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FEATURES

48. World of Glass

Float producers overcome short-term hurdles as they plan for longer-term industry change

BY NORAH DICK

62. The 2023 Forecast

Prepare for what's next with 10 takeaways from leading construction economists

BY KATY DEVLIN

INSIGHTS

32. Code Watch

Pros and Cons of Envelope Backstops

BY KATY DEVLIN

36. Performance

Exploring Vinyl for Commercial Applications

BY JOE ERB

40. Trendhunter

Ideal Applications for Ceramic Frit & Silicone Coatings

BY SPENCER RAYMOND

DEPARTMENTS

- 10. Editor's Notes
- 14. From the NGA
- 15. Glass Advocate
- 16. Glass Informational Bulletin
- 22. News to Know
- 70. Q&A: Glassfab Looks to the Future
- 74. Product Solution: Salem/HHH
- 76. Industry Products
- 86. Suppliers Guide
- 100. Reader Response Center
- 102. Industry Spotlight



Qualex workers handling commercial vinyl extrusions in Kent, Washington, plant. Read more on page 36.

On the cover: Vitro Architectural Glass contributed its Solarban R100 clear glass to the new 70 Rainey building, now a part of the Austin skyline. Vitro's glass was selected for its ability to perform under Texas' strong sun without creating glare, and also preserving clear views for residents of the building.



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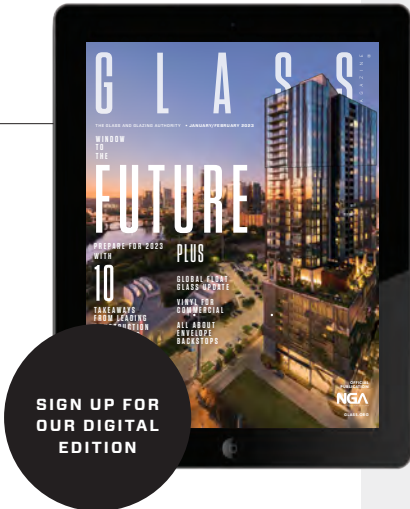
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BONUS CONTENT

Available at GlassMagazine.com and Glass.org

TECHNICAL RESOURCE

Review the updated Overview of Building Information Modeling Glass Technical Paper

IYOG WRAPUP

NGA closes out IYOG at the United Nations capstone event in New York

METAL TRENDS

Glass and metal systems suppliers focus on customers as markets continue to shift

GLASSBLOG



WORKFORCE TRENDS

Focusing on Recruitment and Retention

By Melissa Fischer, National Glass Association



MVP UPDATES

Dynamic Duo and an Amazing System

By Max Perilstein, Sole Source Consultants



PREVENTION STRATEGIES

All About Corrosion and Aluminum

By Tammy Schroeder, Linetec

PROJECT SHOWCASE

Featured in Glass Magazine Weekly and on GlassMagazine.com. To submit projects or case studies, write Norah Dick, ndick@glass.org. Pictured: Trex Commercial engineered more than 18,000 linear feet of custom railing for Climate Pledge Arena in Seattle. The facility is the world's first zero-carbon arena, employing numerous sustainable materials, practices and operations and powered solely with renewable energy sources. Read more at glassmagazine.com.



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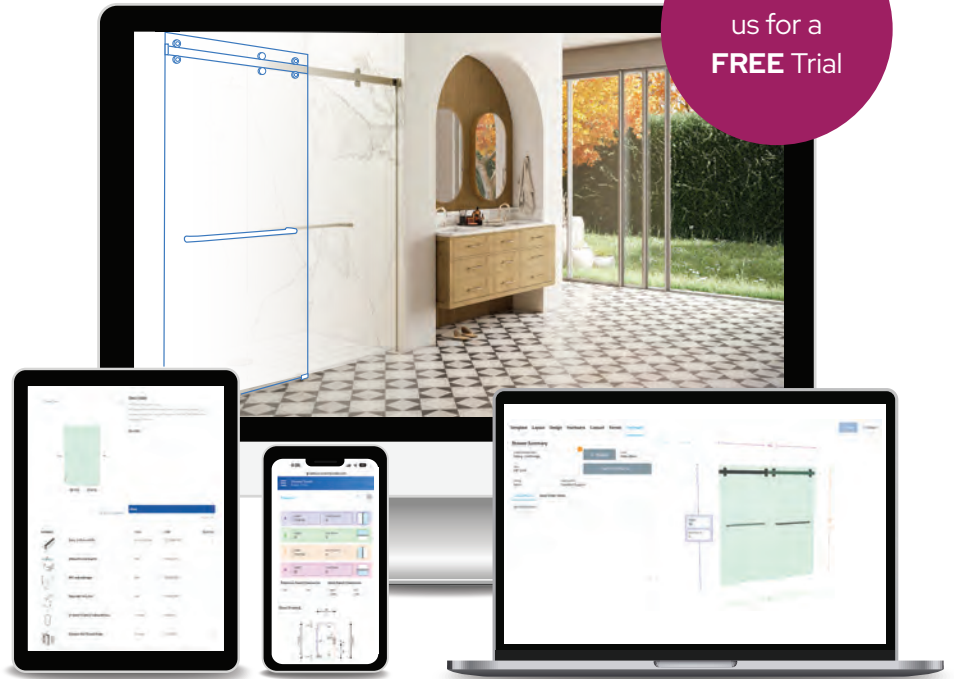
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Closing Out the International Year of Glass



