PLEXIGLAS®

Acrylic Sheet

GENERAL INFORMATION AND PHYSICAL PROPERTIES

ALTUGLAS INTERNATIONAL
ARKEMA GROUP

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INTRODUCTION

Plexiglas® is the acrylic plastic sheet produced by the Altuglas International of Arkema Inc. In its colorless form, Plexiglas acrylic sheet is a crystal clear (with a transparency equal to optical glass), lightweight material having outstanding weatherability, high impact resistance, good chemical resistance, and excellent thermoformability and machinability.

PLEXIGLAS SHEET GRADES

Altuglas International supplies various grades of Plexiglas sheet, each manufactured by two distinct processes, each yielding acrylic sheet of exceptionally high quality.

Plexiglas G acrylic sheet is made by a cell-cast process. The hallmarks of Plexiglas G sheet are high performance and the availability of a broad range of colors, patterns, sizes and thicknesses. Plexiglas G sheet conforms to ASTM D-4802, A-1 material, finish 1, and is supplied as an unshrunk sheet. This means that when heated to forming temperatures, it will shrink about 2% in length and width, and will increase in thickness by about 4%.

Plexiglas MC acrylic sheet is made by a proprietary continuous process known as melt calendering. It offers many of the same high-quality features as Plexiglas G sheet, and also has exceptional thickness tolerance and can be thermoformed to greater detail. Plexiglas MC acrylic sheet is well suited to nearly all the conventional uses for which acrylic sheet has long been noted.

Plexiglas Q is made by the same proprietary continuous process used to make original Plexiglas MC sheet. This process ensures exceptional surface finish, optical quality and thickness uniformity. Plexiglas Q has all these attributes of original Plexiglas MC, in addition to enhanced solvent craze resistance. Plexiglas Q is available as standard sheet and reel stock, in thicknesses from 0.110" to 0.177". You can gain additional information in the Plexiglas Q technical brochure.

Plexiglas T combines the beauty of Plexiglas MC with additional toughness gained from the use of our advanced impact acrylic chemistry. This union produces the aesthetics desired with increased toughness. Plexiglas T is more than 50% tougher than standard acrylic sheet. It is available in colorless, white and black, in thicknesses from 0.080" to 0.354". You can gain additional information in the Plexiglas T technical brochure.

FORMS OF PLEXIGLAS SHEET

Aside from colorless sheet, the various grades can come in a variety of transparent, translucent, and opaque colors, as well as in several different surface patterns.

- *White translucent sheet*—A series of standard white translucent colors in a broad density range provides a wide selection of sheet with varying percentages of light transmittance, diffusion, and lamp hiding power. Light transmission also varies with the thickness of the sheet. This product serves well in lighting and sign applications.

- *Translucent colors*—A wide range of standard, brilliant-to-subdued colors that transmit and diffuse light is available. Objects behind the sheet cannot be clearly distinguished. Light transmittance does not depend on sheet thickness. Translucent color sheet is suitable for most sign applications.

- *Transparent colors*—A selection of standard colors that provide see-through, color filtering, and solar heat and glare control is available. Light transmittance varies from color to color, but for the same color remains about the same value, regardless of sheet thickness. Typical applications include glazing, displays, and fixtures.

- *Opaque colors*—Standard opaque low-chroma colors for non-illuminated decorative panels are available.

- *Solar control colors*—These sheets solve solar heat and glare control problems. Available in bronze and gray tints, they provide a high level of protection for architectural and transportation glazing, enclosures, and sunscreens. As with other transparent colored sheet, the light transmittance varies from color to color, but sheet of the same color transmits light about the same intensity, regardless of its thickness.

- *Patterned sheets*—The surface texture of patterned Plexiglas sheet refracts or bends transmitted light. Adding special textures provides decorative effects, diffuses annoying reflections, and permits privacy. Certain surface texture patterns come on one or both sheet sides, and in transparent, translucent, and opaque colors.

Standard Patterns	Description
P-4	prism (approx. 64/sq in, G only)
P-5	ripple design (one side, G only)
DP-30	stipple (both sides)
DP-32	Flair® (both sides, MC only)
P-95	fine matte finish
Non-Glare	for framing market (MC only)

- *Infrared transmitting*—Colorless Plexiglas sheet transmits most of the invisible near-infrared energy; however, Plexiglas G sheet color 3143 blocks visible light and selectively transmits infrared light. Applications include remote control devices, laser lenses, and heat sensors.

- *Ultraviolet light filtering*—The Plexiglas G, UF-3 and UF-4, and the Plexiglas MC UF-5 sheet formulations block ultraviolet (UV) light, with UF-5 providing maximum UV absorbance. Standard Plexiglas sheet grades only absorb the short UV wavelength energy; however, the UF formulations have the same physical properties as their corresponding sheet grades, and are often used for displaying documents and artifacts to minimize the harmful effects of ultraviolet light.

APPLICATIONS

Plexiglas sheet is a versatile material that has many residential, commercial, industrial, and professional uses. Major applications fall into such categories as architectural glazing, retail display, signs, lighting, noise reduction, industrial guards, restaurant fixtures,

and document preservation. The listing that follows is merely a sample.

- point-of-purchase displays
- trade show exhibits
- map/photo covers
- architectural glazing
- art/document preservation
- vehicle glazing
- framing medium
- electronic equipment panels
- machine glazing
- safety glazing
- infrared windows
- retail display fixtures and cases
- brochure/ad holders
- lenses
- noise shields
- pediatric incubators
- splash guards
- industrial safety guards
- transparent tanks
- lighting fixture diffusers
- transparent lids
- outdoor luminous signs
- transparent equipment
- street lighting shields
- models
- restaurant sneeze guards
- demonstration windows and housings
- food containers
- restaurant trays
- tabletop covers

PROPERTIES AND CHARACTERISTICS

BREAKAGE/IMPACT RESISTANCE

Table 1 compares the impact resistance of Plexiglas sheet at different thicknesses with various types of glass. Plexiglas sheet has greater impact resistance than all types of glass, including tempered glass. Data was obtained from test samples one foot square with edges loosely clamped.

The hardness of an object striking Plexiglas sheet affects its impact resistance. The air-cannon impact test gives a practical measure of the impact strength that Plexiglas sheet can be expected to display in service. This procedure measures the velocity and energy required for a projectile of specified weight and tip radius, shot from an air cannon, to break a specimen. Test samples for data in Table 2 are 14" x 20" Plexiglas G sheet, with edges tightly clamped.

Breakage resistance is maximum when the edges of saw-cut sheet or of drilled holes in the sheet are free of notches. Saw blades and drill bits that meet Atoglas specifications will provide notch-free edges, but it may be desirable to finish edges by sanding or scraping, particularly where the sheet is subjected to high impact.

TABLE 1: Impact Resistance of PLEXIGLAS Sheet and Other Materials

Product	Nominal thickness in	Nominal thickness mm	Weight of free-falling steel ball lb	F50 energy to break ft-lb
Plexiglas Sheet	.098	2.5	.25	3.0
Plexiglas Sheet	.118	3.0	2.00	4.7
Plexiglas Sheet	.177	4.5	2.00	11.1
Plexiglas Sheet	.236	6.0	5.00	18.1
Window Glass				
Single Strength	.100		.25	0.8
Double Strength	.125		.25	1.8
Plate Glass	.187		.25	2.0
Plate Glass	.250		.25	1.0
Laminated Glass	.250		.25	1.1
Rough Wire Glass				
Impact Rough Side	.250		.25	2.2
Impact Smooth Side	.250		.25	0.2
Polished Wire Glass	.250		.25	0.4

TABLE 2: Air-cannon Impact Test Results for PLEXIGLAS Sheet

Nominal thickness		F50 energy (ft-lb) to break impacted with	
		Baseball 0.32 lb	Steel-tipped dart 0.6 lb, 1/2 in. rad. tip
in	mm		
.118	3.0	24 (47 mph)	5
.236	6.0	84 (84 mph)	6
.354	9.0	113 (105 mph)	27
.472	12.0	224 (147 mph)	40
.708	18.0	390 (104 mph)	53
.944	24.0	505 (220 mph)	68

CHEMICAL RESISTANCE

Both Plexiglas G and MC sheet have excellent resistance to most chemicals, including solutions of inorganic alkalies and acids, such as ammonia and sulfuric acid, and aliphatic hydrocarbons, such as hexane, octane and VM&P naphtha.

