Thermoforming applications

Unrivaled in beauty and durability
Material solutions for large-part thermoforming applications.

The challenge
Great Lakes Home & Resort, a leading spa manufacturer, approached SABIC Innovative Plastics to help develop a new line of hot tubs with a unique range of vibrant colors. Intended for outdoor use, the new tubs also needed to maintain their outstanding looks and functionality despite prolonged exposure to the elements.

Great Lakes' chosen solution
SABIC Innovative Plastics' engineers worked with Great Lakes' development team to help identify a material candidate. Great Lakes selected a base of tough Cycolac* ABS resin with a core of advanced Geloy* XTW resin, with an added clear top layer to form a tough, highly weatherable, multilayer sheet system.

The results
SABIC Innovative Plastics' Geloy XTW resin helped enable the creation of a new line of hot tubs with brilliant color and very high gloss. The material offers brighter whites, deeper blacks, an extended color palette and a range of gloss levels from 20 to 90 percent.

Geloy XTW E290 resin virtually eliminates clouding, fading or cracking under tough outdoor conditions and offers excellent chemical and UV resistance. Plus, the multilayer sheet solution helps ensure the new tubs will retain their exceptional beauty and strength for three to five times longer than conventional ASA resins. Unlike cast acrylic shells, the multilayer sheet system allows hot tub owners to more easily repair damaged shells.

The results generated such an overwhelmingly positive response that Geloy XTW resin now represents a majority of the resins that Great Lakes uses in its hot tub product lines.

About the cover

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SABIC Innovative Plastics is a committed supplier to the thermoforming industry.
With over 40 years of experience in developing leading-edge thermoplastics technology, SABIC Innovative Plastics is a committed supplier to the thermoforming industry. Our broad product portfolio offers an expanding range of performance, processing and aesthetic options for thermoforming applications. We continue today to pioneer state-of-the-art materials and process technologies for this market.

Customers can rely on SABIC Innovative Plastics' continuing commitment to provide a global supply of high-quality advanced resins, backed by excellent technical support to help bring applications to market faster.

Geloy® XTW and Cycolac® multilayer sheet delivers highly weatherable, brilliant color without the need for paint.
As a leading materials and technology supplier to this market, SABIC Innovative Plastics offers an expansive portfolio of solutions

The thermoforming industry encompasses a broad range of materials, process technologies and end-markets. As a leading materials and technology supplier to this market, SABIC Innovative Plastics offers an expansive portfolio of solutions, including

• Design and technology innovation

• Global solutions

• No-paint, weatherable resins and sheet

• Low-temperature resins and sheet

• Semi-structural resins and sheet

• High-heat and flame-resistant resins and sheet

• Glazing solutions

If the right material doesn’t exist already, we may be able to leverage two or more SABIC Innovative Plastics’ resins to create a multilayer sheet solution to help meet your application’s needs.
Hardcoat glazing made from Lexan® resin is used in aircraft ranging from the F-16 Falcon to commercial liners.

Case Study

Recyclable tonneau covers

Driven by environmental concerns, EGR, a leading Australian manufacturer in the automotive industry, sought a recyclable alternative for the fiberglass reinforced plastics used to construct its tonneau covers. It found its solution in SABIC Innovative Plastics’ Cycoloy® PC/ABS resin.

In addition to recyclability, Cycoloy resin offered high impact strength, good heat resistance and excellent processing and regrind performance. SABIC Innovative Plastic’s material also offered compatibility with a clear cap layer, and showed minimal distortion under 100 kg loads during heat soak tests.
SABIC Innovative Plastics can help you achieve greater design flexibilities, outstanding aesthetics and advanced processing capabilities – all capabilities that differentiate our customers’ end-products.

The value we offer begins with our thermoplastic resins, which provide an impressive variety of performance qualities, including best-in-class weatherability and resistance to heat and low-temperature impact.

The performance properties inherent in SABIC Innovative Plastics resins transfer into extrusion grades for thermoforming. The same applies to our selection of highly colorable resins and Visualfx™ resin technology, which offer no-paint solutions in line with SABIC Innovative Plastics’ environmentally progressive initiative. Along similar lines, the Azdel® composite sheet presents alternatives to FRP and SMC.

From weatherable outdoor spas and tonneau covers to flame-resistant window masks, our expansive selection of resins, sheet and film meets the performance challenges of a variety of applications. Performance, however, is not the only factor by which consumers judge quality. The forming characteristics of our materials offer the potential for reduced cycle times and lower systems costs.