KATY DEVLIN
Editor-in-Chief
kdevlin@glass.org

Throughout the 2022 United Nation's International Year of Glass, industry companies and associations around the world celebrated the amazing capabilities and possibilities of glass through thousands of events and initiatives, ranging from glass recycling drives and art exhibitions to legislative advocacy efforts. These celebrations wrapped up at the UN headquarters in New York City in December, where I was invited to moderate a panel discussion among industry experts highlighting the impressive IYOG activities during the year, and looking ahead at glass' role in architecture, education, medicine, technology, art and more. Panelists included the National Glass Association's Technical Director Urmilla Sowell, along with other international academics and glass leaders who are dedicated to developing glass solutions for the future.

In preparing for the closing event, I looked back at the year's activities and was encouraged and motivated by the many ways that glass is being used to build a better, more sustainable and equitable future. In no place was this more evident

than in the wide range of IYOG promotions and initiatives from the National Glass Association (Glass Magazine's publisher) this year.

During the IYOG, NGA took the helm on leading the architectural activities for the global program by focusing on two primary themes. The first—"Glass Can Save the World"—recognizes the essential role glass plays in creating a built environment that can meet sustainability and performance goals, helping to address the daunting challenges of climate change, and ensuring safe and healthy spaces for building occupants. The second—"Build the World with Glass"—promotes the glass industry as an exciting, thriving and rewarding career path for the next generation of workers.

I'll highlight a few events from IYOG, beginning with the NGA's Glass & Glazing Advocacy Days, April 4–5, in Washington, D.C. Advocacy Days allowed the association to advocate and educate about glass in the built environment, focusing on energy-efficient buildings, building resilience, recycling, registered apprenticeship programs, school security and bird-friendly glazing. Additionally, the NGA launched several new efforts to recruit a diverse next generation of glass workers, including an educational event at the largest Historically Black College & University in the South, and networking events for women in glass. Finally, the NGA published a range of essential industry resources, including the Glossary of Architectural Glass and Glazing.

While the official International Year of Glass has ended, Glass Magazine's and the NGA's efforts to recognize and promote glass as key to a safe, secure and sustainable future are just beginning. Learn more about IYOG and the NGA's IYOG activities at glass.org/IYOG. ■

IN PREPARING FOR THE CLOSING EVENT, I LOOKED BACK AT THE YEAR'S ACTIVITIES AND WAS ENCOURAGED AND MOTIVATED BY THE MANY WAYS THAT GLASS IS BEING USED TO BUILD A BETTER, MORE SUSTAINABLE AND EQUITABLE FUTURE.



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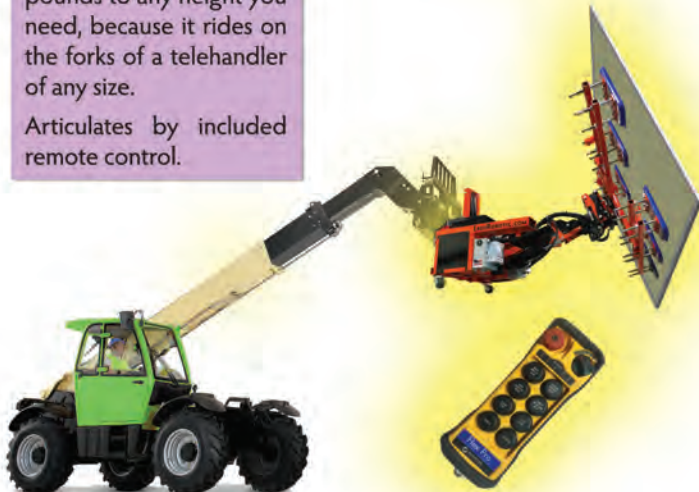


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YOUR ASSOCIATION AT WORK

NEED-TO-KNOW INFORMATION FROM THE NGA

NGA CLOSSES OUT IYOG AT UNITED NATIONS IN NEW YORK CITY

The United Nations International Year of Glass 2022 celebrated the essential role of glass in society. As part of its continued support of IYOG, NGA participated in a final event on Dec. 13-14, 2022, at the United Nations in New York City, where it showcased the achievements of the glass and glazing industry, outlined the role of glass in the United Nations strategic goals, and highlighted the mental health attributes of glass in buildings.

