

TUFFAK AR



Abrasion Resistant

TUFFAK AR polycarbonate sheet is a one or both sides hard-coated polycarbonate product that adds higher abrasion resistance and surface hardness to polycarbonate's inherent performance benefits of impact strength and clarity. The proprietary hard-coat also provides chemical resistance and long lasting outdoor weathering performance. This product is available in clear, a range of standard tints, or can be custom matched to any color.

Applications

Flat architectural glazing, machine guards, and laminates

Regulatory code compliance and certifications

ANSI Z97.1-2009, 2015: American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test, Class A, Unlimited

CPSA 16 CFR 1201 Category I and Category II: Safety Standard for Architectural Glazing Materials

Florida Building Code High Velocity Hurricane Zone Classified
Miami-Dade NOA: NOA

ICC-ES Evaluation Report ESR-2728

UL 94: Flammability File #E87887

UL 982: Burglary Resistant Glazing Materials, UL File #BP2126

UL 746C: Suitability for Outdoor Use, UL File #E87887

AAMA 501.8: Resistance to Human Impact of Windows Systems Intended for Use in Psychiatric Applications

Typical Properties*

Property	Test Method	Units	Values
PHYSICAL			
Specific gravity	ASTM D 792	-	1.2
Refractive index	ASTM D 542	-	1.586
Light transmission, Clear @ 0.118"	ASTM D 1003	%	86
Light transmission, I30 Gray @ 0.118"	ASTM D 1003	%	50
Light transmission, K09 Bronze @ 0.118"	ASTM D 1003	%	50
Light transmission, I35 Dark Gray @ 0.118"	ASTM D 1003	%	18
Water absorption, 24 hours	ASTM D 570	%	0.15
Poisson's Ratio	ASTM E 132	-	0.38
Chemical Resistance	ASTM D 1308	-	Pass
Taber Abrasion @ 100 Cycles, Delta Haze CS-1-F Wheel @ 500 g load	ASTM D 1044	%	2
MECHANICAL**			
Tensile strength, ultimate	ASTM D 638	psi	9,500
Tensile strength, yield	ASTM D 638	psi	9,000
Tensile modulus	ASTM D 638	psi	340,000
Elongation	ASTM D 638	%	110
Flexural strength	ASTM D 790	psi	13,500
Flexural modulus	ASTM D 790	psi	345,000
Compressive strength	ASTM D 695	psi	12,500
Compressive modulus	ASTM D 695	psi	345,000
Izod impact strength, notched @ 0.125"	ASTM D 256	ft-lbs/in	16
Izod impact strength, unnotched @ 0.125"	ASTM D 256	ft-lbs/in	No break
Instrumented Impact @ 0.125"	ASTM D 3763	ft-lbs	47
Shear strength, ultimate	ASTM D 732	psi	10,000
Shear strength, yield	ASTM D 732	psi	6,000
Shear modulus	ASTM D 732	psi	114,000
Rockwell hardness	ASTM D 785	-	M70 / R118
THERMAL			
Coefficient of thermal expansion	ASTM D 696	in/in/°F	3.75 x 10 ⁻⁵
Coefficient of thermal conductivity	ASTM C 177	BTU-in/hr-ft ² -°F	1.35
Heat deflection temperature @ 264 psi	ASTM D 648	°F	270
Heat deflection temperature @ 66 psi	ASTM D 648	°F	280
Brittleness temperature	ASTM D 746	°F	-200
Shading coefficient, Clear @ 0.236"	NFRC 100-2010	-	0.97

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Security ratings for AR 0.500"

- Forced Entry & Containment
- ASTM F 1233.08 Class 2.0 Body Passage
- ASTM F 1233.08 Class 1.4 Contraband Passage
- ASTM F 1915 Grade 3
- H.P. White TP 0.500 Level 1 Sequence 8

Shading coefficient, Gray or Bronze @ 0.236"	NFRC 100-2010	-	0.77
U factor @ 0.236" (summer, winter)	NFRC 100-2010	BTU·in/hr·ft ² ·°F	0.85/0.92
U factor @ 0.375" (summer, winter)	NFRC 100-2010	BTU·in/hr·ft ² ·°F	0.78/0.85

