



# SUNTUF®

*Corrugated Polycarbonate Sheets*



*The way to enjoy the sun*





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# SUNTUF®

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# Company Profile

Palram Industries, founded over 40 years ago, is a leading multinational manufacturer of extruded thermoplastic sheets from polycarbonate, PVC and other materials. Palram thermoplastic sheets are designed to suit a diverse range of applications in the advertising, agricultural, construction, DIY, glazing, and thermoforming markets. Worldwide sales totaled \$ 140 million in 2003.



## Palram - a Global Company

Palram operates production sites, warehouses and sales offices around the globe.

### Production Sites:

- Israel - polycarbonate and PVC sheets
- UK - polycarbonate in Doncaster and PVC in Durham
- USA - polycarbonate in Allentown, PA
- China - polycarbonate in Shanghai

**Warehouses:** Israel, France, UK, USA (5)

**Marketing Offices:** Israel, USA, France, Germany, Italy and Scandinavia Singapore, Japan and Australia

### Quality Assurance

- Maintaining Palram's dedication to the highest internationally recognized quality standards
- All Palram plants have achieved ISO 9001: 2000 Quality Assurance accreditation

### Research and Development

- Creating unique, high performance products
- Maintaining Palram's leadership in adapting, changing and modifying existing products to meet the demands of an ever growing and evolving market

The SUNTUF

## Product Group

SUNTUF is a segment of the extensive line of polycarbonate sheets manufactured by PALRAM Industries. Light weight SUNTUF corrugated sheets are manufactured from polycarbonate which combines clarity with strength and incorporates a co-extruded UV protective layer that will not peel or separate. SUNTUF exhibits outstanding resistance to impact (hail or wind) and physical abuse, the most extreme of weather conditions (SUNTUF will not distort or become brittle at any temperature naturally encountered), a large number of chemicals, while remaining corrosion free. Due to these exceptional properties, SUNTUF sheets are the ideal solution for greenhouse or swimming pool coverings in addition to roofing, siding or cladding in industry, construction and agriculture. SUNTUF can also be used to create skylights or to cover light fixtures. Do-It-Yourself (D.I.Y.) enthusiasts have found SUNTUF useful in a wide variety of applications. This brochure contains detailed information to assist you with selecting the color, dimensions and profile that suit a particular application and location.

**SUNTUF<sup>®</sup>** - Corrugated polycarbonate sheet with co-extruded UV protective layer on one side.

**SUNTUF<sup>®</sup> Plus\*** - Corrugated polycarbonate sheet with co-extruded UV protective layer on the exterior side and anti-condensation treatment applied to the interior side.

**SUNTUF<sup>®</sup> UV2** - Corrugated polycarbonate sheet with co-extruded UV protective layer on both sides.

**SUNTUF<sup>®</sup> Solar Control\* - NEW** - Corrugated polycarbonate sheet that transmits selected percentages (20%, 35%, or 50%) of the light energy while keeping the undesired components of the energy spectrum (heat) out. The solar control feature is an integral part of the sheet and will not peel away.

\* Also available with co-extruded UV protective layer on both sides.

# Applications

As a roofing, siding or cladding material or skylights, SUNTUF sheets are unmatched in their vast variety of uses due to their features, performance and aesthetic appearance.



## Construction and Industry

### ■ Roofing or cladding for structures, industrial facilities, public buildings, etc.

SUNTUF combines resistance to corrosion and high impact strength, with the ability to withstand the most extremely cold to the most extremely hot temperatures that occur in nature. No other material offers this.

### ■ Skylights (SunSky)

SUNTUF can be used in conjunction with other corrugated roofing or cladding materials to facilitate daytime natural light transmission, resulting in reduced lighting costs. (SUNTUF is marketed under the trade name SunSky to the skylight and sidelight market)

### ■ Skylight walkways

### ■ Swimming pool covering

SUNTUF Plus can be used to prevent condensation build-up. SUNTUF's UV protective shield will protect the bathers below.

### ■ Partitions



## Agriculture

■ Commercial Greenhouses - SUNTUF Plus with its unique anti-condensation treatment is the ideal greenhouse covering

■ Various other uses, taking advantage of the material and its properties



# Applications

## Do-It-Yourself (D.I.Y.)

SUNTUF sheets are an outstanding D.I.Y. material particularly for their appearance, versatility, durability and ease of handling. The extent of possible D.I.Y. applications is virtually unlimited.

- Skylights to provide natural lighting in your house
- Canopies, Overhangs and Awnings
- Greenhouses
- Carports and Garages
- Partitions
- Patio Covers and Enclosures
- Sundecks/Verandahs
- Pool Enclosures
- Gazebos and Pergolas
- Sunrooms



## *Features at a Glance*

### **Strength**

SUNTUF sheets, manufactured from polycarbonate - the plastic steel - are unbreakable. SUNTUF is extremely resistant to impact either from a falling tool during installation or hailstones that may strike during a long lifetime of service.

### **Clarity**

Natural, clear SUNTUF exhibits the clarity of glass, transmitting over 90% of light over the entire visible light spectrum.

### **UV Resistance**

A co-extruded UV protective layer, which is an integral component of the sheet, enables SUNTUF to retain its transparency without yellowing over the course of a long lifetime of service.

### **Weather Resistance**

SUNTUF resists wind, hail, and the most extreme of temperatures, from -40 °F to +250 °F. It will not become brittle at low temperatures or distort at high temperatures.

### **UV Protective Shield**

SUNTUF will not allow harmful UV radiation to penetrate and harm either crops or children playing below.

### **Thermal Insulation**

SUNTUF is a better insulator than fiberglass or glass resulting in less heat loss.

### **Corrosion Resistance**

SUNTUF matches the performance of metal roofs at any temperature, but will not corrode and will yield a much longer lifetime of service.