Throughout the year, NGA has spotlighted how glass and glazing can contribute to building occupant safety and energy conservation in the model building codes and is actively involved with standards and codes bodies, including the International Code Council, ASTM International and ASHRAE, among others, to promote and defend the use of glass in the built environment.

The event was streamed live and will be available online as a recording. ■

NGA SUPPORTS RECYCLING EFFORTS ON AMERICA RECYCLES DAY

Organized by the Environmental Protection Agency, America Recycles Day on Nov. 15, recognizes the importance and impact of recycling, which has added jobs and helped to protect our environment. Recycling and the contribution of flat glass recycling to a circular economy is a top priority, and the NGA encourages industry to be involved in recycling at all levels.

NGA resources include free Glass Technical Papers—Recyclability of Architectural Glass and Reusability and Recyclability of Mirror Products—that address the reusability and recyclability of different types of glass and mirrors as well as videos on recycling glass in Europe and North America. ■

NGA PUBLISHES NEW GTP ON ENERGY CONSERVATION CODES

A new Glass Technical Paper—Alignment in U.S. Energy Conservation Codes: ASHRAE 90.1 and the IECC—provides information on the codes' use as national model codes, and their compliance paths for commercial and residential buildings, both new construction and existing buildings.

The GTP further expands upon prescriptive versus performance path requirements, and how it relates to the increased demands placed on glazing systems to achieve certain stringencies based on evolving climate zone maps. U-factors and solar heat gain coefficients, and an estimation of glazing required, are also charted by climate zone for both commercial and residential vertical fenestration paths.

"In representing the interests of the glazing industry on these various energy code committees, we are always looking into the future—in fact, we are already working on development of codes for 2024 and 2025," explains Tom Culp, Birch Point Consulting and NGA energy code consultant. "At the same time, it is equally important that we help educate the industry about the results of those efforts as the energy codes and standards are implemented in the real world today, and NGA's new Glass Technical Paper will be a good resource for the industry." ■



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GLASS ADVOCATE

NGA Represents Glass and Glazing Industry at ICC Code Hearings

NGA's fire, safety and structural code consultants Thom Zaremba and Nick Resetar of Roetzel & Andress represented the glass and glazing industry by participating in the International Code Council Group B Public Comment Hearings in Louisville, Kentucky, beginning Sept. 14.

AHJ alternatives

Of note, NGA staff were instrumental in defeating two proposed changes to Section 104 of the IBC, which would have modified administrative sections of the code to allow the Authority Having Jurisdiction or AHJ to approve alternative means, methods or products even if their use is specifically prohibited by the code. These changes would have permitted AHJs to allow builders to use inferior means or methods of construction and materials specifically prohibited by the code. This could have allowed products inferior to glass to be used in the construction of buildings.

Gas appliance testing

Subject to final determination by the Online Governmental Consensus Vote or OGCV, NGA staff also opposed and defeated proposals requiring gas appliance testing for proper combustion upon installation or replacement of windows, doors or storm windows in a home; changes related to the problem of slack development in cable infill systems used in guards; and a mandate that Environmental Product Declarations or EPDs for glass be included as part of the plans and drawings submitted to approve new building construction.



Safety glazing

A GICC proposal to modify Section 403.2 of the IBC, which applies to the use of 2-hour fire-resistance rated glazing used to enclose interior exit stairways in high-rise buildings, was unanimously approved and will be incorporated into the 2024 edition of the IBC. And a proposed change to IBC Section 2407.1.1, submitted by GICC and NGA and modified with their support from the floor, rewrites the rule mandating that glass in glass guards be designed using a “factor of safety of four” and was unanimously adopted and will be incorporated into the 2024 IBC.

Outboard pane exemption

Finally, NGA supported a modification to Exception 3 to Section 2406.4.3 of the IBC, which exempts outboard panes in multi-pane window assemblies from the safety glazing requirements applicable

to hazardous locations if they are located 25 feet or more above grade. This modification was unanimously adopted and the changes will be incorporated into the 2024 IBC. ■

NGA Weighs in on Proposed Changes to Fire Window and Door Assemblies

NGA code consultants Thom Zaremba, Nick Resetar and Bill Koffell virtually attended NFPA 80's hybrid First Draft Technical Committee Hearings from Oct. 4-6, 2022, which were broadcast live from NFPA's headquarters in Quincy, Massachusetts. The Technical Committee considered dozens of proposed changes to the way fire window and fire door assemblies are installed and maintained. Many of the proposed changes were the product of task groups that met virtually numerous times during the full year leading up to the hearings. ■



GLASS INFORMATIONAL BULLETIN

The Value-Added Performance of Coated Glass

Why glass is coated

Coatings can be used to modify the optical properties of glass, to improve solar and thermal performance, or to change the surface characteristics of the glass without changing the composition of the glass itself.