ELECTRICAL

Dielectric constant @ 10 Hz	ASTM D 150	-	2.96
Dielectric constant @ 60 Hz	ASTM D 150	-	3.17
Volume resistivity	ASTM D 257	Ohm·cm	8.2 x 10 ¹⁶
Dissipation factor @ 60 Hz	ASTM D 150	-	0.0009

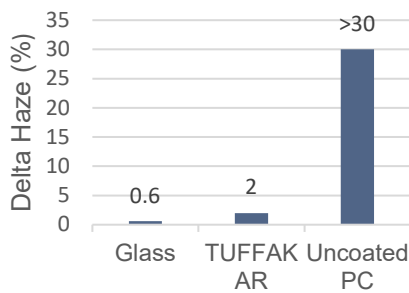
Arc resistance

Stainless steel strip electrode	ASTM D 495	Seconds	10
Tungsten electrodes	ASTM D 495	Seconds	120
Dielectric strength, in air @ 0.125"	ASTM D 149	V/mil	380

FLAMMABILITY

Horizontal burn, AEB	ASTM D 635	in	<1
Ignition temperature, self	ASTM D 1929	°F	1022
Ignition temperature, flash	ASTM D 1929	°F	824
Flame class @ 0.060"	UL 94	-	HB
@ 0.394"	UL 94	-	HB

Abrasion Resistance*



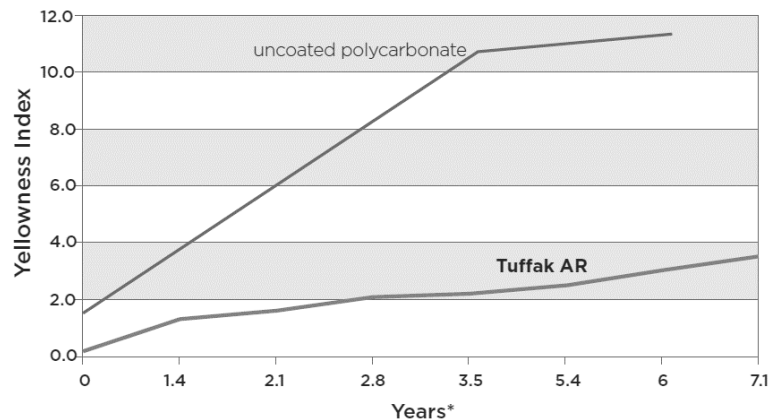
*Taber Abrasion per ASTM D 1044, 100 cycles using CS-10F wheel

*Typical properties are not intended for specification purposes

Chemical Resistance*

Chemical Tested	Resistance Time
Acetone	>24 hrs
Ammonia (10% concentration)	>24 hrs
Antifreeze (50/50)	>24 hrs
Benzene	>24 hrs
Bleach (Clorox concentrated)	>24 hrs
Chloroform	>24 hrs
Denatured Alcohol	>24 hrs
Di (2-3thylhexyl) phthalate	>24 hrs
Diesel Oil	>24 hrs
Isopropyl Alcohol (IPA)	>24 hrs
Kerosene	>24 hrs
Methyl Alcohol	>24 hrs
Methyl Butyl Ketone	>24 hrs
Methyl Ethyl Ketone	>24 hrs
Methylene Chloride	>24 hrs
Naphthalene, 1-bromo-	>24 hrs
Potassium Hydroxide – Lye (10%)	>24 hrs
Sodium Hydroxide (10%)	>24 hrs
Toluene	>24 hrs
Turpentine	>24 hrs
Unleaded Gasoline (87 Octane)	>24 hrs
Vinegar	>24 hrs
Xylene	>24 hrs
Acids:	
Hydrochloric Acid (20%)	>24 hrs
Nitric Acid (20%)	>24 hrs
Sulfuric Acid (20%)	>24 hrs

Weathering Behavior of Tuffak in Vertical Orientation



*Based upon Xenon WOM accelerated weathering for UV dose at mid-latitude location

*Tested in accordance to ASTM D 1308-02
Always keep hazardous chemicals away from uncoated edge of TUFFAK Polycarbonate Sheet