From prototype development to advanced thermoforming to secondary operations, SABIC Innovative Plastics’ Polymer Processing Development Center and laboratory facilities can validate your design on production-scale equipment.

SABIC Innovative Plastics’ extensive computer-aided design and engineering (CAE) expertise helps customers increase speed to market by providing process simulation and structural analysis prior to tool build, ensuring that applications meet their requirements.
With over 92 manufacturing, technology and joint venture facilities, coupled with application development specialists worldwide, SABIC Innovative Plastics can help customers identify solutions to meet their application requirements.

In addition to our broad portfolio, customers can tap SABIC Innovative Plastics’ world-class customer service in the form of outstanding technical support and a culture of manufacturing excellence. Our Global Application Development (GApT) Centers in Shanghai, China; Moka, Japan; Bangalore, India; Bergen Op Zoom, The Netherlands; Sungnam City, Korea; Southfield, Mich.; and Pittsfield, Mass. all provide access to new process solutions and next-generation technologies in extrusion and thermoforming.

Solutions include
• Processing guidelines and product data sheets for thermoforming
• Specialty compounding for custom colors
• Regional application development and technical support
• Tooling design and processing support
• Weathering tests and color technology
• Mechanical, thermal and dimensional stability performance testing
• Computer-aided engineering support
• Environmental simulation
• Concept development
SABIC Innovative Plastics’ no-paint systems offer a value-added solution to thermoformers who wish to reduce or eliminate paint processes from their operations.
In addition to potentially lowering VOC emissions and manufacturing costs, our no-paint systems can deliver highly aesthetic parts, with excellent resistance to weather, scratches and chemicals. In addition, these materials are designed for recyclability, to address the growing demand for products that can be ground down and reused. SABIC Innovative Plastics' portfolio of no-paint systems incorporates a variety of resin technologies, featuring Lexan® SLX, Geloy® XTW and Xenoy® grades.

Lexan SLX PC resin is an excellent candidate for exterior body panels, where it provides a beautiful finish that can withstand weathering for up to 10 years. This resin can also be co-extruded into a multilayer sheet system, providing its weatherable, high-gloss surface to PC-based resin systems. Plus, Lexan SLX resin offers a lightweight, high-performance alternative to metal, contributing to lighter, more fuel-efficient vehicles.

No-paint systems based on Geloy XTW (ASA) resin make good candidates for large-part thermoformed applications such as outdoor spas, which can benefit from the material’s high-gloss color and excellent weatherability. Validation of Geloy XTW resin includes accelerated weathering tests, as well as two years of outdoor exposure studies in Florida and Arizona. All tests indicate that the material will exhibit a prolonged delay in aesthetic shift after five to seven years.

SABIC Innovative Plastics’ Geloy XTW resin can be extruded into a multilayer sheet system that virtually eliminates clouding, fading or cracking under even the harshest environments. Multilayer sheet technology also offers excellent chemical resistance and UV protection. Geloy is used by the extrusion community in a system that combines ABS and acrylic, providing higher recycle and the ability to tailor the system based on customer requirements.

Xenoy’s (PC/PBT) thermoplastic alloy delivers a balance of thermal stability, mechanical strength and strong resistance to impact, chemicals and high temperatures. Originally developed for automotive applications, Xenoy resin can provide a beautiful, no-paint solution for tractor hoods and panels, outdoor recreational vehicles and other large thermoformed parts.

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**Case Study**

**Durable, attractive shower stall**

The fierce competition to deliver cost-effective and unique bath designs led Sally, a leading sanitary ware manufacturer, to select SABIC Innovative Plastics' Geloy FXW749SK resin for its new model shower stall.

SABIC Innovative Plastics' material technology offered the option for an attractive metallic look, enabling Sally to differentiate its shower design from competitive products. In addition, the molded-in aesthetics of Geloy FXW749SK resin enabled Sally's to produce its new model without the need for painting operations. The result: An attractive, cost-effective materials solution that reduced manufacturing time, eliminated VOCs and increased productivity.

Geloy FXW749SK resin also offers multiple color alternatives, offering more room for product development.
SABIC Innovative Plastics' Lexan® EXL sheet excels in demanding low-temperature applications, such as snowmobiles, ATVs, trucks and buses.