### **Chemical Resistance**

SUNTUF resists a wide variety of chemical substances. However, certain substances are not compatible with polycarbonate.

### **Flexibility**

SUNTUF can be curved parallel or perpendicular to their corrugation. Arched roofs and curved walls are easily constructed.

### **Flammability**

SUNTUF sheets have a low flammability rating and do not emit toxic gases when burning. They are less flammable than fiberglass or acrylic. SUNTUF meets many international fire standards, some of which appear on page 19.

### **Ease in Handling and Installation**

Light in weight, SUNTUF sheets are easy to handle and install. SUNTUF is easily cut and drilled using standard ordinary tools.

### **Appearance and Minimum Maintenance**

SUNTUF retains its attractive appearance over its long lifetime and is easily cleaned with soap and water.

### **Limited Lifetime Warranty**

SUNTUF retains its integrity and properties over an extended lifetime of service. A limited lifetime warranty is available upon request.

# Characteristics

## SUNTUF Typical Properties

SUNTUF corrugated sheets possess electrical, mechanical, physical, optical and thermal properties, presented in the table below, that provide comprehensive solutions for the wide

variety of applications depicted previously. The combination of these characteristics qualifies SUNTUF sheets as a first class material.

### Typical Properties of SUNTUF Sheet

	Property	Conditions	ASTM Method <sup>a</sup>	Units US Customary	Value
Physical	Density		D-1505	lb/ft <sup>3</sup>	75
	Specific Gravity		D-1505		1.2
	Water Absorption	24 hr. @ 23°C	D-570	%	0.15
Mechanical	Tensile strength at yield	0.4 in./min	D-638	psi	9,000
	Tensile strength at break	0.4 in./min	D-638	psi	9,500
	Elongation at yield	0.4 in./min	D-638	%	7
	Elongation at break	0.4 in./min	D-638	%	>80
	Tensile Modulus of Elasticity	0.4 in./min	D-638	psi	340,000
	Flexural Modulus	0.04 in./min	D-790	psi	310,000
	Flexural Strength at Yield	0.04 in./min	D-790	psi	13,500
	Notch Impact Strength Izod	73°F	D-256	ft-lbf/in.	1.5
	Notch Impact Strength Charpy	73°F	D-256	ft-lbf/in.	1.5
	Impact Falling Weight	0.032 in. sheet	ISO-6603/1 <sup>a</sup>	ft-lbf	37
Rockwell Hardness		D-785	R Scale	118	
Thermal	Long Term Service Temperature			°F	-40 to +212
	Short Term Service Temperature			°F	-40 to +250
	Heat Deflection Temperature	Load: 264 psi	D-648	°F	275
	Vicat Softening Temperature	Load: 2.2 lb	D-1525	°F	300
	Coefficient of Linear Thermal Expansion		D-696	10 <sup>-5</sup> in./in. °F	3.6
	Thermal Conductivity		C-177	Btu-in./hr-ft <sup>2</sup> -°F	1.45
	Specific Heat Capacity		C-351	Btu/lb°F	0.31
Optical	Haze		D-1003	%	<0.5
	Light Transmission		D-1003	%	90
	Refractive Index		D-542		1.57
	Yellowness Index		D-1925		<1
Electrical	Dielectric Constant	1 kHz	D-150		2.6
		1 MHz	D-150		2.4
	Dissipation Factor	1 kHz	D-150		0.005
		1 MHz	D-150		0.02
	Dielectric Strength Short Time	500 V/s	D-149	V/mil	520
	Surface Resistance	Ketley	D-257	Ohm	4.1x10 <sup>15</sup>
Volume Resistance	Ketley	D-257	Ohm-cm	1.7x10 <sup>17</sup>	

a. All the results depicted in this table were obtained by following the indicated ASTM method except where another method is indicated by the appearance of this symbol (a).

# UV and Weather Resistance

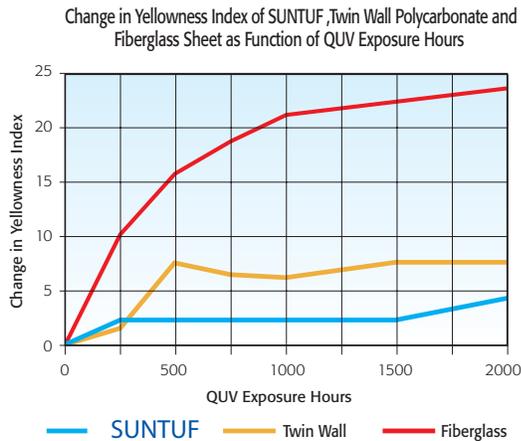
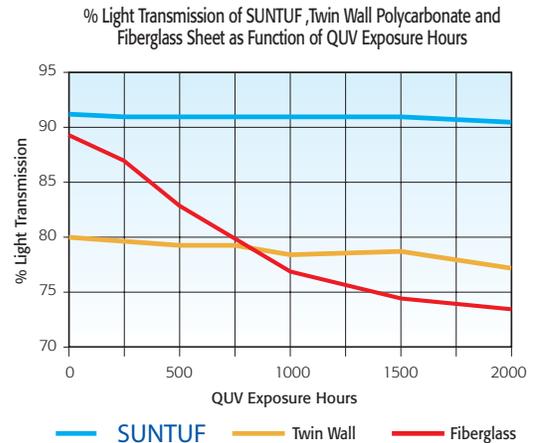
## Weather Resistance

SUNTUF will resist all that nature has to offer. Wind will not buckle it. SUNTUF is Dade County approved for material acceptance. Hail bounces off. Extremely cold temperatures will not render it brittle and leave it vulnerable to breakage. Even the hottest of days in the middle of the desert will not distort SUNTUF.