Coatings as filters

Coatings can alter the transmission, reflection and absorption characteristics at different wavelengths of the solar spectrum, altering what the human eye perceives. The visible appearance of the glass may be altered by varying light transmission, varying light reflection, or changing the color of transmitted or reflected visible light in the visible spectrum.

Coatings can change solar and thermal performance of glass by reducing the amount of the UV spectrum transmitted through the glass or reducing the near-infrared portion of the spectrum (felt as heat) that is transmitted through glass or reflecting far-infrared energy.

Low-E coatings

Low-emissivity glass is designed for thermal performance improvement and is required across all climate zones to meet energy conservation codes. Low-E glass used in fenestration products improves the U-value. This improvement works in two ways: limiting the amount of solar heat gain into a building in the summer in southern climates or reflecting heat back into a building in the winter in northern climates.

Low-E glass is designed to allow day-

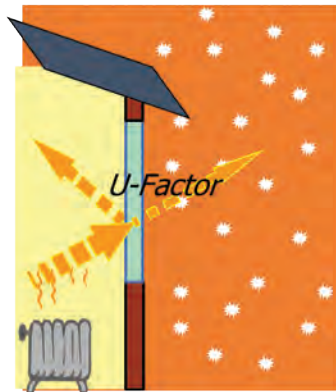
light to be transmitted into the building at a specified amount known as visible light transmission. Low-E glass also blocks a certain percentage of UV transmission, which can be damaging to furnishings and interior surfaces.

Glass coating methods

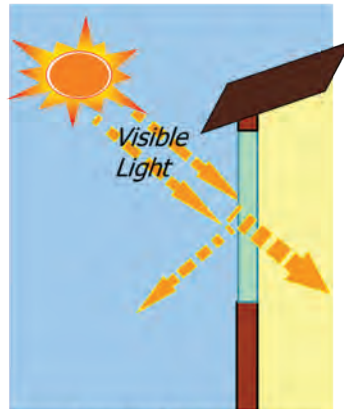
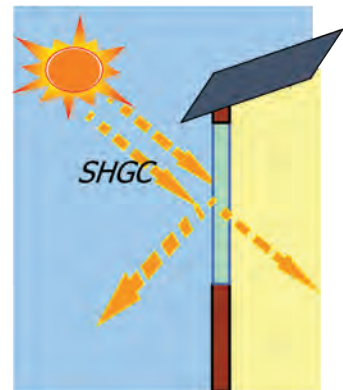
There are two widely employed methods for coating glass: pyrolytic and sputter

Low-e Coated Glass

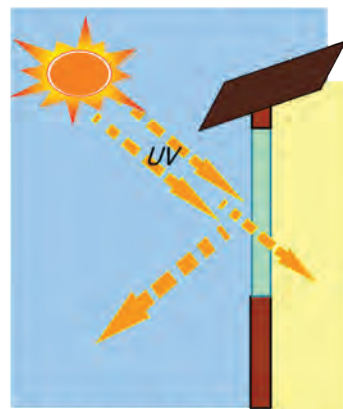
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Rejects excessive solar heat, keeping you cool when it's hot outside



Transmits natural daylight, brightening your home and mood



Reduces damaging UV rays, protecting home furnishings



GLASS INFORMATIONAL BULLETIN—THE VALUE-ADDED PERFORMANCE OF COATED GLASS

Pyrolytic coatings contain a conductive oxide infrared reflecting layer, usually tin-oxide based. Because these coatings are a permanent part of the glass itself, pyrolytic coated glass is extremely durable and easy to transport and store. Glass with pyrolytic coating can be heat-strengthened, fully tempered and laminated. Some pyrolytic coatings can be exposed to weather, on the No. 1 or No. 2 surface monolithically or surface No. 1 or No. 4 of an IGU. Pyrolytic coatings can be used with heat-absorbing (tinted) glass to reduce solar heat gain and improve solar performance.

Sputter coatings contain multiple layers of metals, each with a different purpose, such as thermal and solar performance, light transmission, reflectance or durability. Low-E coatings typically have an infrared reflecting layer. Some sputter coatings can be cut, tempered and fabricated after the coating has been applied, allowing local inventory to be maintained for shorter lead times. Some sputter coatings can shed moisture and resist scratching. A range of target materials can be used to provide many different coating options to enhance performance and aesthetics.

Sputter coatings can have solar control and improved thermal performance properties, saving energy for commercial and residential structures in all climates.