Plexiglas G and MC sheet do differ somewhat in their resistance to certain chemicals, as indicated in Table 3. Both grades are attacked by aromatic hydrocarbons and dissolve in organic compounds such as acetone, benzene, and toluene. Chemical resistance can be influenced by several factors, including stresses generated by fabrication operations and end-use stresses caused by changes in temperature, etc.

Certain gasket and sealant materials, while in contact with Plexiglas sheet, could cause crazing of the sheet under certain conditions. Resistance to stress cracking and crazing is dependent on such factors as total stress on the part, temperature and exposure time; consequently, before using any such materials, the fabricator should test them thoroughly, replicating end-use conditions as closely as possible, to ensure their compatibility.

DIMENSIONAL STABILITY

Plexiglas acrylic sheet will expand and contract with changes in temperature and humidity. Different temperature and/or humidity conditions on the inner and outer surfaces of Plexiglas sheet may cause it to bow slightly in the direction of the higher temperature and/or humidity. However, this type of bowing is reversible. The sheet will return to its original flat state when the temperature and humidity differentials become zero.

Bowing does not affect visibility through flat transparent Plexiglas sheet, but may distort reflections. For translucent or opaque panels in which it is unnecessary to see objects through the sheet, surface textures or formed designs will help disguise specular reflection distortions.

In construction, Plexiglas sheet is often used with other materials that undergo less expansion and contraction. The listing in Table 4 (page 5) compares the coefficients of thermal expansion of Plexiglas sheet with other common construction materials.

To ensure good performance in environments where temperature varies widely, Plexiglas sheet should be installed in a channel frame that permits the sheet to expand and contract freely. The channel frame should be deep enough for the sheet to contract fully and still stay within the frame.

Avoid inflexible fasteners such as bolts that do not permit expansion and contraction. Tapes and sealants that adhere to both the acrylic sheet and the frame should be sufficiently extensible to accommodate thermal expansion of both.

Plexiglas sheet may develop permanent deformation under long-term continuous loading. This cold flow characteristic may be minimized by using thicker sheet, reducing the size of unsupported areas, or using thermoformed configurations.

ELECTRICAL CONDUCTIVITY

Plexiglas sheet is an excellent electrical insulator with a high dielectric constant. This property, however, causes a static charge on the sheet surface, which attracts dust particles and lint. Antistatic compounds can be employed when static buildup and high dust concentration create a cleaning problem.

FORMING

Cold forming

Plexiglas sheet can be cold formed (bent at room temperature) in a smooth arc and held to a radius by forcing the material into a curved channel support.

TABLE 3: Chemical Resistance of PLEXIGLAS Sheet [1]

Weight gain (%) of .236" thick sheet after 7 days immersion at 77°F, ASTM D543 (weight change of 1% or less is considered negligible)

Compound Class	Name	Type [2]	Conc., %	PLEXIGLAS (% weight gain) G .236"	PLEXIGLAS (% weight gain) MC .236"
Acids	Acetic	glacial	100	R-S	DL
	Acetic		5	0.4	0.5
	Chromic		40	0.2	4-D
	Citric		10	0.3	0.4
	Hydrochloric	concentrated	38	0.2	A
	Hydrochloric		10	0.3	0.4
	Hydrofluoric		40	8.5E	—
	Nitric	concentrated	70	A-D	A
	Nitric		40	2.8	5-A
	Nitric		10	0.3	0.4
	Oleic		–	0.0	-0.1
	Sulfuric	concentrated	98	D-R-S	DL
	Sulfuric		30	0.2	0.3
	Sulfuric		3	0.4	0.5
Bases	Ammonium hydroxide	concentrated	28	0.2	0.3
	Ammonium hydroxide		10	0.4	0.5
	Sodium carbonate		20	0.2	0.3
	Sodium carbonate		2	0.4	0.5
	Sodium hydroxide		60	-0.2	-0.4
	Sodium hydroxide		10	0.3	0.4
	Sodium hydroxide		1	0.4	0.5
Commercial	Cottonseed oil	edible grade		<0.1	0.1
Products	Detergent solution	heavy duty		0.25	0.5
	Kerosene	No. 2 fuel oil (ASTM D396)		<0.1	0.1
	Mineral oil	white, USP		<0.1	0.1
	Lacquer thinner			DL	DL
	Olive oil	edible grade		<0.1	0.1
	Soap solution	white flakes		1	0.5
	Transformer oil	(ASTM D1040)		<0.1	0.1
	Turpentine	distilled spirit (ASTM D13)		<0.1	0.1-C
Inorganic	Distilled water			0.4	0.6
Compounds	Hydrogen peroxide		28	0.4	0.8
	Hydrogen peroxide		3	0.4	0.6
	Sodium chloride		10	0.3	0.5
	Sodium hypochlorite		5	0.3	0.4
Organic	Acetone			DL	DL
Compounds	Aniline			DL	DL
	Benzene			DL	DL
	Carbon tetrachloride [3]			<0.1	A-E
	Dibutyl sebacate			0.1	0.1
	Diethyl ether			<0.1-C	R-S
	Dimethyl formamide			DL	DL
	Ethyl acetate			DL	DL
	Ethyl alcohol		95	1.4	4.0
	Ethyl alcohol		50	0.8	2.0
	Ethylene dichloride			DL	DL
	2-Ethylhexyl sebacate			<0.1	0.1
	Heptane			0.0	0.1
	Isooctane			<0.1	0.1
	Isopropyl alcohol		99	0.1	C
	Methyl alcohol			5.8-S	A
	Phenol (aqueous)		5	A-C	A
	Toluene			DL	DL

Chemical Resistance Code:

A = Attacked
C = Crazed
D = Discolored
DL = Dissolved
E = Edge Swelling
R = Rubbery
S = Swollen

Weight change is affected by the thickness of the material. Values given are for .236" thickness.

(1) Values given are averages and should not be used for specification purposes.

(2) Samples conditioned per ASTM D618, Procedure B, except where noted.

(3) Although exposure to carbon tetrachloride causes only negligible weight change in Plexiglas sheet, it does cause optical distortion of the surface. Carbon tetrachloride should NOT be used on Plexiglas sheet.