## UV Protection

SUNTUF is manufactured with a co-extruded UV resistant layer that will not separate or peel over time. The graph to the right, which depicts the results of laboratory QUV testing, which simulates actual UV exposure, indicates that there is only a negligible decrease in light transmission over the 20 year lifetime of the sheet. The small increase in yellowness index depicted in the graph below is not visible to the human eye. For comparison, the results of representative twin wall and fiberglass sheets are also depicted.

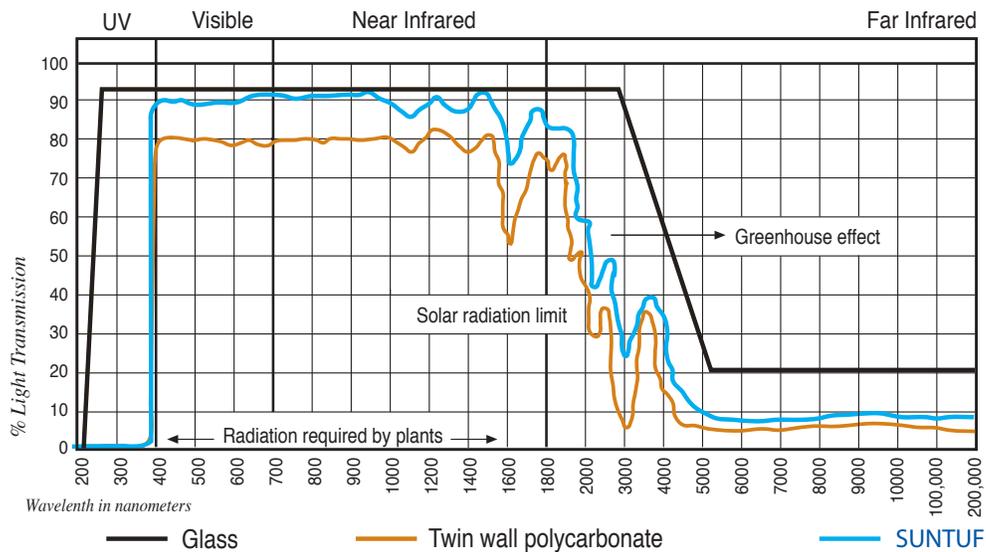
Note that QUV testing consists of 20 hours of intense UV radiation followed by 4 hours exposure to high humidity. A constant temperature of 118 °F is maintained. Testing is carried out for up to 2000 hours. 100 hours of QUV exposure is equivalent to approximately one year of exposure to solar UV radiation in the USA's Southwest, Australia and the Middle East.

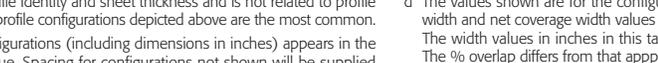


# Radiation Filtering

The graph below depicts the transmission of electromagnetic radiation from 200 to 200,000 nm by SUNTUF. It can be observed that SUNTUF transmits selectively. The beneficial blocking of potentially harmful UV radiation (200 to 400 nm) will be discussed in detail on page 14. On average, clear SUNTUF will transmit 90% of incident visible radiation (400 to 700 nm). This makes clear SUNTUF an ideal material for creating skylights integrated into opaque roofing or cladding of the identical profile. It also makes SUNTUF a requested material for covering public or residential structures where the maximum entry of light is required. This same property has played a significant role in SUNTUF's dramatic penetration into the greenhouse covering market over the last ten years. No other synthetic covering transmits a greater percentage of P.A.R. Also contributing to the attractiveness of SUNTUF as a greenhouse cover is the reduced transmission of far infrared radiation (2000 – 3000 nm). Visible light and near infrared radiation (780 -1400 nm) heat both the air they pass through and solid objects inside which they strike. These warmed objects, in turn, radiate energy in the far infrared region, which is only partially transmitted by SUNTUF. This untransmitted radiation raises the temperature within the structure, an example of the "greenhouse effect". Regulating the ambient temperature created by this phenomenon can be done by controlled ventilation. Choosing tinted SUNTUF glazing with suitable light transmission can also assist in controlling the internal temperature (refer to page 15).

## Transparency versus other products



No.	Standard Available Profiles with Configuration and Support Distance			
	Units	Profile	Thickness <sup>c</sup>	Pitch
	Name		in.	in.
A	B	C	D	
1	<b>Mini 32</b>		0.03	1 1/4
2	<b>Iron 76</b>		0.031	3
3	<b>Greca 76</b>		0.031	3
4	<b>Greca 70</b>		0.031	2 3/4
5	<b>Omega 76</b>		0.031	3
6	<b>Asbestos</b>		0.039	7
7	<b>Asbestos</b>		0.047	7
8	<b>American 4.2"</b>		0.039	4 7/32
9	<b>American 4.2"</b>		0.047	4 7/32
10	<b>Trimdeck 190</b>		0.031	7 1/2
11	<b>Trimdeck 190</b>		0.047	7 1/2
12	<b>SunSky 7.2" <sup>l</sup></b>		0.039	7.2
13	<b>SunSky 7.2" <sup>l</sup></b>		0.047	7.2
14	<b>SunSky 9" <sup>l</sup></b>		0.031	9
15	<b>SunSky 12" <sup>l</sup></b>		0.031	12
16	<b>SunSky 12" <sup>l</sup></b>		0.047	12
17	<b>Astoria</b>		0.06	12
18	<b>Industrial 0100</b>		0.031	9 13/16
19	<b>Industrial 0100</b>		0.047	9 13/16

<sup>a</sup> Support distance is characteristic of profile identity and sheet thickness and is not related to profile configuration (width and overlap). The profile configurations depicted above are the most common.