Mirror coating

Coatings may be used to produce highly reflective surfaces or mirrors. Back-side or second-surface mirrors are produced using a chemical reduction method known as “electroless plating” to apply a copper or silver coating on the glass surface. Mirrors can also be first surface, which means the reflective coating surface faces the eye. First-surface mirror can

be pyrolytic coated within a float furnace or produced in a vacuum sputtering coater. Metal targets such as aluminum or chromium are used within the coater to sputter ultra-thin metal layers onto the glass surface.

Radio frequency shielding

When eavesdropping is a concern, security glazing can be specified with special metallic coatings designed to provide signal attenuation, or radio frequency shielding, significantly reducing signal leakage emitted by wireless networks, computers, printers, cell phones and other electronic devices. A metallic coating is deposited on glass by an electrochemical process. The coating has a tinted appearance that reduces light transmission. Exterior windows are typically specified as insulating glass units with the coated outer faces of the two glass lites sealed against the aluminum frame by conductive gaskets around the entire base. Frames are then grounded to metal screening, integrated with the room walls. When tested from 300 MHz to 6 GHz, the coating can provide signal attenuation between 40 decibels and 55 decibels.

Antibacterial and antimicrobial coatings

Using electrically conductive coatings, it is possible to heat glass and take advantage of high temperatures to neutralize bacteria and viruses. Silver and copper coatings can have antimicrobial properties, as trace amounts of bactericidal silver/copper ions leach from the surface and kill bacteria through ionization. Similarly, photocatalytic or TiO₂ coatings can kill bacteria and viruses through photocatalytic reaction. TiO₂ photocatalytic disinfection has

been proven to have positive impacts on indoor air quality through reduction of VOC, ozone and NO_x when applied to the interior surface of façade glazing.

Coatings that change surface properties

Coatings can improve surface abrasion effects, reduce reflectivity for solar or lighting applications, improve resistance to chemical attack, or create barrier layers to change the surface chemistry effects. Coatings can change the surface effects of glass that is exposed to moisture, making it hydrophobic or hydrophilic. Specialized coatings have been optimized for shower enclosures to seal the glass surface, which could reduce the amount of soap scum and other shower products sticking to the glass surface, making it easier to clean.

Low-maintenance glass products employ photocatalytic properties, which in combination with moisture and UV radiation from the sun decompose organic materials that are on the surface.

Additional resources from NGA

This GIB is based on the AIA-Accredited Presentation for Architects, “The Value-Added Performance of Coated Glass.” NGA is an approved American Institute of Architects provider of CES credits. NGA members may use these presentations as a resource when reaching out to architects and other interested parties. They are approved for use as either in-person or virtual live presentations. Become an approved presenter and use NGA’s AIA-accredited presentations to host an educational event for architects.

NGA’s GANA Glazing Manual includes a section on coated glass. The new 2022 International Year of Glass edition is available for download at glass.org/store. ■

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Trulite Acquired by Truelink Capital

Truelink Capital acquired Trulite Glass & Aluminum Solutions. The investment firm acquired the fabricator from an affiliate of Sun Capital Partners Inc.

“Trulite has been on a journey to expand geographically, optimize operations and create a platform for scalability, which is a direct result of the hard work, persistence and determination of the Trulite team,” says Kevin Yates, CEO of Trulite. “Upon our first meeting with Truelink, it was evident that they believe in our business, our potential and—most

importantly—our people. The Truelink team brings a breadth of industry knowledge that will help us chart our path forward and continue to successfully execute our strategic priorities. This milestone is a natural next step for our company, and we are confident that Truelink is the right partner as we work to unlock our next phase of growth.”

“At Truelink, we are focused on helping companies adapt, meet the business challenges of today and thrive—and that is exactly how our firm intends to support Trulite,”

says Todd Golditch, cofounder and managing partner of Truelink. “Trulite is an industry leader, with an immensely talented team, experienced leadership and a strong customer value proposition. The company has a solid foundation for growth, and we are enthusiastic about Trulite’s high-quality products, high-touch service and ability to capture the opportunities that lie ahead. We are confident that, with additional investment, the company is well-positioned to build upon its positive momentum and reach new heights in its next chapter.”

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AGC Glass France Closes Float Line

AGC Glass France closed the B2 float line at the Boussois Industrial Unit, which has been in operation for over 21 years. This line closure is a direct consequence of the European energy crisis.

The plant specializes in the production of flat glass for the building industry and employs 135 people. It operated in a market affected by overcapacity in Europe and by very

strong pressure on prices resulting from the impact of the energy surcharge. The intention to close the B2 line is an effort to preserve AGC’s flat glass activities in Europe.

NSG’s Second Float Glass Plant in Argentina is Now Operational

NSG Group’s second float glass plant in Argentina completed construction and started operation. The new plant

is located at Los Cardales in Buenos Aires, Argentina, and is operated by Vidriería Argentina S.A., a joint venture subsidiary in Argentina, with a history of over 80 years.

