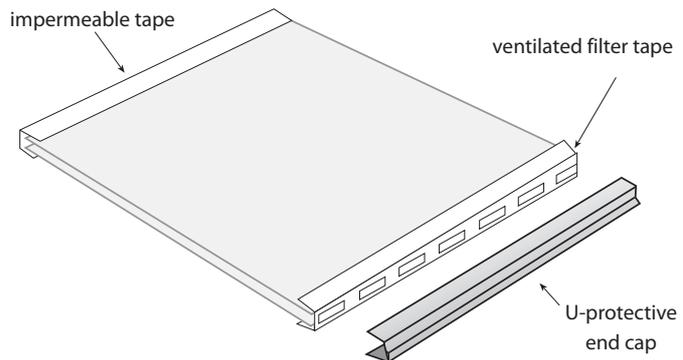


Figure 17c. Installation of Impermeable Tape at Top of the Sheet and
Installation of Ventilating Tape at the Bottom of the Sheet

- E. Ensure the use of the proper type of sealing tape according to the application used, verifying that the prepared sheets are mounted correctly. **Please note:** In case of curved installation, where both open ends are situated at the bottom - apply the ventilated tape on both ends. Take care to protect the sealing tapes at both ends from mechanical damage by inserting the edges into aluminium profiles, or cover them with polycarbonate U-shaped profiles (Fig-17c).

X. Glazing Profiles and Fastening Screws:

Type of glazing/clamping profile used in the installation of SUNLITE sheets, differs according to the glazing system chosen:

- A. Framing profiles are similar in concept and detail to those used in fixed glass windows, curtain walls and skylights, made of wood, steel or aluminum, but wider, allowing for the larger Edge Engagement depth required for SUNLITE. The frames are prepared in advance, and glazing is done after they are all in place, along with completion of the other finishing jobs. (See Figures 3a, 3b).
- B. Two and four-sided clamped glazing employ practically the same profiles used for framing, as used in curtain walls and skylights. Almost all are prepared prior to the glazing work, and just the clamps, the rubber packing profiles (and silicone sealant in "wet" glazing) are installed along with or after the glazing is in place.
- C. The roofing and cladding glazing installation method installs SUNLITE over the supporting skeleton, rafters and purlins. The glazing profiles, which are usually flatter by design, consist of top and bottom parts, made of polycarbonate, rigid PVC or a combination (a bottom aluminum profile and top profile made of polycarbonate, or rigid PVC). SUNLITE sheets and their connecting profiles (also acting as glazing profiles) are installed together, advancing step by step. Most profiles are flexible enough to be easily shaped into curves by hand, when installed over curved structures, enabling inexpensive implementation of curved glazing.

XI. Handling and Storage:

- A.** SUNLITE sheets should be transported and stored horizontally, on a flat, sturdy pallet whose dimensions are equal to or larger than the sheets themselves. The sheets must be secured and fastened to the pallet during transportation and handling on site. It is possible to stack the sheets with the longer sheets at the bottom and the shorter on top, leaving no unsupported overhang.
- B.** While moving a pallet with a forklift, always use forks as long as the sheets' width. Shorter forks on a wider pallet may cause damage to the sheets.
- C.** SUNLITE sheets leave the factory in packages, wrapped in white, watertight polyethylene. The wrapping should be taken off as close to the actual time of installation as possible. Storage of the sheets should be in a covered, dry, ventilated place, away from direct sunlight and rain.
- D.** Avoid leaving the sheet pallet in the rain, even if still wrapped, for extended periods, as water may condense inside the hollow core. Extended exposure to direct sunlight may cause heat buildup, softening the protective film, fusing it to the sheet face, making removal difficult or impossible.
- E.** Avoid leaving the sheets stored unwrapped, with their ends open, for more than a few days, as dust may collect inside the hollows.
- F. Important! Never cover the pallet with, or place on the pallet, materials that collect heat or are good heat conductors (e.g. dark objects, metal profiles or pipes, steel sheets etc.) They may collect and deliver excess heat, and damage the sheets.**
- G.** When necessary to store the pallet in the open, cover it with a white opaque polyethylene sheet, cardboard, or any other insulating material, taking care to cover the pallet completely.