<sup>b</sup> Detailed information on all profile configurations (including dimensions in inches) appears in the PALRUF and SUNTUF Profiles Catalogue. Spacing for configurations not shown will be supplied upon request.

<sup>c</sup> Other thicknesses and widths are available. See page 20. Thickness and configuration are independent parameters. The configuration information is valid for all thicknesses of a given profile

<sup>d</sup> The values shown are for the configuration depicted. Computation of % overlap is based on the width and net coverage width values in mm. Sheet widths are manufactured to mm specifications. The width values in inches in this table are computed conversions that have been rounded off. The % overlap differs from that appearing in PALRUF and SUNTUF Profiles Catalogue. % Overlap = ((width - Net Coverage)/width) x 100%

<sup>e</sup> Values depend on thickness. Those listed are for the values appearing under thickness in the same row. The theoretical gross weight per sqm. Depicts the value for the sheeting in itself, profile without taking into account the overlapping percentage.

<sup>f</sup> The supports spacing depicted here are based on the assumption that the installation instructions are carefully followed, including the use of the Sheet-to-Sheet stitching fasteners (or screws) along the overlapping corrugations.

# Asbestos Corrugated Profiles

Support Spacing <sup>a</sup> for Selected Thicknesses <sup>a</sup> and Widths <sup>b</sup>						Theoretical weight (lb.) per sq. foot <sup>e</sup>	Maximum Support Spacing <sup>f,g,h</sup>			
Depth	No. of <sup>d</sup>	Width <sup>c,d</sup>	Net Coverage Width <sup>c,d</sup>	No. of Overlap <sup>d</sup>	% Overlap <sup>d</sup>		Design Load <sup>i,j</sup>	Slope <sup>k</sup> 10-20%	Slope >20%	Wall
in.	Corrugations	in.	in.			lb/ft <sup>2</sup>	psf	in.	in.	in.
E	F	G	H	I	J	K	L	M	N	O
5/16	32 1/2	41	39	1 1/2	4.6	-				
5/8	17	50	47.8	1	3.5	0.22	10 16 23	33 27 24	39 31 26	47 43 37
5/8	17	50	47.8	1	3.5	0.25	10 16 23	43 39 35	47 43 39	51 47 43
5/8	15	43	41.3	1	4.1	0.26	10 16 23	43 39 35	47 43 39	51 47 43
19/32	24	73.6	71.8	1	2.5	0.23	10 16 23	41 37 33	43 41 37	51 47 43
2	5 1/2	36	34.8	1/4	3.8	0.29	10 16 23	49 45 43	51 47 45	57 53 49
2	6 1/2	43.3	41.8	1 1/4	3.5	0.35	10 16 23	55 51 49	55 53 50	61 59 55
1 1/16	10	42	37.9	1	10	0.28	10 16 23	49 45 43	51 47 45	57 53 49
1 1/16	6	42	37.9	1	10	0.34	10 16 23	48 43 41	50 45 43	55 51 47
1 1/16	5	32.3	29.9	1	7.3	0.23	10 16 23	43 41 37	47 43 39	51 49 47
1 1/16	7	47.2	44.9	1	5	0.40	10 16 23	49 45 41	51 47 43	59 55 51
1 1/2	7	40.7	40 1/2	1	9.7	0.35	10 16 23	55 53 49	57 55 51	65 61 59
1 1/2	7	40.7	40 1/2	1	9.7	0.42	10 16 23	58 55 53	60 57 54	68 66 62
3/4	5	38	36	1	4.3	0.21	10 16 23	30 24 20	33 29 24	40 37 33
1 1/4	4	38	36	1	5.2	0.22	10 16 23	41 37 33	45 41 37	49 45 41
1 1/4	4	38	36	1	5.2	0.33	10 16 23	51 47 42	53 48 43	58 56 52
1 1/2	4	40.7	36	1	10.5	0.48	10 16 23	55 53 50	57 55 53	65 61 59
1 9/16	5	41.8	39.4	1	5.9	0.30	10 16 23	51 49 47	53 51 49	61 59 57
1 9/16	5	41.8	39.4	1	5.9	0.35	10 16 23	53 51 49	55 53 51	63 59 55

g Supports spacing values shown, are based partly on actual load tests performed, and partly on empirical experience gained out of field use, theoretical calculations, educated estimates, extrapolations and evaluations made according to similar, or parallel products. Actual values may be updated later on, due to further testing and evaluations

h Maximum suggested supports span shown for the Asbestos profiles (of both widths and gages), are really theoretical. These profiles are meant as a replacement for the obsolete previous Asbestos panels, which are now banned from use, and are practically installed on the same structure and existing smaller spans as dictated by the previous cladding. There is usually no use of this type of profile in new structures.

i Deflection at maximum load depicted (useful wind/uplift or snow workloads) is up to 1/20 (5%) of the proposed purlins span.

j Relationship between wind velocity and wind load: 60 miles/hr is equivalent to a wind load of 10 psf, 80 miles/hr is equivalent to 16 psf and 95 miles/hr is equivalent to 23 psf.

k Slopes of less than 10% are not recommended. If chosen, the support spacing needs to be reduced by up to 60% (depending on the actual slope chosen), due to the reduced possibility of self-cleaning and lower rate of rainwater evacuation, necessitating much smaller deflection.