The investment was decided in 2018 to meet the growing demand for architectural and automotive glass in Argentina and to supply South American markets, where the market continues to grow as well. The initial plan was to start operations in early 2020, but due to turmoil in the global economy, including the spread of COVID-19, the start of operations was postponed. Glass production officially started on Oct. 8.

Saint-Gobain Signs Renewable Electricity Supply Agreement

Saint-Gobain has signed a Power Purchase Agreement with the top energy supplier in Spain, Endesa. This 11-year agreement will start in 2024 and will cover around 55 percent of Saint-Gobain’s Spanish electricity needs. The electricity supplied by Endesa will be generated by its renewable portfolio: wind, solar and hydroelectric power.

This agreement will enable a reduction in CO2 emissions of roughly 39,000 tons per year. This is the second renewable energy supply agreement signed by Saint-Gobain in Spain. Together, the two agreements will cover 65 percent of the Group’s electricity needs in Spain. Under this agreement, Endesa will supply Saint-Gobain 150 gigawatt hours of renewable energy annually, which corresponds to the supply of about 43,000 Spanish homes with renewable energy every year.

Quanex Acquires LMI Custom Mixing Assets

Quanex announced the acquisition of LMI Custom Mixing LLC, an advanced polymer solutions provider with a focus on advanced methods for mixing rubber compounds.

The acquisition will complement and expand Quanex’s polymer solutions expertise, enabling the company to diversify into key new markets, enhance polymer solutions for its existing

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businesses and deliver an enhanced experience to LMI customers throughout North America.

Dodge Construction Network Acquires Principia Consulting

Dodge Construction Network, backed by affiliates of Clearlake Capital Group and Symphony Technology Group, announced the acquisition of Principia Consulting, a data,

research and consulting firm. With this announcement, the company hopes to expand its Dodge Advisory Services suite to bring new consultative and research capabilities to the market, providing clients new tools to improve their growth and profitability.

Principia delivers data, primary research and market intelligence focused on the building materials industry. The acquisition of Principia broadens

Dodge's capabilities in residential markets and adds further expertise in the commercial sector. The company will now deliver consulting services for clients of all sizes and specializations.

Glass Fabricator Blue Star Glass Expands into Texas

Blue Star Glass, a New Jersey-based glass fabricator, is expanding and opening a new facility in Dallas that is now ready to begin production.

The 145,000-square-foot facility is home to a fully automated insulating glass facility. Not a single human is involved in cutting, carrying, seaming, tempering or insulating, according to officials. Quality control is also computerized, with state-of-the-art lenses and sensors checking each piece of glass. The new facility also has jumbo cutting and processing capabilities, which means better cutting yields that may lead to more competitive pricing, high-volume output and bigger glass. Blue Star's maximum IG size in Texas is 95 inches by 172 inches, but projects that require sizes up to 196 inches long are able to be reviewed by the project team as well.

Quaker Window & Doors' Facility Enters Phase II of Addition

Quaker Windows & Doors' Eldon, Missouri, campus officially opened on Oct. 24, with more than 100 people in attendance for the grand opening of Phase II, a quarter-million-square-foot addition to Quaker's original Eldon facilities.

At the event, Quaker CEO Kevin Blansett praised the many people integral to making Phase II a reality. Michelle Hataway, deputy director of Missouri's Department of Economic Development, spoke of Quaker's impact on the community and the state as a whole. A check for \$83,000 was also presented as part of Ameren's BizSavers Program, which offers monetary incentives to businesses who implement energy efficiency within their facilities.