For applications demanding reliable performance in temperatures reaching -76° F (-60° C), SABIC Innovative Plastics offers Lexan EXL sheet. Based on proprietary siloxane copolymer technology, this durable grade offers thermoformers all the benefits of standard polycarbonate with enhanced low-temperature impact strength and ductility, plus excellent release from the mold.

Lexan EXL sheet can withstand prolonged outdoor exposure or extreme temperature fluctuations from -40° to 104°F (-40° to 40°C) without losing dimensional stability or becoming brittle. The material's extended property profile makes it an ideal candidate for exterior panels on trucks, buses and recreational vehicles, which all require consistent performance under all conditions in outdoor environments.
SABIC Innovative Plastics’ portfolio offers outstanding solutions for thermoform part designs for semi-structural and low thermal expansion applications, such as exterior body panels for vehicles, bathtub shells and tonneau covers. Product selections such as a reinforced Cycoloy® PC/ABS resin and Azloy® glass-mat thermoplastic sheet present excellent alternatives to traditional thermoset material systems, such as SRIM, SMC and FRP. These materials may be combined with first-surface aesthetic solutions to offer a no-paint solution.

Certain glass-filled Cycoloy resins exhibit excellent modulus of 442 kpsi (3.1 MPa), along with a high HDT of 250° F (121° C) and a low coefficient of thermal expansion to enable large-part dimensional stability.

Through its Azdel® joint venture with PPG Industries, SABIC Innovative Plastics also offers Azloy thermoplastic composite mats made from Lexan poly-carbonate. These high-performance mats deliver outstanding modulus over 1 million psi (6.895 MPa), and HDT up to 293° F (145° C). Comprising five-layered construction of alternating resin layers and fiber-glass mats, Azloy composites are adapted to matched-mold thermoforming techniques. Finished parts are characterized by excellent stiffness and high-heat performance. Azloy composites also bond well with metal, and provide enhanced surface finishing capability.

**Case Study**

**Low weight, high modulus**

Confronted by higher fuel prices, a leading U.S. motor home manufacturer wished to increase the fuel efficiency of its two new models by reducing their overall vehicle weight.

The solution: SABIC Innovative Plastics’ Cycoloy CE1820 PC/ABS resin. Compared with competitive materials, this resin’s high modulus permitted the use of thinner gauges, reducing weight by up to 17 percent for parts of equivalent stiffness and similar geometries.

The result: Lighter exterior compartment doors, lower valence panels, back wall trim and aero fences, translating as higher fuel efficiency. Plus, Cycoloy CE resin’s capability for molded-in color and adaptability to thermoforming processes offered excellent aesthetics and manufacturability.
For high-heat applications, SABIC Innovative Plastics offers an array of resins and sheet materials designed to perform at extreme temperatures.

Customers can select from our Noryl® GTX (PPO/PA) and Noryl PPX (PPO/PP) resins, Ultem® (PEI) sheet products, or Azdel® Superlite® composite technology to find the best balance of critical properties. The highly specialized engineering underlying these materials helps address critical challenges in weight reduction, processing performance, flame retardancy, impact, chemical resistance and low smoke and toxicity profiles.

SABIC Innovative Plastics’ continued innovation of its high-heat portfolio has given traditional customers in automotive and electronics a competitive edge, and pioneered new interior components applications in aircraft and passenger rail. Originally designed for the automotive industry, our Noryl GTX and Noryl PPX thermoplastic resins provide excellent impact and processing performance, in addition to high-heat resistance. Noryl GTX is better adapted to withstand the elevated temperatures of on-line painting operations. But both grades deliver broad environmental resistance to commonly used automotive fuels, greases and oils, as well as substantially higher stiffness compared to conventional TPOs.

Boeing selected SABIC Innovative Plastics’ high-heat Ultem 1668A sheet to form the entire cockpit for its C17 jetliner. The material delivers low weight and flame toxicity, as well as excellent impact strength.

Noryl GTX provides a class A surface for painting in your current system while providing weight reduction and improved impact compared with competitive materials.
Our extruded Ultem* (PEI) sheet provides design flexibility, outstanding mechanical properties and excellent flame, smoke and toxicity performance. Well-adapted to thermoforming processes, this material is an excellent candidate for aircraft interior applications, where it is used to mold window reveals, air ducts, seating and flight deck components, galleys, stow bins and sidewalls.