Figure 18

XII. Cutting:

- A.** SUNLITE sheets can be cut with standard wood or metal workshop equipment. Saw blades designed especially for plastic yield best results. A circular saw (fixed or portable, with small teeth suited for hardwood), rotating at high speed, band saw or a jigsaw (best for short, complex cuts) can all be used, taking care to advance the blade slowly. A hand and hacksaw may also be used for local cutting.
- B.** Always support the sheet in the vicinity of the cut and clean (with compressed air and/or by a vacuum cleaner) the dust and debris generated by the cutting. Running clean compressed air through the hollow channels, blowing away sawdust and shavings inside is a good practice.
- C.** Sheets of low and intermediate thickness, with modest dimensions, can be cut (taking the appropriate precautions) with a short, thin, sharp blade. A special cutting-wire hand tool may also be used, to make lengthwise cuts.

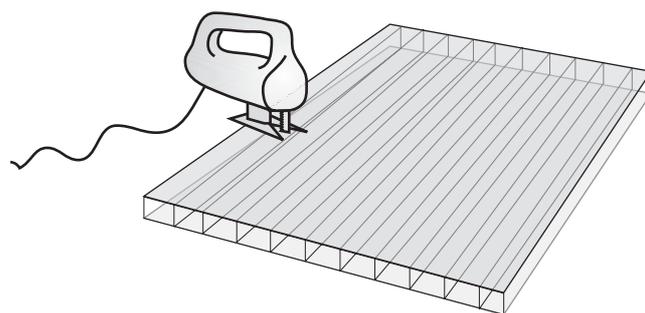


Figure 19

XIII. Drilling:

- A. Drilling can be carried out with drill bits intended for metal. When pre-drilling for a fastening screw, the hole's diameter should be 2 mm larger than that of the screw used. As when cutting, always support the sheet in the vicinity of the place being drilled, and clean away the sawdust and shavings, both on and inside the sheet.
- B. Special attention must be given to drill all the required holes perpendicular to the face of the sheet.
- C. Though drilling the sheet for fastening is a common way of installation, it is recommended to be used mostly in plain, economy-oriented projects, and used sparingly elsewhere.

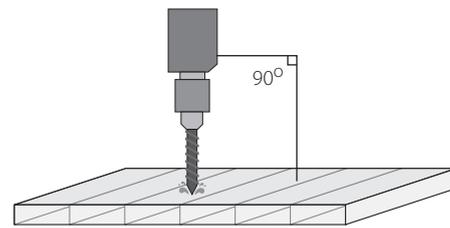


Figure 20

XIV. Sealing and Bonding:

- A. **Silicone Sealant:** PALRAM strongly recommends using Dow Corning 3793 (white) or Novasil S-64 from Otto Chemie (white or translucent).
- B. **Sealant and Weather Strips:** Applied in "wet" or "dry" systems.
 - The "**Wet**" system can use IDL 311 L Butyl rubber double-sided sticky tape by Sellotape, or simple neoprene or EPDM rubber strips, combined with the silicone sealant above.
 - The "**Dry**" system uses neoprene or EPDM rubber packing strips (in simpler framing system), or profiled neoprene or EPDM rubber strips inserted into grooves in the metal connecting/framing profiles. Mechanical pressure of the clamping profile on the rubber gasket achieves the sealing, like in glass systems.
- C. **Sealing the Sheets** is done by aluminum impermeable, or ventilated filter sticky tapes, as described in the paragraph "Pre-preparation of the sheet" above. Such specialty tapes can be obtained from the leading tape manufacturers, or through PALRAM/SUNTUF dealers (See figures 17b, 17c).