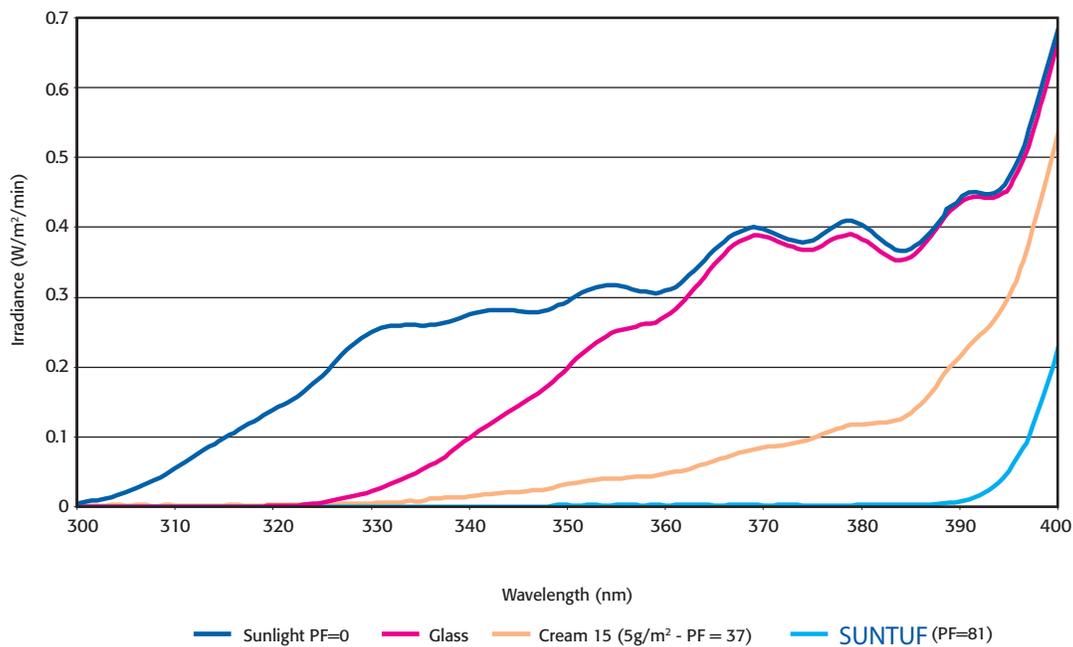
l Minimum support spacing is calculated for continuous panel runs. For integration with metal panels (skylights) please consult with your distributor.

## *SUNTUF Polycarbonate Sheet Protects*

### *against the Harmful Affects of UV Radiation*

Exposure to solar ultraviolet (UV) radiation is becoming a major health concern. The adverse affects were once thought to be associated with solar UV radiation in the 270 to 320 nm (UV-B) range. However, in recent years it has become apparent that exposure to UV-A (320-400 nm) is also detrimental. Both ranges in addition to the UV-C range (200-290 nm) were included in the 10th Report on Carcinogens issued by a US government agency. In addition to skin cancer, premature aging has been associated with exposure to UV-A. SUNTUF sheets totally block out UV radiation in this portion of the spectrum. Almost all the UV-A radiation is also blocked out. This almost total blockage of UV radiation can be observed in the figure below.

**Comparison of Irradiance of Solar UV Radiation through Various Protective Barriers**



A comparison of the UV protection offered by SUNTUF and that offered by sunscreen Cream 15 is depicted in the graph above. Note that no barrier is as effective as SUNTUF sheet. **The Skin Cancer Organization recognized this by granting its Seal of Recommendation to SUNTUF.** Activity below SUNTUF will be more protected than that offered by proper application of sunscreen, though the latter is sufficient in almost all cases. The key word in the previous sentence is proper. Improperly applied sunscreen or forgetting to apply sun screen will result in undesirable levels of exposure. In addition, note that protection factors are computed on the basis of UV-B exposure. There is as yet no way to compute protection to UV-A exposure. It should also be noted that formulations are still being marketed which only block out UV-B. When playing or swimming below SUNTUF, protection is always complete. When swimming, there is no danger that the protection will be washed away.

In the last ten years, it also has been documented that UV exposure can also damage the eyes, specifically to the cornea. Wearing sunglasses manufactured from polycarbonate protects the eyes. However, most people remove their glasses when entering the pool. This is a factor for both public and private pools to consider when contemplating a choice of covering.

## *Thermal and Optical Properties*

Thermal insulation is an important factor to consider when choosing a glazing material due to its impact on energy expenditure for heating in the winter and air conditioning in the summer. Textured, tinted, opal, diffuser and the new SUNTUF Solar Control sheets possess energy saving properties that complement those resulting from the low thermal conductivity of SUNTUF. (SUNTUF's thermal conductivity is lower than that of fiberglass (FRP) sheets and glass.) The light transmission is reduced from the very high value available with clear SUNTUF. However, the resulting lowered light transmission still delivers excellent lighting within, while providing a shading coefficient (SC) which provides significant cooling for structures located in hot sunny climates, or in cases where large glazing areas face direct sun exposure for many hours a day.

The range of SUNTUF clear, tinted, opal, diffuser or Solar Control sheets, depicted on the next page, offers a wide range of light transmission and shading coefficient grades to suit the application. They diminish solar energy buildup and glare created by direct sunlight, prevent dazzle and reduce air-conditioning costs. The diffused light transmitted through translucent or textured SUNTUF sheets, or the special shade of light delivered by other tinted SUNTUF sheets, help to maintain a comfortable and pleasing ambience to the users of the structure.

SUNTUF textured, diffuser, opal and solar control sheets are ideal for the creation of skylights. They enable designers to deliver the exact quantity and quality of light desired.

On the following page, a series of definitions appear to assist you in understanding the thermal and optical properties of SUNTUF sheets, followed by a table depicting these properties.



# Thermal and Optical Properties

## Definitions

### Visible Light Radiation

The portion of the light spectrum whose wavelength ranges from 400 nm to 700 nm.

### % Light Transmission (%LT)

Percentage of incident visible light that passes through an object.

### % Light Reflection (%LR)

Percentage of incident visible light that strikes an object and returns as visible light.