Certain Ultem sheet products may also meet commercial aircraft interior requirements, including FAA smoke and flammability testing and toxicity standards BSS7239 and ABD0031, and have OSU heat-release rates below 65/65. The material is highly paintable, and offers options for molded-in color.

Azdel® Superlite® composites with SABIC Innovative Plastics’ flame-resistant resins provide the potential to thermoform high-performance components that can replace SMC, FRP or aluminum, meet aesthetic demands and help reduce vehicle weight for automotive, aircraft and passenger rail applications.

Superlite composite technology delivers a high stiffness-to-weight ratio, good dimensional stability, an extremely low coefficient of thermal expansion and high impact resistance over a wide temperature range. This material also delivers high flame resistance, meeting OSU 65/65.

### Case Study

**Train interior**

SABIC Innovative Plastics’ Ultem R16SG29 sheet forms the entire interior of Siemens’ S70 platform line of passenger trains, now traveling rails in Houston and San Diego. Siemens selected the material for its exceptional cleanability, durability and vandal resistance, and because it meets stringent flame, smoke and toxicity requirements of the rail industry.

More specifically, Ultem R16SG29 sheet meets:

- U.S. FRA 49 CFR Part 238 flammability and smoke emissions standards for train passenger cars and locomotive cabs
- Toxicity standard Bombardier SMP 800C
- Germany’s DIN5510, Part 2 (S4/SR2/ST2 rating)
- French NF P 92-501/5 and NF F 16-101 (M1, F1 rating)
SABIC Innovative Plastics continues to provide glazing materials of the highest optical quality, while meeting specific application requirements in industries from building and construction to transportation.

Our portfolio offers a range of innovative Lexan® polycarbonate sheet for flat or curved glazing applications. Flat Lexan sheet can be easily cut to size and milled using standard machine equipment, while hard-coated formable Lexan Margard® sheet makes an excellent candidate for manufacturing 3-D spherical and cylindrical shapes using conventional drape and thermoforming techniques.

Case Study

Clear, curved quality

More and more frequently, new motorcycle and scooter windshields are designed as spherical 3-D shapes. Concurrently, U.S. Department of Transportation requirements on abrasion resistance and weatherability have grown increasingly stringent. These trends have led many manufacturers to select SABIC Innovative Plastics’ Lexan Margard sheet with a formable hard coating for their windshield applications.

Lexan Margard FMR5XT sheet, for example, met the demanding performance criteria of Honda Italia, which used SABIC Innovative Plastics’ sheet to form the windshield for its latest Pantheon model. The company’s selection of Lexan Margard sheet signaled its sincere commitment to safety, quality and performance.
Also available is a selection of specialty products that deliver superior weatherability or anti-fog properties, as well as sheet with enhanced impact or graffiti resistance.

For glazing applications requiring high optical quality performance, SABIC Innovative Plastics is a key supplier of top-of-the-range optical quality Lexan* and Lexan Margard* sheet. Both products meet application requirements regarding black specks, bubbles, lints and fibers, distortion and ripple. Also, both products are in compliance with DIN 52305 A AZ requirements.

Case Study

Beautiful, lightweight truck caps

A major automaker sought a new truck cap design with improved looks and lower weight. It went to TBR, and TBR went to SABIC Innovative Plastics.

Working with SABIC Innovative Plastics, TBR selected a twin shell solution formed from SABIC Innovative Plastics’ beautiful, highly weatherable Geloy* ASA and durable Cycolac* ABS materials. The cap was then equipped with tinted, formed windows made from Lexan SLX sheet.

The result: A sleek modern-looking cap weighing 50 pounds less than traditional fiberglass tops with glass windows. In addition to lighter weight, the windows combined great impact resistance and weatherability. Plus, the SLX hard surface resists scratching and can be easily repaired.