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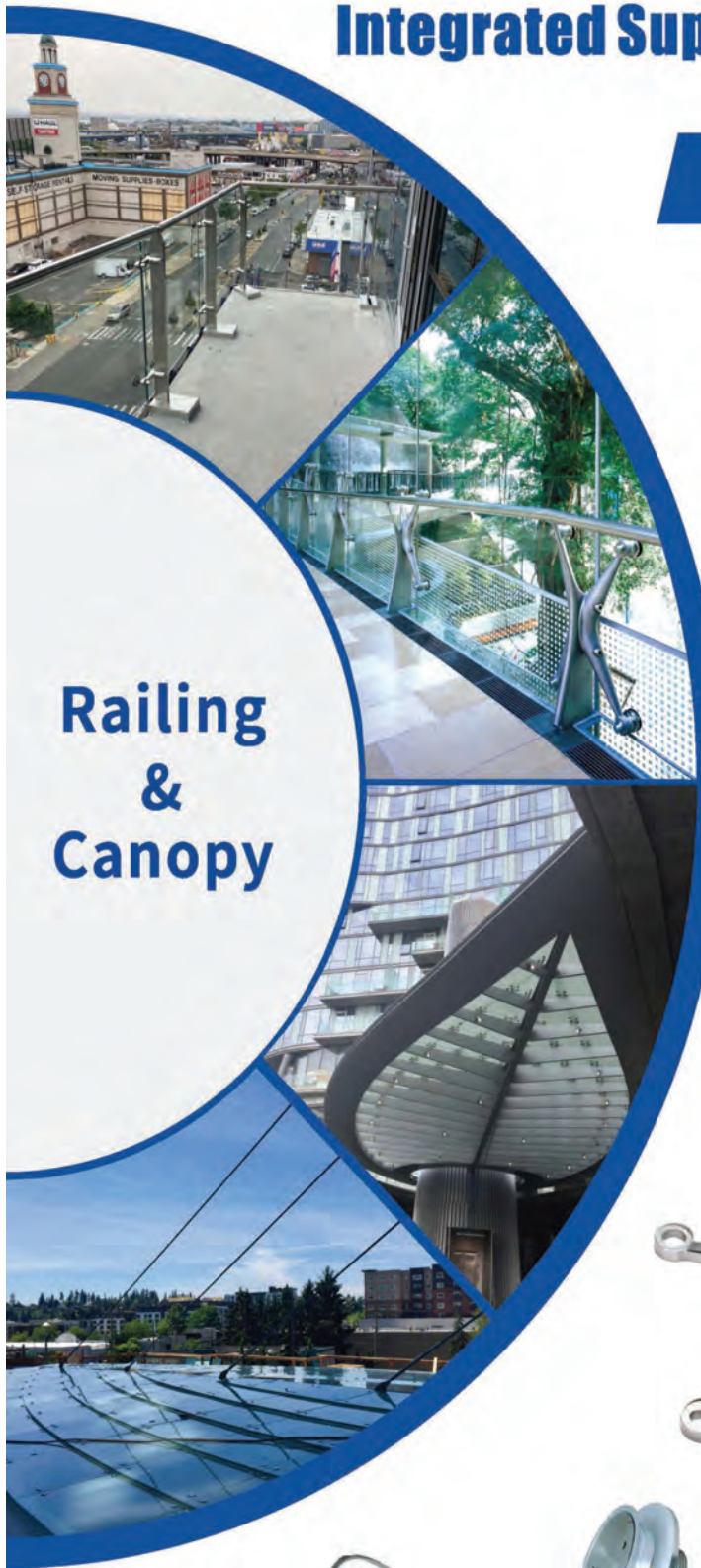
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Wood

Wood's Powr-Grip's chairman and former president *Keith Wood* passed away on Oct. 30. Wood helped run WPG in 1970 and later

became president. Wood and his wife Faye continued to grow the business, getting more involved in the glass industry and cladding both nationally and internationally. Wood ran the company in Wolf Point until it outgrew the location(s). Wood leaves behind his wife, Faye, and their five children, 15 grandchildren and eight great-grandchildren.



Sennese

Vitro veteran employee *Joe Sennese* passed away after a long battle with cancer. Sennese's legacy of humble service to Vitro's customers and

architects in the Chicago and Great Lakes region has inspired countless Vitro team members and endeared him to all who knew him, say officials.



Nixon

Quanex named *Jim Nixon* its first vice president of Innovation and New Markets.

Nixon will develop and lead an enterprise-level innovation strategy, advance new product and market possibilities, drive revenue and EBITDA growth and ensure a return on investment for new market product launches. Nixon joins Quanex with more than two decades of industry experience.



Miret

Inovues hired *Jen Miret* to spearhead its marketing and communications efforts. She brings 15 years of experience in the

architectural glass industry, where she was able to build brand recognition and lead generation through thought leadership. ■

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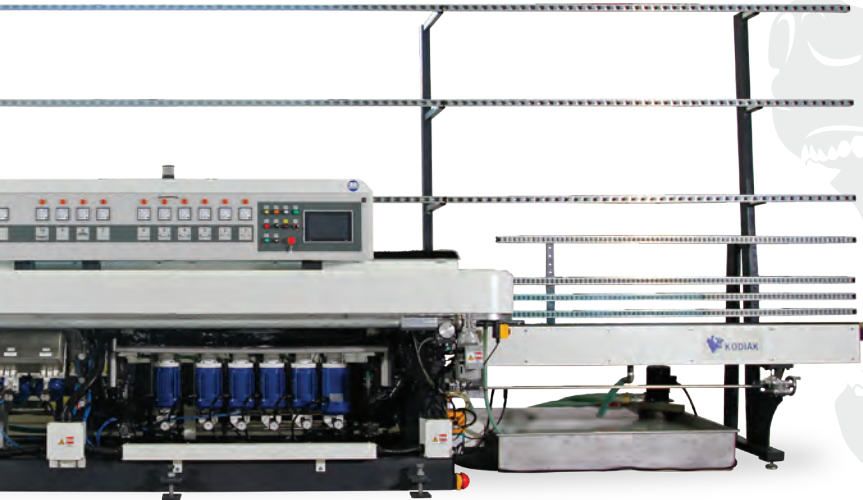