### % Light Absorption (%LA)

Percentage of incident visible light that strikes an object and is absorbed by it.

$$\%LT + \%LR + \%LA = 100\%$$

### Solar Radiation

The solar spectrum ranging from 300 nm to 2400 nm. Included are UV, visible and NIR radiation.

### % Direct Solar Transmission (%ST)

Percentage of incident solar radiation that passes directly through an object.

### % Solar Reflection (%SR)

Percentage of incident solar radiation that strikes an object and is reflected.

### % Solar Absorption (%SA)

Percentage of incident solar radiation that strikes an object and is absorbed by it.

$$\%ST + \%SR + \%SA = 100\%$$

### Total Solar Transmission (%ST<sub>t</sub>)

The percent of incident solar radiation transmitted by an object which includes the direct solar transmission plus the part of the solar absorption reradiated inward.

### Total Solar Reflection (%SR<sub>t</sub>)

The percent of incident solar radiation reflected by an object, which includes the solar reflectance plus the part of the solar absorption, reradiated outward.

$$\%ST_t + \%SR_t = 100\%$$

### Shading Coefficient (SC)

The ratio of the total solar radiation transmitted by a given material to that transmitted by normal glass, whose light transmission is 87%. It can be approximately calculated by:

$$SC = 1.15 \times (\%ST + (0.27 \times \%SA)) / 100$$

$$\%ST + (0.27 \times \%SA) = \%ST_t$$

$$SC = 1.15 \times ST_t / 100$$

## SUNTUF - Solar Light and Radiation Transmission Properties (Thickness 0.03 in. to 0.06 in.)

Product	% LT	%LR	%ST	%SR	%SA	%SR <sub>t</sub>	%ST <sub>t</sub>	SC
	ASTM D-1003	ASTM E424-71	ASTM E424-71	ASTM E424-71	ASTM E424-71	ASTM E424-71	ASTM E424-71	ASTM E424-71
Clear	90	10	86	10	4	14	86	1.00
Clear Textured	87-89	10-12	83-85	10-12	3 to 7	14	86	1.00
Bronze 50%	50	7	54	7	39	35	65	0.75
Bronze 35%	35	6	42	6	52	44	56	0.64
Bronze 20%	20	6	28	6	66	54	46	0.52
Solar Gray 50%	50	7	54	7	39	35	65	0.75
Solar Gray 35%	35	6	42	6	52	44	56	0.64
Solar Gray 20%	20	6	27	6	67	55	45	0.51
White Opal (0.8 mm)	45	51	46	43	11	51	49	0.56
White Opal (1.0 mm)	35	55	40	47	13	57	43	0.50
Mist Green 20%	20	25	33	24	43	55	45	0.51
Smooth Cream 35%	35	17	45	17	38	50	50	0.64
Solar Metallic Gray 20%	20	30	21	30	49	66	34	0.38
Solar Metallic Gray 35%	35	28	32	28	40	57	43	0.49
Solar Metallic Gray 50%	50	24	48	24	28	44	56	0.64
Solar Ice 20% <sup>1</sup>	20	59	29	52	19	66	39	0.39
White Opaque	<2	N.A. <sup>2</sup>	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Green Opaque	<2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Blue Opaque	<2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Red Brick	<2	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

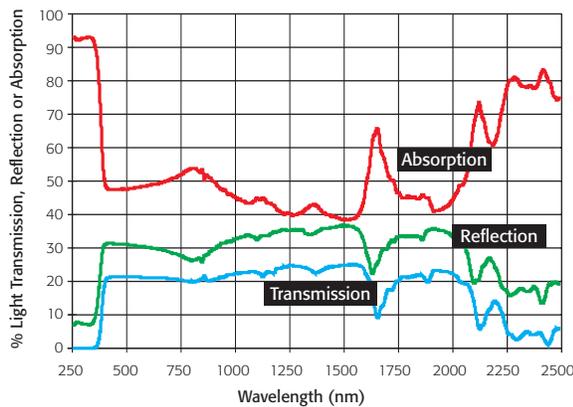
<sup>1</sup>Additional Solar Ice % LT are available.

<sup>2</sup>N.A. Not applicable

# SUNTUF Solar Control

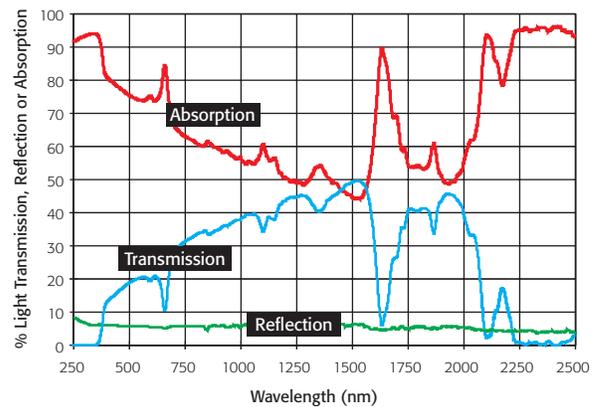
As can be seen in the table on page 16, the **new** SUNTUF Solar Control sheet possesses the lowest shading coefficient and conversely the coolest temperatures at a given level of light transmission. The solar control is integrated. **There is no chance of a laminated layer peeling away.** To illustrate the advantage of solar control in fighting heat buildup, the figures below compare a 20% Light Transmission Solar Gray sheet with a 20% Light Transmission Solar Control Sheet. **First note that both sheets transmit practically 0% UV radiation and offer 100% protection to anyone sitting or playing under the sheets.** Comparing the absorption spectrum, it becomes apparent that the Solar Gray sheet absorbs more solar energy over the entire spectrum. This energy is partially converted into heat which can be radiated inward, heating the area below the sheets. The Solar Control sheet avoids this by reflecting a much larger percentage of energy over the entire spectrum. Compare this with the small percentage of reflection by Solar Gray. Also note that the Solar Control transmits a uniform 20% of light energy over a wide portion of the energy spectrum. Similar comparisons can be made for sheets transmitting 35% and 50% of incident light.