Windscreen made from hard-coated Lexan Margard sheet provide an excellent impact resistant barrier against tree branches and falling objects during construction. Plus, its excellent optical quality can help reduce worker fatigue.
<table>
<thead>
<tr>
<th>Units</th>
<th>Test method</th>
<th>Geloy® XTW290</th>
<th>Cycloal® GPX3800</th>
<th>Lexan® SLX1432</th>
<th>Lexan® SLX12AZ0 (film)</th>
<th>Xenoy® X5600WX</th>
<th>Lexan® EXL1330</th>
<th>Lexan® EXL1414</th>
<th>Cyclogy® CE1821</th>
<th>Adloy®</th>
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<td>Weatherability</td>
<td>Yrs</td>
<td>SAE J1960</td>
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<td>304,580</td>
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<td>Flexural modulus, 0.05 in/min, 2 in span</td>
<td>psi (Mpa)</td>
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<td>384,000 (2,650)</td>
<td>299,000 (2,060)</td>
<td>361,000 (2,490)</td>
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<td>26,800</td>
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<td>Flexural modulus, 0.10 in/min, 4 in span</td>
<td>psi (Mpa)</td>
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<td>377,100 (2,600)</td>
<td>346,640 (2,390)</td>
<td>311,830 (2,150)</td>
<td>304,580 (2,100)</td>
<td>326,335 (2,250)</td>
<td>442,365 (3,050)</td>
<td>1,050,000 (7,250)</td>
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<td>9,500 (65)</td>
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<td>in-lb (J)</td>
<td>ASTM D 3763</td>
<td>265 (29.9)</td>
<td>672 (75.9)</td>
<td>479 (54.1)</td>
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<td>619 (69.9)</td>
<td>252 (28)</td>
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<td>265 (29.9)</td>
<td>672 (75.9)</td>
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<td>Instrumented impact energy @ peak, 22°F</td>
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<td>ft-lb/in (J/m)</td>
<td>ASTM D 256</td>
<td>1.7 (92)</td>
<td>8.4 (455)</td>
<td>16.1 (860)</td>
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<td>ft-lb/in (J/m)</td>
<td>ASTM D 256</td>
<td>0.6 (32)</td>
<td>2.3 (123)</td>
<td>5.0 (267)</td>
<td>12.7 (678)</td>
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<td>Izod impact, notched, -60°F</td>
<td>ft-lb/in (J/m)</td>
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<td>3.5 (187)</td>
<td>11 (587)</td>
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<tr>
<td>Izod impact, notched 80°C +23°C</td>
<td>ft-lb/in (J/m)</td>
<td>ASTM D 648</td>
<td>278 (137)</td>
<td>248 (120)</td>
<td>274 (134)</td>
<td>283 (139)</td>
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<td>HDT, 66 psi, 0.125”, unannealed</td>
<td>°F (°C)</td>
<td>ASTM D 648</td>
<td>168 (76)</td>
<td>248 (120)</td>
<td>208 (98)</td>
<td>249 (121)</td>
<td>256 (124)</td>
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<tr>
<td>HDT, 66 psi, 0.250”, unannealed</td>
<td>°F (°C)</td>
<td>ASTM D 648</td>
<td>168 (76)</td>
<td>248 (120)</td>
<td>208 (98)</td>
<td>249 (121)</td>
<td>256 (124)</td>
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<tr>
<td>HDT/Ae, 1.8 Mpa Edgew 120*104 sp=100mm</td>
<td>°F (°C)</td>
<td>ASTM D 75/Ae</td>
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<td>284 (140)</td>
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<tr>
<td>HDT/Af, 1.8 Mpa Flatw 80*104 sp=64mm</td>
<td>°F (°C)</td>
<td>ASTM D 75/Af</td>
<td>172 (78)</td>
<td>244 (118)</td>
<td>203 (95)</td>
<td>250 (121)</td>
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<td>CTE, flow, -40 to 100°F</td>
<td>1/F (1/C)</td>
<td>ASTM E 831</td>
<td>4.72 (8.5)</td>
<td>5.10 (9.18)</td>
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<td>3.87 (6.97)</td>
<td>3.05 (5.5)</td>
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<td>3.44 (6.2)</td>
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<td>CTE, flow, 23 to 80°C</td>
<td>1/F (1/C)</td>
<td>ISO 11359-2</td>
<td>3.22 (5.8)</td>
<td>4.0 (7.2)</td>
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<td>1.8E-05 (3.2E-05)</td>
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<td>4.1 (7.4)</td>
<td></td>
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</tr>
</tbody>
</table>

1. ASTM D-3574 method used
2. Tensile data using the ASTM D882 method
3. Stress at break using ISO 178 method
4. This data run at 0.15 in/min, 4 in span
5. Value at break (0.10 in/min, 4 in span)
6. Value at impact (0.10 in/min, 4 in span)
7. Stress at maximum
8. ASTM D696 method used
9. Tested from -40° to 248°F (-40° to 120°C)
10. Impact at -40°F
11. Tested from -40° to 200°F (-40° to 93°C)