TABLE 4: Coefficients of Thermal Expansion

Product	Inches/Inch/°F
Plexiglas sheet	.0000410
Aluminum	.0000129
Copper	.0000091
Steel	.0000063
Plate glass	.0000050
Pine, along grain	.0000030
Pine, across grain	.0000190

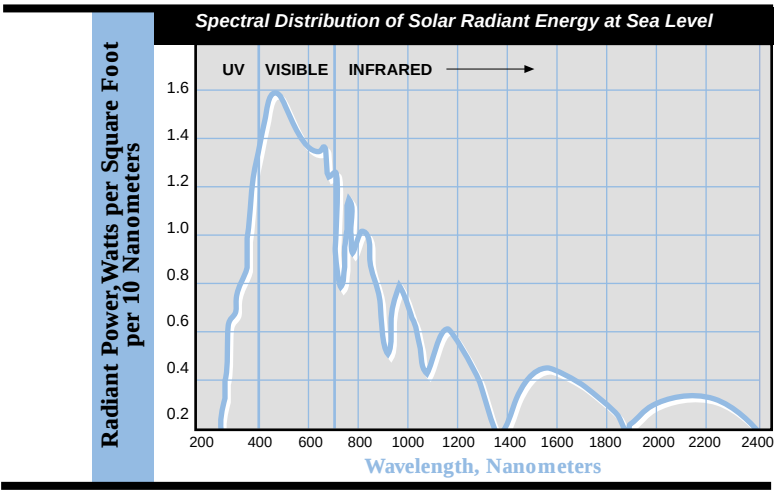
TABLE 5: Recommended Minimum Radii of Curvature for Cold-formed PLEXIGLAS Sheet

Nominal sheet thickness (in)	(mm)	Recommended minimum radius (in) PLEXIGLAS G	PLEXIGLAS MC
0.060	1.5	11	N.A.
0.098	2.5	17.5	29
0.118	3	21	35
0.177	4.5	32	53
0.236	6	42.5	71
0.354	8.5	60	100
0.472	12	86	143

Radii of curvature less than those specified may exceed the design stress limits for the material, resulting in crazing.

N.A. = Not Applicable.

FIGURE 1



The recommended radius of curvature should be a value greater than 180 times the thickness of the sheet for Plexiglas G sheet, and 300 times the thickness for Plexiglas MC sheet (see Table 5).

Hot forming

In the case of hot forming, Plexiglas sheet becomes soft and pliable at its forming temperature: approximately 325° F. After being formed, the sheet cools and hardens, retaining the new shape.

Because Plexiglas sheet forms at low pressure, molds can be made of low-cost wood and plastic. This permits complex, custom-designed panels in small quantities at a reasonable tooling cost.

Hundreds of formed panels can be made in the same mold without loss of quality in the finished part.

Design stresses

Plexiglas sheet has good tensile and flexural strength properties. However, stress considerably below the values shown in Table 12 (page 10) will produce light surface cracks known as crazing. To avoid stress-crazing, design limits for continuously imposed loads should not exceed 1,500 psi for Plexiglas G sheet and 750 psi for Plexiglas MC sheet. Stresses of greater magnitude but short duration will not generally cause stress-crazing.

RESPONSE TO ELECTROMAGNETIC RADIATION

Visible light transmittance

In colorless form, Plexiglas sheet is as transparent as the finest optical glass. Its total light transmittance is 92%, and haze measurement for colorless Plexiglas sheet averages only 1%.

The wavelengths of visible light fall between approximately 400 and 700 nanometers in the electromagnetic spectrum. Electromagnetic energy reaching the earth from the sun is rich in these wavelengths, tapering off in the ultraviolet and infrared regions as shown by the relative energy distribution curve in Figure 1.

When light energy strikes colorless Plexiglas sheet perpendicular to the surface (0 degree angle of incidence), most is transmitted, part is reflected at each surface, and a negligible fraction is absorbed (Figure 2).

The theoretical maximum transmittance of a nonabsorbing optical medium depends on its refractive index. Plexiglas sheet has a refractive index of 1.49; the calculated theoretical maximum light transmission

FIGURE 2

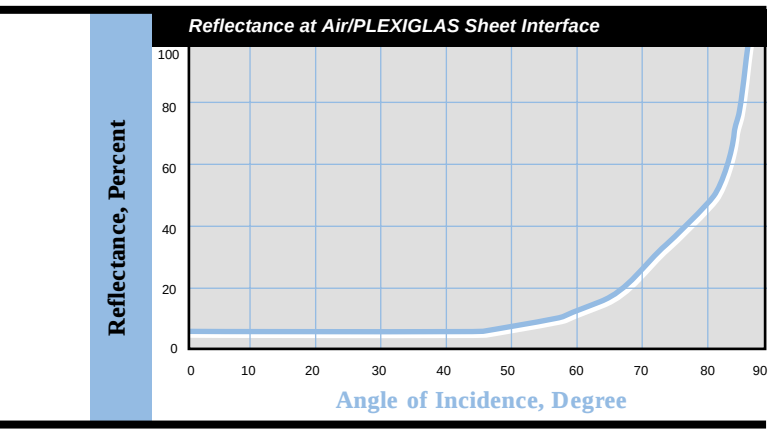
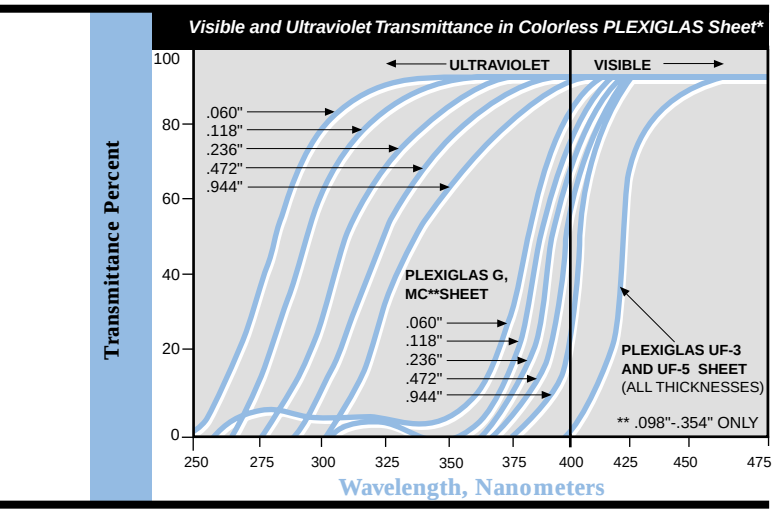


FIGURE 3



The curves in Figure 3 are typical for these materials; however, values can change slightly with formulation modifications and, therefore, should not be used for specification purposes.

for such a medium is 92.3%. Actual measurement shows that colorless Plexiglas sheet as thick as six millimeters (0.236") transmits 92% of perpendicular rays; this represents virtually all the light that could be transmitted by a perfect optical medium of this refractive index.

Approximately 4% of the incident perpendicular rays are reflected on passage through each surface of colorless Plexiglas sheet, giving a total reflectance loss of approximately 8%. As the angle changes, reflectance increases and the transmittance decreases.

The data in Tables 6 and 7, to the right, present transmittance values for colorless, white translucent, and transparent gray and bronze Plexiglas sheet in its full range of densities.

In all ordinary thicknesses, the light absorbance of colorless Plexiglas sheet is not significant. Even at a thickness of one inch, absorbance is less than 0.5%.

TABLE 6: Solar Energy and Visible Light Transmittance of White PLEXIGLAS Sheet

	Solar energy transmittance (%)	Light transmittance (%)		
White tl color no.	0.177" thick (4.5 mm)	0.118" (3 mm)	0.177" (4.5 mm)	.236" (6 mm)
Colorless	85	92	92	92
W-2067	66	71	61	52
W-2159*	62	64	53	43
W-2254*	59	60	50	41
W-2447	52	50	42	35
W-7138	37	41	33	26
W-7328	27	31	23	17
W-7420	18	22	15	11
W-7508	8	8	6	4

*Custom color.

TABLE 7: Solar Energy and Visible Light Transmittance of PLEXIGLAS Sheet–Solar Control Colors

Color number	Transmittance (all thicknesses)	
	Solar energy	Visible light
Colorless	85%	92%
Gray #2538	27%	16%
Gray #2537	41%	33%
Gray #2064	36%	27%
Gray #2074	24%	12%
Gray #2094	55%	45%
Gray #2514	62%	59%
Gray #2515	74%	76%
Bronze #2370	20%	10%
Bronze #2412	35%	27%
Bronze #2404	56%	49%
Bronze #2539	62%	61%
Bronze #2540	75%	75%

Ultraviolet transmittance

Plexiglas sheet absorbs short wavelength ultraviolet (UV) energy, but transmits most of the long wavelength UV (those wavelengths just short of the visible region), Figure 3.