### Optical Properties of Solar Control\* Sheet with 20% Light Transmission



\* Solar Metallic Gray

### Optical Properties of Solar Gray Sheet with 20% Light Transmission



## *Chemical Resistance*

The mechanism of chemical attack on SUNTUF polycarbonate sheets differs significantly from the mechanism of corrosion of metals. Corrosion of metals results in a gradual loss of surface material as a result of electrolytic action by the relevant chemicals. In the cases where chemical attack on polycarbonate sheet occurs, all or a portion of a range of effects can be observed. Ethylene chloride, chloroform, tetrachloroethane, m-cresol, pyridine and other chemicals can cause partial dissolution of polycarbonate. Swelling agents include benzene, chlorobenzene, tetralin, acetone, ethyl acetate, acetonitrile and carbon tetrachloride. Additional effects include color change and/or whitening. These effects may not always lead to product failure, especially for non-loaded sheets. Nevertheless, the level of measured mechanical properties will be reduced. The most critical effect of chemical attack is stress cracking or crazing, which may range in size from being visible to the naked eye to being only observable under a microscope. Stress cracks will always result in sheet failure which will emanate from areas of greatest stress (screws, fixings, bends, etc.)

SUNTUF polycarbonate sheets are generally not recommended for use with acetone, ketones, ethers, and aromatic and chlorinated hydrocarbons in addition to aqueous or alcoholic alkaline solutions, ammonia gas and its solutions and amines.

SUNTUF polycarbonate sheets are resistant to mineral acids, many organic acids, oxidizing and reducing agents, neutral and acid salt solutions, many greases, waxes and oils, saturated, aliphatic and cycloaliphatic hydrocarbons and alcohols, with the exception of methyl alcohol. The resistance of polycarbonate to water may be described as good up to approximately 140 °F. At higher temperatures, degradation occurs, the extent of which depends on time and temperature. Polycarbonate should therefore not be exposed for long periods of time to hot water. However, brief contact with hot water has no effect. For example, polycarbonate tableware can be washed over 1000 times in a dishwashing machine with no adverse effects being observed.

A table, which lists the resistance of polycarbonate sheet to many commonly encountered chemicals and other corrosive media at room temperature, appears in the pamphlet, "Palram Industries Chemical Resistance of Polycarbonate Sheets".

### **Adhesives and Sealants**

Adhesives and sealants are often required when installing SUNTUF. Detailed information on compatible adhesives and sealants can be found in the leaflet, "Adhesives and Sealants Compatible with Polycarbonate Sheets".

## *Flammability, Building and Construction Standards*

The value and quality of a construction material is indicated by the standards, which it meets. The table below lists the stringent international building and construction standards, which SUNTUF meets.

Standard	Country	SUNTUF Thickness	Method	Designation or Rating
Flammability	Dade County FL - USA	0.03 in.	ASTM D-1929	Meeting the South Florida building code - 806° F
			D-1929	1004° F
			D-635	45 Sec
			D-635	1.77 in
			E-84	6
			E-84	78
			D-638	(Weathering)
Flammability	USA	0.03 in.	UL : UL 723	4.7 47.0
			ASTM D-1929	914 °F @ 4:3 min 986 °F @ 2:15 min
			ASTM D-635	7.6 in./ min 100 (AEB) 30 (Burning rate)
Flammability	USA Los Angeles	0.03 in.	Los Angeles Building Code Based on ASTM D-635	CC2 (Section 2603)
Flammability	France	0.03 - 0.04 in.	NFP 92501, NFP 92504, NFP 92505	M-1
Flammability	Germany	0.03 - 0.04 in.	DIN 4102	B-1
Dade County Notice of Acceptance	Dade County (Miami), Florida, USA		00-1226.02	Accepted
TNO Hail Test	Netherlands		1999-CON- LBC/B7139/JNE	Passed
TNO Load Test (Pressure)	Netherlands		1999-CON- LBC/B7157/JNE	Passed

# *SUNTUF Standard Corrugated Profiles*

Standard SUNTUF Profiles and dimensions appear in the table below (a graphical depiction of the profiles appears in the table on pages 12-13). Nonstandard products are available for a guaranteed minimum order. These include the following:

- 1-Products with nonstandard thicknesses, widths or lengths.
- 2-Additional available profiles not in the list below. ("The PALRUF and SUNTUF Profiles Catalogue" will be supplied upon request.)
- 3-Tailor or custom made profiles which can be developed to meet any existing or future design requirement.

## Standard Available Dimensions

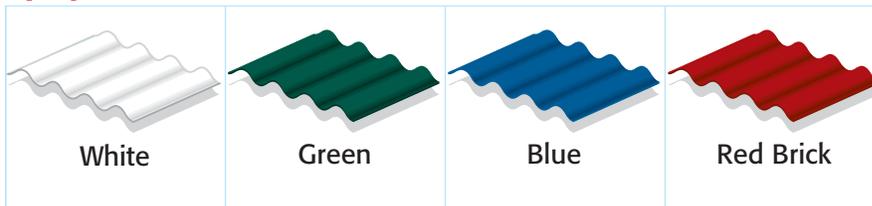
Profile Units	Thickness in.	Width in.	Length ft.
<b>Mini 32</b>	0.03	41	5 - 20
<b>Iron 76</b>	0.03 - 0.06	26, 34, 35.4, 49.6	5 - 38
<b>Greca 76</b>	0.03 - 0.06	26, 42, 49.6, 73.6	5 - 38
<b>Greca 70</b>	0.03 - 0.06	43.1	5 - 38
<b>Greca 78</b>	0.03 - 0.06	40.2	5 - 38
<b>Omega 76</b>	0.03 - 0.06	49.6, 73.6	5 - 38
<b>Asbestos 177</b>	0.04 - 0.06	36.2, 43.3	5 - 20
<b>SunSky 7.2"</b>	0.04 - 0.06	40.7	5 - 20
<b>SunSky 9"</b>	0.03 - 0.06	38	5 - 20
<b>SunSky 12"</b>	0.03 - 0.06	38	5 - 20
<b>American 4.2"</b>	0.04 - 0.06	42.1	5 - 20
<b>Trimdek 190</b>	0.03 - 0.06	32.3, 47.2	5 - 20
<b>Astoria</b>	0.04 - 0.06	40.7	5 - 20
<b>Industrial 0100</b>	0.04 - 0.06	41.8	5 - 20

