

TUFFAK TG 460 polycarbonate sheet

RAIL GLAZING

TUFFAK TG 460 sheet is a hard-coated polycarbonate product designed for high optical quality and exceptional durability. This 0.460" thick product meets stringent U.S. Federal Railroad Administration requirements for impact, ballistic, and flammability performance. State-of-the-art manufacturing and inspection processes provide low optical distortion and the advanced hard coat technology provides excellent abrasion resistance, chemical resistance, and long lasting outdoor weathering performance. This product is available in clear and a variety of standard and custom tints. TUFFAK TG 460 is offered with a seven (7) year Limited Product Warranty against breakage for flat vertical applications. The terms of the warranty are available upon request.

APPLICATIONS

Passenger rail car windows and other transportation glazing

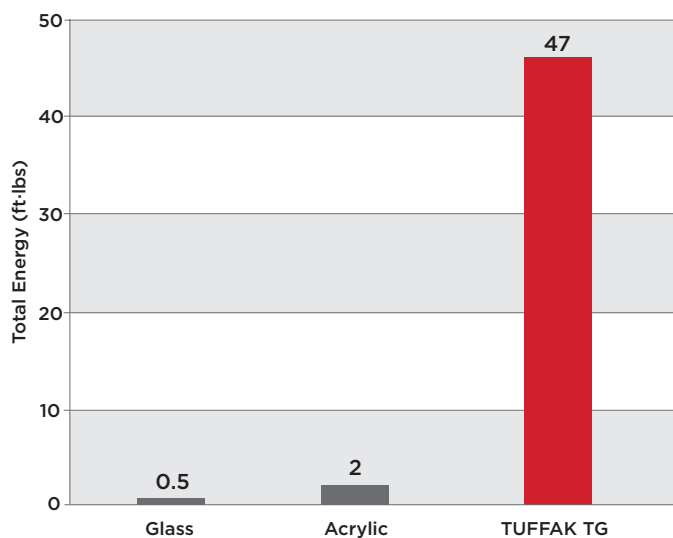
Typical Properties*

| Property | Test Method | Units | Values |
|--|--------------------|------------------------------|-------------------------|
| PHYSICAL | | | |
| Specific Gravity | ASTM D 792 | - | 1.2 |
| Light Transmission, Clear @ 0.460" | ASTM D 1003 | % | 80 |
| Chemical Resistance | ANSI Z26.1 | - | Pass |
| Taber Abrasion @ 100 Cycles, Delta Haze CS-10F Wheel @ 500 g load | ASTM D 1044 | % | 2 |
| MECHANICAL | | | |
| Tensile Strength, Ultimate | ASTM D 638 | psi | 9,500 |
| Modulus of Elasticity | ASTM D 638 | psi | 340,000 |
| Flexural Strength | ASTM D 790 | psi | 13,500 |
| Compressive Strength | ASTM D 695 | psi | 12,500 |
| 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 |
| Poisson's Ratio | ASTM E 132 | - | 0.38 |
| Rockwell Hardness | ASTM D 785 | - | M70/R118 |
| THERMAL | | | |
| Coefficient of Thermal Expansion | ASTM D 696 | in/in/°F | 3.75 x 10 ⁻⁵ |
| Heat Deflection Temperature @ 264 psi | ASTM D 648 | °F | 270 |
| Heat Deflection Temperature @ 66 psi | ASTM D 648 | °F | 280 |
| 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 |
| Dissipation Factor @ 1 MHz | ASTM D 150 | - | 0.01 |
| Arc Resistance | - | - | - |
| Stainless Steel Strip Electrodes | ASTM D 495 | Seconds | 10 |
| Tungsten Electrodes | ASTM D 495 | Seconds | 120 |
| Dielectric Strength, in air @ 0.125 mils | ASTM D 149 | V/mil | 380 |
| FLAMMABILITY/BALLISTIC/IMPACT | | | |
| Federal Railroad Administration | | | |
| 49 CFR Part 238, Appendix B | ASTM E 162 | Is | <100 |
| 49 CFR Part 238, Appendix B | ASTM E 662 | Ds (1.5 min) Ds (4.0 min) | <100 <200 |
| 49 CFR Part 223 | Ballistic | - | Pass |
| 49 CFR Part 223 | Impact Type I & II | - | Pass |
| Bombardier Toxic Gas Generation | SMP 800-C | - | Pass |

*Typical properties are not intended for specification purposes

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Impact Resistance*

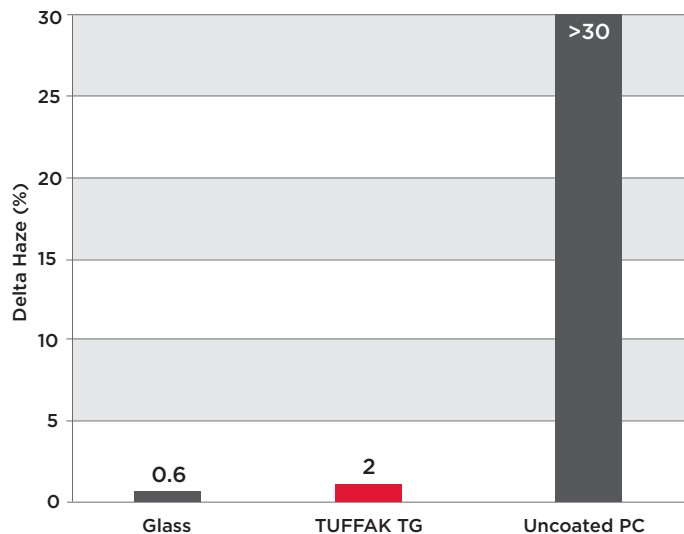


*Instrumented Impact per ASTM D 3763, sample thickness is 0.125" nominal

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-ethylhexyl) 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 |

Abrasion Resistance*



*Taber Abrasion per ASTM D 1044, 100 cycles using CS-10F wheels at 500 g load

*Tested in accordance to ASTM D 1308-02

Always keep hazardous chemicals away from uncoated edge of Tuffak Polycarbonate Sheet

These suggestions and data are based on information we believe to be reliable. They are offered in good faith, but without guarantee, as conditions and methods of use are beyond our control. We recommend that the prospective user determine the suitability of our materials and suggestions before adopting them on a commercial scale.