For alternative materials, please refer to our "**Adhesives and Sealants Compatible with Polycarbonate Sheets**" technical information leaflet, or consult with your PALRAM distributor

XV. Accessories:

PALRAM invests ceaseless efforts to create a complementary of accessories for the SUNLITE range of products, easing use, avoiding runaround trying to find suitable solutions for proper installation. SUNLITE can now offer suitable corrosion resistant fasteners, special washer/gasket combos and compatible sealing & bonding silicones. Immediately in line, or shortly, are basic polycarbonate "H" connectors and "U" end-caps, along with impermeable and ventilated aluminum sealing tape for end closure. Various specialized aluminum glazing profile, EPDM rubber sealing strips and gaskets will follow in the near future.

Please consult your local SUNLITE distributor for details.

Different aluminum or steel glazing profiles, structural elements, sealing materials and other components required for the completion of varied projects appear, in concept, in the sketches in this manual. Such products & materials are usually available through professional suppliers of metals and glazing accessories. Other designated elements like gutters, closures, ridge caps, trimming and flashing, etc. are to be specially fabricated according to specific design.

XVI. General Recommendations for Working with SUNLITE Sheets:

A. Cleaning

1. Keeping SUNLITE clean will yield the best long-term results. Self-cleaning by rain is usually sufficient. Local small areas may be washed using diluted mild household detergents. Make sure the detergent contains no abrasives or solvents. Pre-wash with warm water, then wash the stained area with a soft sponge or brush, preferably with hot water, until the stain disappears. Rinse with water and dry with a soft cloth.
2. Heavy oil or tar stains can be removed with an isopropyl alcohol watery solution. Rub the area gently with a soft rag. Follow with the treatment depicted above, rinsing with a lot of water.
3. Avoid dry cleaning, as the sand and dust particles clinging to the exterior of the glazing may scratch the surface.
4. Large areas may be professionally washed by high-pressure water jet, possibly adding a mild compatible detergent, and/or a steam jet.
5. Avoid the repeated sliding of sheets over each other, even when still protected by the masking film. This action generates electrostatic charge in the sheet, attracting dirt and dust and hindering cleaning.

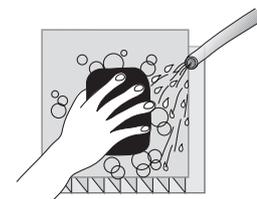


Figure 21

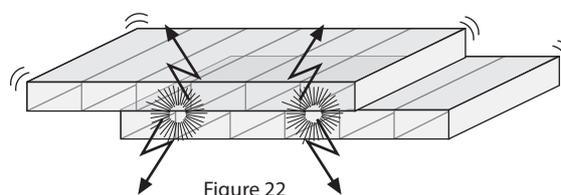


Figure 22

B. Safety Measures During Installation and Maintenance:

1. When installing SUNLITE or doing maintenance work, always consider the sheet to be unfit to support a person's weight. Always use stepping ladders or crawling boards, supported by the roof structural elements, when working on a glazed roof of any kind.
2. **Never step on SUNLITE sheet between the purlins or in the middle of a framed glazing!!! In emergency, step only on the lines of purlins or of structural framing.**
3. Never leave the glazing sheets unattended on the roof or at the glazing area, until all the required fastening clamps or screws are secured properly. Throughout the installation process, always ensure that the sheets ready for installation are temporarily secured against sudden wind gusts.



Warning! Do not step on the sheets between the purlins!

Figure 23

Inasmuch as Palram Industries has no control over the use to which others may put the material, it does not guarantee that the same results as those described herein will be obtained. Each user of the material should make his own tests to determine the material's suitability for his own particular use. Statements concerning possible or suggested uses of the materials described herein are not to be construed as constituting a license under any Palram Industries patent covering such use or as recommendations for use of such materials in the infringement of any patent. Palram Industries or its distributors cannot be held responsible for any losses incurred through incorrect installation of the material. In accordance with our company policy of continual product development you are advised to check with your local Palram Industries supplier to ensure that you have obtained the most up to date information.