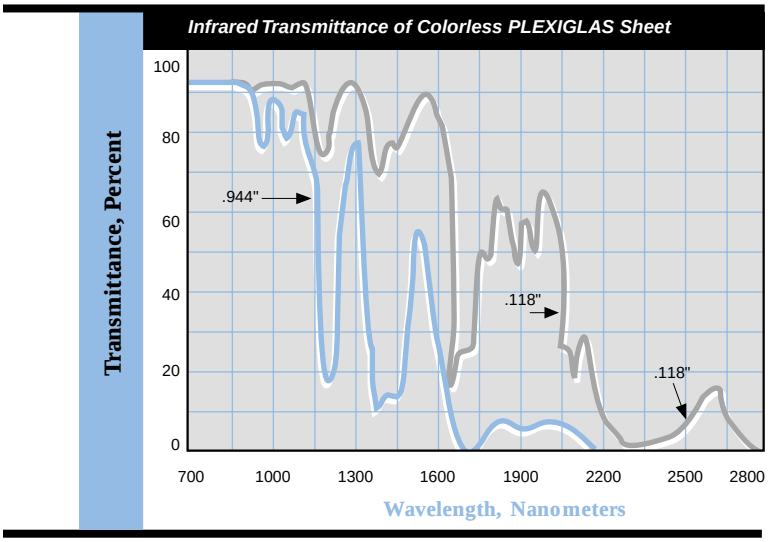
This UV stability gives Plexiglas sheet superb weatherability and makes it the logical choice for outdoor and artificial lighting applications.

The absence of visible changes in Plexiglas sheet after prolonged outdoor or artificial light exposure means that no change has taken place in the spectrophotometric characteristics of the material in the ultraviolet and visible ranges. Plexiglas sheet exhibits an increase in UV absorbance caused by sunlight. Most of the drop in UV transmittance of Plexiglas sheet takes place in the first two years. Absolutely no change occurs in the spectrophotometric curves of these exposed samples between 5 and 10 years outdoors.

Colorless Plexiglas sheet exhibits the same excellent resistance to discoloration when exposed for 20 years or more to constantly lit fluorescent lamps, even when the Plexiglas sheet is only two inches from the lamp.

Some applications, such as document preservation, call for a filter material that absorbs more UV energy than ordinary glass without absorbing visible light. Plexiglas G UF-3 and Plexiglas MC UF-5 acrylic sheet absorb 98% of all UV rays, as well as some visible light. Plexiglas G UF-4, developed for mercury vapor lighting applications, can also be used as a protective shield. Plexiglas G UF-4 sheet does transmit slightly more UV energy than Plexiglas G UF-3 and Plexiglas MC UF-5 sheet.

FIGURE 4



Infrared transmittance

Colorless Plexiglas sheet transmits most of the invisible near-infrared energy in the 700 to 2800 nanometer region, but it also absorbs certain bands as shown in Figure 4. The curves for 0.118" and 0.944" thick colorless Plexiglas sheet show that near-infrared transmittance depends on thickness, decreasing logarithmically as thickness increases.

At infrared wavelengths longer than 2800 nanometers and as long as 25000 nanometers, and in thicknesses greater than 0.118", colorless Plexiglas sheet is entirely opaque. At thicknesses less than 0.118", Plexiglas sheet transmits small amounts of infrared energy at certain wavelengths within this region. All standard formulations of colorless Plexiglas sheet have the same general infrared transmittance characteristics.

Sensitive instruments confirm that weathering produces no change in the infrared transmittance characteristics of Plexiglas sheet.

Plexiglas G 3143 custom-colored sheet selectively transmits infrared light. Applications for this material include remote control devices, laser lenses, and heat sensors.

X-ray transmittance

Colorless Plexiglas sheet readily transmits X-rays in all ordinary thicknesses. Plexiglas sheet has essentially the same X-ray absorption coefficient as water. X-ray photographs can be taken of knitting bone fractures without removing the acrylic splints.

Radio frequency transmittance

Most formulations of colorless Plexiglas sheet readily transmit standard broadcast and television waves as well as most radar bands.

High-energy radiation

Although Plexiglas sheet possesses unusual resistance to discoloration from exposure to all ordinary light sources, special sources that emit a combination of

TABLE 8: Noise Reduction Values for PLEXIGLAS Sheet

(Test panels were 75" x 100")

Frequency spectrum of noise source	Approximate noise reduction - dB(A) Sheet thickness (in)				
	.118* (3mm)	.236 (6mm)	.472 (12mm)	.944 (24mm)	double glazed**
Low frequencies predominant	15	21	26	30	34
Flat frequency spectrum	25	29	33	35	38
High frequencies predominant	28	31	34	36	40

* Estimated from measurements of .236", .472", and .944" sheet.
** 0.236" Plexiglas sheet, air space, 0.177" Plexiglas sheet.

TABLE 9: STC Noise Ratings of PLEXIGLAS Sheet

Construction thickness	STC
Plexiglas sheet (0.118")*	25
Plexiglas sheet (0.236")	29
Plexiglas sheet (0.472")	33
Plexiglas sheet (0.944")	35
Plexiglas sheet [(0.236") air space (0.177")]	38

*Estimated from measurements of .236", .472", and .944" sheet.

intense, high-energy radiation plus visible light may in time discolor and even physically degrade Plexiglas sheet.

Under normal exposure conditions, visible light and UV radiation do not affect the optical properties of Plexiglas sheet, but UV radiation between 280 and 400 nanometers, if sufficiently intense or persistent, will cause slight yellowing. Light sources that may produce this type of energy include sunlamps and mercury vapor lamps.

Discoloration induced by the high UV emissions of some mercury vapor lamps is best resisted by the special colorless formulation, Plexiglas G UF-4 sheet.

Germicidal or sterilizing radiation (approximately 260 nanometers) attacks all types of Plexiglas sheet and most other organic materials. This short wavelength UV radiation has a very high energy content capable of physically damaging Plexiglas sheet. For this reason, acrylic parts should be shielded from direct exposure to radiation produced by germicidal lamps such as those used in vending machines.

High energy ionizing radiation of the type encountered in outer space or in nuclear experiments is usually harmful to Plexiglas sheet, causing discoloration, physical deterioration, or both. The specific reaction of Plexiglas sheet closely depends on the nature of the radiation, its intensity and duration. The behavior of acrylic sheet and other plastics on exposure to ionizing radiation has been discussed in the scientific literature.

Nuclear radiation transmittance

Colorless Plexiglas G sheet has the following nuclear transmittance characteristics:

- *Alpha rays*—Generally opaque, exhibiting essentially 100% absorption at all thicknesses.
- *Beta rays*—Essentially opaque at thicknesses of 0.334" or more.
- *Gamma rays*—Transparent to gamma rays in all ordinary thicknesses. Colorless Plexiglas sheet has about the same gamma ray absorption coefficient as water; however, high dosage and intensity, as is common in sterilizing, may

TABLE 10: Comparison of Noise Reduction Characteristics of PLEXIGLAS Sheet With Other Materials

Construction material thickness	Approximate noise reduction*- dB(A)
Plexiglas sheet (0.118")	25
Plexiglas sheet (0.236")	29
Plexiglas sheet (0.472")	33
Plexiglas sheet (0.944")	35
Double glazed Plexiglas sheet	38
Glass (1/8")	25
Glass (1/4")	27
Plywood (1")	26
Steel (1/8")	37
Sheet lead (1/16")	38
Wood stud partition	38

**Noise reduction obtained in enclosures depends on the completeness of the enclosure, tightness of joints, etc. The above dB(A) noise reductions were obtained in a completely enclosed, tightly joined structure. These conditions are seldom achieved in the real world; however, even under more realistic conditions, the use of Plexiglas sheet barriers can reduce noise levels enough to protect against heavy damage. The main purpose of this Table is to indicate the relative noise reduction capabilities of commonly used materials in terms of dB(A).*

cause discoloration or even the loss of some physical properties.