# Colors

SUNTUF sheet is available in a wide variety of transparent, translucent, and opal colors. Opaque colors do not transmit light. Transparent colors transmit light and images (and are clear or tinted). Clear and opaque sheets may have a glossy or embossed surface on one side. Opal or translucent sheets have 20% to 40% light transmission, depending on the thickness of the sheet. SUNTUF Solar Control transmits fixed amounts of light (20, 35 or 50%) and will allow images to be viewed. The heat transmission is also reduced. Please refer to the table on page 16 for more detail.

A list of standard colors appears below. The colors depicted on this page are the closest reproduction of the actual color that is technically possible. Only sample chips\* accurately characterize the colors in question.

## Opaque



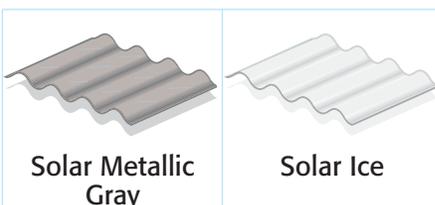
## Transparent



## Translucent



## Solar Control Translucent



\* Please consult with your local Suntuf Inc. distributor to:

- Receive a sample color chip.
- Order custom colors and/or light transmissions (subject to certain minimum quantities).

## *Consulting with your Distributor*

### **Nationwide Distribution Network**

Suntuf Inc. has a nationwide distribution network with local representatives in most states. Please call 1-800-999-9459. Suntuf Inc. representatives can supply you with the required know-how and accessories for integrating SUNTUF sheets with construction designs employed in your region.

As there are many factors involved in selecting a roofing, siding or cladding material, we strongly advise you to consult with your Suntuf Inc. distributor to assist with your profile selection before placing an order.

### **Consult with your local distributor or call 1-800-999-9459 for:**

- Alternative Suntuf Inc. products that may be more suitable for your application (PALRUF corrugated PVC sheet, SUNLITE multi-wall polycarbonate sheet or PALSUN flat rigid polycarbonate sheet).
- Advice on the final selection of a profile.
- Accessories
- Adhesives and Sealants required for installation
- Requests for the Suntuf Inc. Technical Support Department to test materials for compatibility or use of SUNTUF sheets for a new application.
- Additional Literature related to SUNTUF is available upon request

### **Greenhouse**

SUNTUF Plus  
SUNTUF Plus Technical Guide  
SUNTUF Plus Installation Instructions

### **Installation Instructions**

SUNTUF Industrial 0100 Profile  
SUNTUF Iron 76 Profile  
SUNTUF Greca 76 Profile  
SUNTUF Omega 76 Profile  
SUNTUF Asbestos 177 Profile  
SUNTUF American 4.2 Profile

### **Skylight and Sidelight**

SunSky  
SunSky Installation Guide

### **Technical Literature**

Catalogue of Finishing Accessories  
PALRUF (PVC) and SUNTUF (Polycarbonate) Profiles Catalogue  
Palram Industries Chemical Resistance of Polycarbonate Sheets  
Adhesives and Sealants Compatible with Polycarbonate Sheets

## **Additional Products Manufactured by Palram Industries**

### **PALSUN<sup>®</sup>**

Flat rigid polycarbonate sheets with the following options: standard, one or two sided co-extruded UV protection, mirror, solar control, FR, embossed (E102, prismatic, haircell), abrasion and scratch resistant.

**PALSUN FOAMED** - **NEW** flat foamed polycarbonate sheet.

### **SUNTOP<sup>®</sup>**

Corrugated foam polycarbonate sheets in rounded profiles with co-extruded UV protection on one side.

### **SUNLITE<sup>®</sup>**

Multi-wall (structured) sheets co-extruded with UV protection on one or two sides available with anti-condensation treatment.

### **COMPAX<sup>®</sup>**

Flat rigid matte opaque modified polycarbonate sheets for thermoforming without pre-drying.

### **PAL-G<sup>®</sup>**

Flat rigid standard or UV protected (one side) co-polyester sheets.

### **PALGLAS<sup>®</sup>**

Flat rigid extruded solid acrylic sheet.

### **PALRUF<sup>®</sup>**

Corrugated rigid PVC sheets with the following options: clear, translucent or opaque, with or without additional UV protection, HI (High Impact), standard or tailor-made profiles.

### **PALCLEAR<sup>®</sup>**

Flat rigid clear PVC sheets with the following options: standard, HI (High Impact), UV protection on one side, UV protection on one side for thermoforming, embossed (prismatic 12).

### **PALOPAQUE<sup>®</sup>**

Flat rigid opaque PVC sheets with the following options: glossy, matte, UV protection, UV protection for thermoforming.

### **PALDOOR<sup>®</sup>**

Flat rigid matte or wood grain PVC sheets for thermoforming door panels.

### **PALIGHT<sup>®</sup>**

Flat foam PVC sheets with the following options: matte, glossy (one side or two), UV protected.

## Distributor

61302 - 8.04

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

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