18 SABIC Innovative Plastics
### Flame-resistant resins and sheet

<table>
<thead>
<tr>
<th>Noryl® GTX 626</th>
<th>Noryl PPX7110</th>
<th>Ultem® 1668A and R165G00 sheet</th>
<th>Azdel® Superlite® with Ultem resin @ 2500 GSM (2.3 and 4 mm molded thickness)</th>
<th>Lexan® SLX16688</th>
<th>Lexan F2000 sheet</th>
<th>Lexan 9600 sheet</th>
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<tbody>
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<tr>
<td>1.09</td>
<td>0.97</td>
<td>1.26-1.33</td>
<td>1.25</td>
<td>0.83</td>
<td>0.625</td>
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<td>1.25</td>
</tr>
<tr>
<td>225,000</td>
<td>(1,550)</td>
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<tr>
<td>330,000</td>
<td>(2,270)</td>
<td>460,000 (3,172)</td>
<td>1,030,000 (7,100)</td>
<td>558,395 (3,850)</td>
<td>449,620 (3,100)</td>
<td>239,310 (1,650)</td>
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<td>253,810 (1,750)</td>
<td>130,535 (900)</td>
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<td>340,000 (2,345)</td>
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<td>370,000 (2,550)</td>
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<td>13,900</td>
<td>(95)</td>
<td>7,400 (51)</td>
<td>20,400 (141)</td>
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<td>12,908 (89)</td>
<td>11,312 (78)</td>
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<td>5,656 (39)</td>
<td>5,800 (40)</td>
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<td>3,190 (22)</td>
<td>12,500 (86.2)</td>
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<td>1,350 (9.3)</td>
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<td>335 (37.8)</td>
<td>600 (67.8)</td>
<td>64.6 (7.3)</td>
<td>70.8 (8.0)</td>
<td>79.7 (9.0)</td>
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<td>245 (27.7)</td>
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<tr>
<td>276 (31)</td>
<td>327 (37)</td>
<td>17.7 (2.0)</td>
<td>22.1 (2.5)</td>
<td>31.9 (3.6)</td>
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<td>324 (36)</td>
<td>239 (27)</td>
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<tr>
<td>6.3 (336)</td>
<td>8.2 (438)</td>
<td>1.4 (75)</td>
<td></td>
<td>12 (64)</td>
<td>112 (600)</td>
<td>2.4 (12.8)</td>
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<tr>
<td>2.3 (123)</td>
<td>2.8</td>
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</tbody>
</table>

### Additional Testing Data

**Lexan SLX 12A20 film**
- Pencil hardness (ASTM D3363): HB
- Taber abrasion (ASTM D1044): 19

**Noryl GTX 626**
- UL recognized (UL 94), 94HB flame class rating: 0.059 in.

**Noryl PPX7110**
- UL recognized (UL 94), 94HB flame class rating: 0.060 in.

**Ultem® 1668A and R165G00 sheet**
- UL recognized (UL 94), 94HB flame class rating: 0.060 in.

- OSU heat release @ 3.5 W/cm² (OSUHRRC)
  - @ 2 min.: <50 kW-min/m²
  - @ Peak: <60 kW-m²

- NBS smoke, flaming mode (ASTM E662): D, 4 min.: <100

- FAA flammability @ 0.40 to 0.250 in.

- AT1000: pass

- R165G00 sheet flammability

- FRA49 CFR part 238, appendix B flame spread index, Is (<35 max) (ASTM E 162): pass, Is = <5

- Smoke density (ASTM E 662)
  - D – 1.5 min., (<100 max) Pass, D, 1.5 = 1
  - D – 4.0 min., (<200 max) Pass, D, 4 = 7

- Heat and visible smoke release rate (ASTM E 1354/ISO 5660)

- Average heat of combustion: 30.96 MJ/kg

- Average extinction area: 85.10 m²/kg

**Azdel Superlite® with Ultem resin @ 2500 GSM**
- Oxygen index (ISO 4589): 42.4
- Flame class rating (UL 94): V-0

**Lexan F2000 sheet**
- Light transmission (ASTM D1003): 90%

**Lexan 9600 sheet**
- Light transmission (ASTM D1003): 85%
- Flammability (UL 94): 0.034-0.089 in.: V-2
- 0.090 in. and above: V-0
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