- *Neutrons*—Opaque to neutrons. Plexiglas sheet serves as a neutron stopper with stopping power that varies directly with hydrogen content (8%).

LUMINOUS COLOR EFFECTS

Plexiglas sheet comes in a wide range of translucent and transparent colors that withstand the effects of sunlight and other elements extremely well. As a result, back-lighted Plexiglas sheet panels are very effective in outdoor/indoor lighting and display treatments.

SOUND TRANSMISSION

Plexiglas sheet offers sound loss characteristics that are equal to or better than those of glass. Since Plexiglas sheet is also more resistant to breakage, it can be used as a transparent sound barrier to reduce noise levels and increase safety at the same time. Tables 8, 9 and 10 (on page 8) show noise reduction values and STC ratings for Plexiglas sheet and other construction materials.

RIGIDITY

Plexiglas sheet is not as rigid as many other materials used in building and construction. The sheet may buckle under load and contract as a result. Users can avoid problems of this sort by adhering to the following guidelines:

- Channels engaging the edges of Plexiglas sheet must be sufficiently deep to allow for contraction from deflection under load, as well as thermal expansion and contraction.
- Forming Plexiglas sheet increases its rigidity. Wherever practical, specify *formed* Plexiglas sheet panels in large unsupported areas where wind or snow loads are possible.
- If it is not practical to form Plexiglas sheet, increasing the thickness of the flat Plexiglas sheet will guarantee greater rigidity.

SERVICE TEMPERATURE

The allowable service temperatures for Plexiglas sheet range up to 200ºF, sufficiently high for fluorescent lighting and exterior applications. But, unless the designer takes certain precautions, Plexiglas sheet should not be installed in applications with incandescent or mercury vapor lamps that exceed these limits. Exposure of Plexiglas sheet to temperatures exceeding 200°F for extended periods of time may adversely affect the physical properties and appearance of the sheet.

WEATHER RESISTANCE

Plexiglas G and Plexiglas MC sheet have a proven ability to withstand the effects of weather, sun, and a wide range of temperatures in outdoor use. This permanence derives from the acrylic resin's inherent stability. A large number of clear samples, after more than 10 years' outdoor exposure in Pennsylvania, show an average of more than 90% light transmission, which represents a loss of only 2%. Inspection reveals that very few test samples exhibit any obvious damage due to weathering.

In other tests, samples of colorless Plexiglas G sheet exposed outdoors in Arizona, Florida, and Pennsylvania for 20 years or more show no significant discoloration, crazing, surface dulling, loss of light transmission, or development of haze or turbidity. Although these samples were Plexiglas G sheet, ongoing weathering studies have shown Plexiglas MC sheet to behave in a similar manner.

In these tests the samples were mounted on outdoor racks at a 45-degree angle facing south. Angling the racks in this manner significantly increases the rigors of exposure. Actual outdoor applications ordinarily involve less severe conditions.

WEIGHT

Plexiglas sheet is less than 50% as heavy as glass and 43% as heavy as aluminum.

TABLE 11: Weight of PLEXIGLAS Sheet, Various Thicknesses

Thickness in	Weight lb/sq ft
0.118	0.73
0.177	1.09
0.236	1.46

TABLE 12: Average Physical Properties of PLEXIGLAS Sheet [1]

Property	ASTM Method [2]	Units	Type of Acrylic sheet PLEXIGLAS G	PLEXIGLAS MC
Thickness, nominal		**in**	**0.236**	**0.236**
Specific gravity	D792	N.A.	1.19	1.19
OPTICAL				
Refractive index	D542	N.A.	1.49	1.49
Light transmittance and haze "as received"	D1003			
Parallel		%	91*	91*
Total		%	92*	92*
Haze		%	1*	2*
After 5 years' outdoor exposure, Bristol, Pa., 45° angle, facing south				
Parallel		%	90*	90*
Total		%	92*	92*
Haze		%	2*	3*
After 240 hours' artificial exposure, Carbon Arc Type, per ASTM G-23				
Parallel		%	90*	—
Haze		%	2*	—
Artificial weathering, fluorescent sunlamp with dew, 10 cycles, 240 hours' exposure	D1501 or Fed. Test Std. 406			
Crazing	6024		none	none
Warping			none	none
Instrumental measurement change in Yellowness Index after artificial weathering	D1925	N.A.	1.0	0.8
Ultraviolet transmission, 320 nm	Beckman DU-792	%	0	0
MECHANICAL				
Tensile strength (0.25" specimen-0.2"/min)	D638			
Maximum		psi	10,500	10,200
Rupture		psi	10,500	10,200
Elongation, maximum		%	4.9	4.5
Elongation, rupture		%	4.9	4.5
Modulus of elasticity		psi	450,000	450,000
Poisson's ratio			0.35	—
Flexural strength (span depth ratio 16, 0.1"/min)	D790			
Maximum		psi	16,000	15,000
Rupture		psi	16,000	15,000
Deflection, maximum		in	0.6	0.5
Deflection, rupture		in	0.6	0.5
Modulus of elasticity		psi	450,000	450,000

TABLE 12 *(continued)*

Property	ASTM Method[2]	Units	Type of acrylic sheet PLEXIGLAS G	PLEXIGLAS MC
Thickness, nominal		**in**	**0.236**	**0.236**
Compressive strength (0.05"/min)	D695			
Maximum		psi	18,000	16,000
Modulus of elasticity		psi	450,000	430,000
Compressive deformation under load	D621			
2,000 psi at 122° F, 24 hrs	Method A	%	0.2	0.3
4,000 psi at 122° F, 24 hrs		%	0.5	0.9
(Conditioned 48 hrs at 122°F)				
Shear strength	D732	psi	9,000*	—
Shear modulus		psi	167,000	—
Impact strength				
Charpy unnotched @ 73°F	D256	ft-lb/ 1/2" X 1" sect.	7.0	7.0
Izod milled notch @ 73°F		ft-lb/ in. of notch	0.3	0.3
Rockwell hardness	D785	—	M-100*	M-90*
Barcol number	D2583	—	49	—
Resistance to stress				
Critical crazing stress	ARTC Mod.			
Isopropyl alcohol	of	psi	2,100[3]	1,300
Toluene	MIL-P-6997	psi	1,700[3]	1,200
THERMAL				
Hot forming temperature		°F	290-360	275-350
Deflection temperature under				
(flexural) load	D648			
3.6° F/min-264 psi		°F	205*	200*
Maximum recommended				
continuous service temperature		°F	180-200	170-190
Coefficient of thermal expansion	E831	in/in/ °F X10^{-5}		
-40°F			2.8	2.7
-20			2.9	2.9
0			3.1	3.1
20			3.3	3.2
40			3.6	3.4
60			3.9	3.6
80			4.2	3.9
100			4.6	4.3
Coefficient of thermal conductivity	Cenco-Fitch	BTU/ (hr)/(sq ft)/(°F/in)	1.3	1.3
Specific heat at 77°F		BTU/ (lb)(°F)	0.35	0.35
ELECTRICAL				
Dielectric strength, short time test	D149	volts/mil	500	500
Dielectric constant	D150		3.7	3.7
60 Hz			3.7	3.7
1,000 Hz			3.3	3.3
1,000,000 Hz			2.5	2.2

TABLE 12 *(continued)*

Property	ASTM Method[2]	Units	Type of acrylic sheet PLEXIGLAS G	PLEXIGLAS MC
Thickness, nominal		**in**	**0.236**	**0.236**
Power factor	D150			
60 Hz			0.05	0.05
1,000 Hz			0.04	0.04
1,000,000 Hz			0.03	0.03
Loss factor	D150			
60 Hz			0.19	0.19
1,000 Hz			0.13	0.13
1,000,000 Hz			0.08	0.07
Arc resistance	D495		No Tracking	No Tracking
Volume resistivity	D257	ohm-cm	6×10^{17}	1×10^{18}
Surface resistivity	D257	ohm/sq cm	2×10^{18}	1×10^{17}
MISCELLANEOUS				
Horizontal burning test avg. Burning rate	D635	cm/min (in/min)	2.8 (1.1*)	2.5 (1.0*)
Smoke density	D2843	%	4-10	4-10
Flammability classification		UL 94	94HB	94HB
Water absorption, 24 hrs at 73° F	D570			
Weight loss on drying		%	0.1*	0.1*
Weight gain on immersion		%	0.2*	0.3*
Soluble matter lost		%	0.0*	0.0
Water absorbed		%	0.2*	0.3*
Dimensional changes on immersion		%	0.0*	0.0*
Water absorption (weight gain) after immersion for:				
1 day	D229	%	0.2*	—
2 days	and	%	0.3*	—
7 days	D570	%	0.4*	—
28 days		%	0.8*	—
56 days		%	1.1*	—
84 days		%	1.3*	—
Humidity expansion, change in length on going from 20% to 90% relative humidity at equilibrium, 74°F		mils/in	3	—
Odor			None	None
Taste			None	None

* This value will change with thickness. The value given is for the thickness indicated in the column heading.
(1) Values reported are averages and should not be used for specification purposes.
(2) Samples conditioned per ASTM D618, Procedure B, except where noted.
(3) The values are after the material has been heated for forming.
N.A. = Not Applicable.

STORAGE AND HANDLING

Plexiglas sheet is shipped in corrugated fiber cartons, or wood-reinforced fiberboard boxes having a gross weight of 400 pounds or more, or on pallets weighing approximately 2,000 pounds. All Plexiglas G and MC sheets are boxed in standard packages. The number of sheets in each package depends on the size and thickness of the sheets.

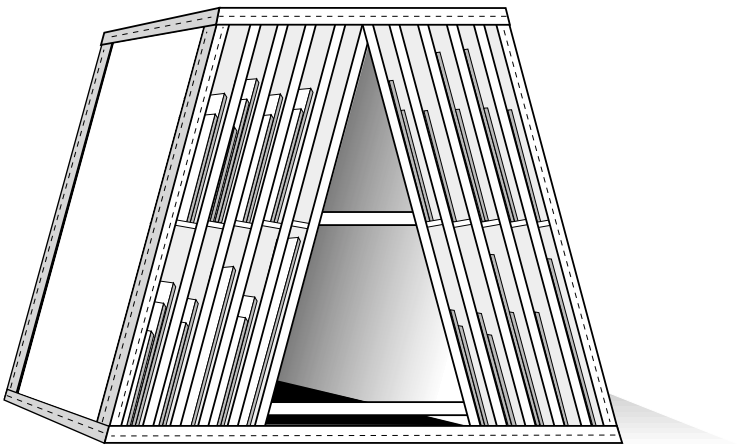
Containers should be handled carefully to prevent damage to the Plexiglas sheet. When possible, forklift trucks should be used to move containers. Otherwise a special hand truck can be constructed or purchased to facilitate safe and economical handling of cases of Plexiglas sheet.

Storage areas should be well ventilated. Air should circulate freely and be relatively moist and cool. The temperature should not exceed 125ºF. If Plexiglas sheet is stored in a hot, dry environment or for extremely long periods of time indoors, the adhesive on the masking paper may eventually dry out, making it difficult to remove. Excessive moisture may cause the paper to deteriorate and reduce its effectiveness for protecting the Plexiglas sheet.

Storage areas for Plexiglas sheet should be completely separated from spray-painting booths and other possible sources of solvent vapors. Otherwise the vapors may attack and soften the surface of the sheet.

Packages of Plexiglas sheet should be stored on edge at a 10-degree angle from the vertical. Two-by-three-inch wood strips placed on the floor about 42" apart will keep package edges off the floor and facilitate handling with fork lifts or hand trucks.

FIGURE 5 – A-Frame Rack



Formed sections of Plexiglas sheet must be stored in relatively cool areas. If the parts are to be stacked, they must not be nested, but should be placed in simple frames or racks that fully support the parts so that they will not deform.

MASKED SHEETS

Plexiglas G and MC sheets are supplied with a tough masking paper on both sides. The paper is coated with a pressure-sensitive adhesive that does not attack the Plexiglas sheet surface. Plexiglas MC sheet may also be purchased with a heavy-duty polyethylene masking. The polyethylene clings tightly to the surface without adhesive, so it is easier to remove than paper, and makes the sheet easy to fabricate.

Masking helps prevent accidental scratching during normal handling and fabrication operations, and should be kept in place for most cutting and machining procedures. Although the masking provides a significant degree of protection against surface marring, the fabricator should avoid sliding the sheets over each other or across rough or soiled surfaces.

Paper masking should be removed from both sides of the sheet before it is thermoformed or stored outdoors.

Masked pieces of Plexiglas sheet are best stored on edge in A-frame storage racks as shown in Figure 5. Typically these racks are constructed of plywood and slotted angle iron. The supporting floor of each partition is 1/2" thick plywood. The floor panel may be covered with galvanized sheet metal for increased wear resistance. The rack's A shape equalizes the weight and eliminates stresses on building walls.

These racks give full support to the sheets yet permit easy removal of individual sheets from any rack.

If masked sheets must be stored flat, avoid trapping chips and dirt between the sheets. Plexiglas sheet should not be piled more than 18" high. Small sheets should be stacked on top of the larger ones to prevent unsupported overhang.

It is good practice to store sheets of similar formulation, color, and thickness together. Mark this and other pertinent information on the masking of sheets that have been cut, so they can be identified when needed.

The adhesion of masking paper on the Plexiglas sheet may increase over time, making it difficult to unmask. Use older stock first. Newly received sheets should be placed behind the older sheets in the storage bins.

Masked Plexiglas sheet should never be stored outdoors. Exposure to sunlight and weathering longer than a few days makes removal of masking paper difficult. If it is absolutely necessary to store Plexiglas sheet outdoors, remove the masking paper and cover the sheet with a suitable tape or protective coating.

The masking paper used on Plexiglas sheet is not water repellent. If masked Plexiglas sheet is soaked with water, a white residue may appear on the sheet when the masking paper is removed. To avoid this, store masked sheet where it cannot come into contact with water. If a residue is deposited on the sheet, it may be removed by wiping the surface gently with a clean, soft, damp cloth and drying it with a soft flannel cloth.

UNMASKING

Plexiglas sheet can be unmasked by lifting the masking paper along one edge and rolling it around a dowel or cardboard tube. The paper may be built up on the dowel or tube in successive layers, using the adhesive layer to secure the turned up edge of the masking to the dowel. Remove all residual adhesive from the sheet surface at the time of masking removal. Any residue that remains can be cleaned by wiping with a soft clean cloth dampened with isopropyl alcohol.

Unmasking usually builds an electrostatic charge on the Plexiglas sheet. The electrostatic charge attracts dust and lint to the Plexiglas sheet surface. Eliminate the charge by wiping the sheet with a dampened cloth after unmasking. During dry weather, wet down the shop floor occasionally to minimize dust.

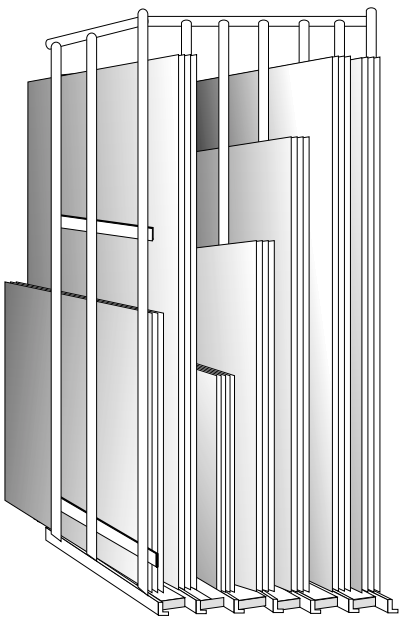
For operations such as a strip heating, cementing, or applying glazing sealants, only the masking paper in the area being worked on should be removed from the sheet. When cutting out small sections of masking paper, take care not to score or scratch the Plexiglas sheet surface underneath. Scoring the sheet may reduce its impact resistance.

Special tools can be employed to minimize the possibility of scoring or scratching the Plexiglas sheet when removing small masking sections (contact Atoglas for information on commercial tools and materials for Plexiglas sheet). When used properly in combination with a suitable solvent, these tools will not score or scratch the Plexiglas sheet.

Masking paper may be difficult to remove in the following circumstances: 1) Plexiglas sheet that has been stored outdoors and exposed to sun and moisture; and 2) sheet that has been stored indoors for lengthy periods or has been exposed to heat or high humidity. When the sheet will be thermoformed, and the masking paper is not adhering too tightly, flash heating the sheet for 60 seconds at 350ºF will loosen the paper enough for easy stripping.

In cases where the paper is sticking more tenaciously, it may be necessary to choose a more aggressive solvent to loosen the masking paper. In such cases, thoroughly soak the masking paper with the solvent, and allow at least 10 minutes for the solvent to penetrate the paper. Strip as described above. If necessary, apply more solvent along the separation line between the masking paper and the Plexiglas sheet.

FIGURE 6–Roller Storage Rack



Use only solvents that will not attack the Plexiglas sheet. A list of recommended solvents for removing masking paper is available from Altuglas International. Remove the solvent from the sheet as soon as possible by first washing the sheet with isopropyl alcohol, then with soap and water and, finally, with clear water.

Before attempting to remove tightly adhering masking with solvents, become familiar with the properties of the appropriate solvents and take proper safety precautions. Obtain Material Safety Data Sheets from the manufacturer. Ventilate the work areas as OSHA requires, and prohibit smoking or open flame.

Cases can be stored on edge. Open cases can be stored flat or they can be placed on edge in roller-type racks as shown in Figure 6. Uncased sheets may be stored in A-frame racks. The interleaving tissues should not be removed until the sheets are used.

REMASKING

The masking paper used on Plexiglas sheet will retain its tack and may be replaced if desired. Film masking cannot be reapplied. The adhesive bonds firmly to itself, however, so the coated sides of the masking paper must not be allowed to contact each other. The masking paper can be rolled up in loose tubes and stored on pegs in a clean, dry area. Take care to avoid contaminating the masking paper with dirt to keep from scratching the sheet when the masking paper is reapplied.

Prepared masking papers are available from a number of sources and may be used for remasking. Before using one of these products, however, the user should check its adhesive to be sure it will not attack the Plexiglas sheet.

PROTECTIVE COATINGS

Masking compounds are available that can be sprayed on the Plexiglas sheet and later peeled off. These are especially useful when remasking formed parts.

Use only spray masking compounds by manufacturers that have tested and approved their spray masking for use on acrylic sheet. Some masking compounds may be used indoors for periods as long as 12 months. In general, no masking compound should be used on parts that will be stored outdoors for more than two months.

When using spray masking compounds, apply a coating at least 3-5 mils thick. If the film is too thin, it may be difficult to remove. The film should also be uniform and free from runs and other imperfections.

To remove spray masking from Plexiglas sheet, peel it off or lift a corner of the film and blow a jet of compressed air under it. If the film is hard to remove because it was applied too thinly, apply a fresh coating of the masking compound, let it dry, then remove it. In some cases, it might be necessary to apply a layer of cheesecloth over the fresh spray coating; let it dry before attempting removal. The cheesecloth reinforces the spray coating and makes it easier to remove.

If the protective film has deteriorated because it has been stored outdoors, soaking the coated part in cold water for 24 to 48 hours may help to soften and loosen the film. Stripping compounds supplied by the manufacturers of the spray masking compounds may also be used if they will not craze the Plexiglas sheet.

Remove protective spray masking coatings from Plexiglas sheet parts before the parts are annealed. Otherwise, optical distortions may occur in areas where the thickness or surface of the coating is irregular.

The manufacturers of the protective spray masking should provide the precautions necessary for the safe usage of their products.

PLEXIGLAS SHEET MAINTENANCE

CLEANING

To clean Plexiglas sheet, wash with plenty of nonabrasive soap or detergent and water. Use the bare hand to feel and dislodge any caked dirt or mud. A soft, grit-free cloth, sponge or chamois may be used, but only as a means of carrying water to the sheet. Do not use hard, rough cloths that will scratch the Plexiglas sheet. Dry with a clean damp chamois.

For interior installations, where water cannot be used freely, the Plexiglas sheet should first be lightly dusted (not wiped) with a soft, clean cloth. Then the surface

can be wiped carefully with a soft, wet cloth or chamois. The cloth or chamois should be kept free of grit by frequent rinsing in clean water.

Grease and oil may be removed with kerosene or aliphatic naphtha (no aromatic content).

Do not use solvents such as acetone, benzene, carbon tetrachloride, fire extinguisher fluid, dry-cleaning fluid, and lacquer thinners, since they attack the Plexiglas sheet surface. Do not use window sprays or kitchen scouring compounds.

HEALTH AND SAFETY PRECAUTIONS DURING CLEANING

Some of the chemicals and solvents mentioned here may be toxic if inhaled for extended periods or if swallowed. Provide proper workroom ventilation.

Employees should be protected from skin or eye contact with harmful solvents by use of protective equipment such as impervious gloves, aprons, and splash goggles.

Before attempting to use any solvent or commercial cleaning product, become familiar with its properties and the precautions necessary for its safe use. Material Safety Data Sheets should be obtained from the manufacturer for this purpose.

REMOVING PAINT FROM PLEXIGLAS SHEET

When painting in an area where Plexiglas sheet is stored, the sheet should be covered with paper or drop cloths. If paint splatter or overspray settles on the Plexiglas sheet, attempt to remove it by wiping with isopropyl alcohol. Or soak the paint-covered part in a 10-20% solution of caustic soda or trisodium phosphate and then rinse with water. If the part cannot be soaked, try applying caustic soda or trisodium phosphate solution as a paste made by adding wallpaper paste to the solution.

CAUTION: Caustic soda or trisodium phosphate attacks the skin very quickly. The operator's hands should be shielded by rubber or other protective gloves. Caustic soda or trisodium phosphate can cause permanent injury to eyes. Splash goggles should be worn during use. If caustic soda is splashed into eyes, flush with copious amounts of water and see a physician.

NOTE: Certain types of paints, notably those made with an acrylic resin base, cannot be removed from Plexiglas sheet by the previously described method. For recommendations on how to remove these paints see the Plexiglas Sheet Painting Manual.

CLEANING AIRCRAFT GLAZING

The general guidelines on maintaining Plexiglas sheet also apply to aircraft windows and canopies. However, additional precautions must be observed, because the acrylic glazing is commonly exposed to the chemicals employed to strip paint and brighten, and degrease the aircraft skin. Make sure that chemicals used for this purpose have no solvent or crazing action on the Plexiglas sheet.

WAXING

If, after removing dirt and grease, no great amount of scratching is visible, coat the Plexiglas sheet with a good grade of commercial wax. This process will improve surface appearance by filling in minor scratches. The wax should be applied in a thin, even coat and brought to a high luster by rubbing lightly with a dry, soft cloth, such as cotton flannel, outing flannel, or flannelette.

Excessive rubbing with a dry cloth not only is likely to cause scratches, but it also creates an electrostatic charge which attracts dust particles to the Plexiglas sheet surface. Blotting with a clean, damp chamois or cloth will remove this charge as well as dust.

ANTISTATIC COATINGS

Antistatic coatings successfully prevent the accumulation of an electrostatic charge on Plexiglas sheet parts used indoors for periods of several months. Wiping the surface lightly with a wet cloth will also prevent the buildup of static electricity. Between applications of the antistatic coating, the parts need only be dusted with a soft, clean cloth to maintain a good appearance.

Antistatic coatings can be applied to Plexiglas sheet parts used outdoors before they are first installed. This prevents static buildup when the parts are wiped down after installation. Additional coatings are unnecessary since occasional rain and humidity prevent static accumulation; however, if exterior acrylic parts are dry-wiped frequently, additional antistatic coating applications may be prudent.

Apply liquid antistatic coatings in a uniformly thin coat. If beads appear, the application is too thick; remove the excess with another cloth. Allow the coating to dry, then bring to a high gloss with a soft cloth. When many parts are to be treated, they may be dipped in a thinned solution of the coating.

HAND POLISHING

If, after washing, the Plexiglas sheet surface shows minor scratches, most can be removed or reduced by application of polish. To apply polishes, use a small pad of soft cotton flannel dampened with water. Rub the sheet along the length of the scratches with a back and forth motion (or use a circular motion). Avoid excess rubbing on any one spot. Several applications may be necessary, but most minor scratches can be reduced and the clarity improved within a relatively short time.

When the scratches are removed or considerably reduced, remove the cleaner with a clean, soft cloth, and apply an antistatic coating or wax.

SANITIZING

Plexiglas sheet may be safely and thoroughly sanitized by applying a commercial germicidal compound. An advantage of these high coefficient germicidal materials is that they are effective at room temperatures, so Plexiglas sheet does not have to be heated. Heating may produce undesirable softening effects.

Conventional steam sanitizing at 15 psi is not particularly appropriate, because the heat can deform Plexiglas sheet formed parts. Modification of the conventional procedure sometimes produces a workable system. A succession of relatively short, sanitization passes coupled with an adequate supporting frame for the Plexiglas sheet part will often provide satisfactory results.

Alcohol solutions containing more than 10% alcohol or cresylic acid germicides may attack and harm the Plexiglas sheet surface.

Strong alkali solutions (lye, sodium, ammonium hydroxide, etc.) are extremely effective germicides. Since Plexiglas sheet is very resistant to the effects of strong alkali solutions, they can be used freely.

HEALTH, SAFETY, AND FIRE CONSIDERATIONS

HEALTH AND SAFETY PRECAUTIONS

Some of the chemicals mentioned here may be toxic if inhaled for extended periods or if swallowed. Provide proper workroom ventilation.

Employees should be protected from skin or eye contact with harmful chemicals by use of protective equipment such as impervious gloves, aprons, and splash goggles.

Before attempting to use any commercial sanitizing product, become familiar with its properties and the precautions necessary for its safe use. Material Safety Data Sheets should be obtained from the manufacturer for this purpose.

FIRE CONSIDERATIONS

Plexiglas sheet must be used with an appreciation for the fact that it is a combustible material.

In general, the same fire precautions observed in the handling and use of any ordinary combustible material should be observed when handling, storing or using Plexiglas sheet.

Relevant considerations are: use of the structure (occupancy); location (exposure); height and area; nature of interior arrangements (decorations, finishes and furnishings); availability and construction of fire exits; need for special fire protection systems such as sprinklers, automatic heat and smoke vents, early warning devices and deluge systems or water curtains. Unless there are extenuating circumstances, use sprinkler systems.

FIRE RESPONSE CHARACTERISTICS

The use of Plexiglas sheet is not restricted because of the character of its products of decomposition, but because of its combustibility and burning characteristics.

The ignition temperature of Plexiglas sheet is higher than that of most woods, but it will ignite readily. As for its behavior during combustion, Plexiglas sheet burns vigorously and generates heat rapidly.

Plexiglas sheet softens when heated above 260ºF, which is approximately 300ºF degrees below its ignition temperature. If suspended in air during combustion, Plexiglas sheet will drip burning droplets.

When installed as a wall or ceiling finish or when laminated to a substrate, Plexiglas sheet provides a surface over which flame may spread rapidly and release heat and gases contributing to flashover.

Burning Plexiglas sheet does not produce either excessive quantities of smoke or gases more toxic than those produced by burning wood or paper. The concentration of carbon monoxide and/or carbon dioxide released by burning Plexiglas sheet depends on the quantity of Plexiglas sheet involved and the conditions of burning.

RECOMMENDED PRACTICES

Install Plexiglas sheet away from sources of intense heat or flame. Enclose edges of Plexiglas sheet components. Observe building code stipulations and restrictions. Do not use more Plexiglas sheet than required to perform the function required of it. Employ fire protective systems, such as sprinklers, fire detectors, and automatic vents, as hazard analysis indicates.

Do not use Plexiglas sheet as a supporting element or in any location where resistance to fire penetration is required.

In overhead lighting, mount Plexiglas sheet in free channel mountings to insure fallout prior to ignition. When used in interior window systems, mount the Plexiglas sheet in such a manner as to insure fallout prior to ignition. Extinguish burning Plexiglas sheet with water or fire extinguishers.

Do not install Plexiglas sheet as a wall or ceiling finish or as a substrate surfacing material for large interior surface areas in building applications, unless the areas are protected by an automatic sprinkler system and approval is obtained from the controlling jurisdiction.

BUILDING CODES

Building codes define good practices to follow in the use of Plexiglas sheet for light transmission and control. These practices presume that the combustibility and fire characteristics of the material will receive due consideration during the planning stages of construction. The fire hazard of uses of Plexiglas sheet can be kept at an acceptable level by complying with building codes and observing established principles of fire safety.

Building code regulations may not provide for large-area installations; such installations do not always conform to area limitations. Installations of Plexiglas sheet, such as transparent building enclosures and continuous sections of interior window systems, may require special permits based on an analysis of all relevant fire safety considerations.

On request, Altuglas will provide copies of the approvals of Plexiglas sheet under various building codes. Reports on the status of Plexiglas sheet under Federal Government regulations are also available. Altuglas code consultants and engineers offer assistance in interpreting the codes for installation of Plexiglas sheet in applications that constitute justifiable exceptions to existing restrictions.

A considerable amount of information is available to support such applications. Code reports of general interest include: ICBO Research Recommendation No. 1084 and BOCA Report No. 95-25; SBCCI Report No. 9501; New York City Board of Standards and Appeals Calendars 444-60-SM, 216-63-SM; New York City Department of Water Supply, Gas & Electricity approval for use in signs and lighting fixtures; New York City MEA 107-69-M and MEA 7-93-M.

Plexiglas acrylic plastic is a combustible thermoplastic. Observe fire precautions appropriate for comparable forms of wood and paper. For building uses, check code approvals. Impact resistance is a factor of thickness. Avoid exposure to heat or aromatic solvents. Clean with soap and water. Avoid abrasives.

NOTES

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See MSDS for Health & Safety Considerations.

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