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PROS AND CONS OF ENVELOPE BACKSTOPS

EMERGING REQUIREMENTS COULD HAVE MAJOR IMPLICATIONS FOR THE GLASS INDUSTRY **BY KATY DEVLIN**

Envelope backstop requirements have been popping up in energy codes across the country in recent years, and they could have a major impact on the glass industry, according to speakers during a panel on backstops at the NGA Glass Conference: Chicago, July 18-20, hosted by the National Glass Association.

Backstops place caps on what can be “traded off” to meet performance requirements, thus necessitating a minimum level of envelope performance no matter what else is done to improve whole-building performance. The implications—both positive and negative—are significant for the glass and glazing industry, according to Helen Sanders, general manager, Technoform Glass Insulation NA at Technoform, and NGA code consultants Tom Culp, owner of Birch Point Consulting, Thom Zaremba, partner at Roetzel & Andress, and Nick Resetar, shareholder, Roetzel & Andress.

Prescriptive and performance paths, and backstops

To understand where envelope backstops fit into the codes, it’s helpful to put them in context with the traditional prescriptive and performance path options set forth in the energy codes.

The prescriptive path sets up requirements for U-factor and solar heat gain coefficient for the glazing systems, as well as minimum requirements for all other components in a building.

The performance path requires the team to perform a whole-building model to demonstrate the same overall energy performance as a prescriptive baseline level, while allowing the design team flexibility to make changes in individual components. With the performance path, “You can make tradeoffs anywhere in the buildings to allow you to use different windows or change window area. ... You just have to be able to show

the overall building meets the energy requirement,” says Culp.

Envelope backstops, however, limit a project team’s ability to make tradeoffs when using the performance path. While there are several types of backstops in the codes, the requirements generally set performance limits for just the envelope, regardless of the performance of other elements of the building, from mechanical systems to lighting.

Types of backstops

Envelope backstops are currently required in Massachusetts, New York City and the state of Washington. They are also coming in the new version of ASHRAE 90.1. However, the types of backstop requirements vary across the codes.

Overall envelope U-factor limits set a threshold for overall area-weighted average U-factor of the entire building envelope, including fenestration, walls, roofs and floors. The states of Washington and Massachusetts utilize some form of overall UA limits in their energy code requirements, says Culp.

Envelope Performance Factor limits rely on performance calculations using COMcheck from the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy. COMcheck includes the performance effects of U-factor, SHGC, shading, orientation, thermal mass, daylighting, dynamic glazing and more. New York City’s envelope backstop requirements are based on EPF limits, and the 2022 version of ASHRAE 90.1 will include similar requirements.

Individual component performance limits set separate limits on performance criteria for individual components, such as window U-factor, window SHGC, wall U-factor, roof U-factor and more. The low-rise residential IECC has some individual component backstops.

Potential advantages

Backstop requirements in the codes are new developments, and the industry doesn’t yet have data on how projects perform under the various methods, nor on how the requirements might impact the glass industry. However, the panelists noted several potential advantages.

Use of value-added products.

Backstop requirements could drive use of higher-performing, value-added glazing products, panelists say.

More comfortable, resilient envelopes. Since real-world data from projects built using backstops aren’t yet available, and because the building must still meet the same overall energy efficiency in the performance path regardless of trade-offs or backstops, the panelists can’t say definitively if the projects will actually save any energy. However, Sanders argues that projects built using envelope backstops would require use of higher-performing glazing products, leading to more comfortable buildings and more resilient envelopes.

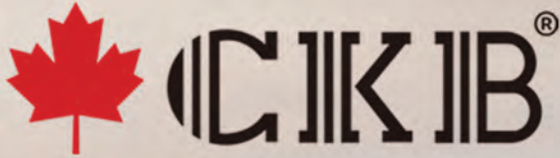
“If you improve the envelope, you make the building more comfortable,” she says. Additionally, “it makes buildings more resilient. If the power goes off in a severe climate event, the [better building envelope] will keep the building habitable, as it will be more likely to maintain a survivable environment.”

Response to the ‘energy hog’ label.

Sanders adds that backstops—and the requirements for higher-performing glazing products—could help the industry counter the narrative that glass façades are poor energy performers. “Backstops drive better products. They give glass a better name. You don’t get issues with gas-guzzling skyscrapers,” she says.

Earlier involvement on projects.

Architects designing a project to meet backstop requirements would likely bring glaziers into the process earlier, says Sanders. “Our glazing contractors complain that people who have a seat at the table with the architects are the HVAC contractors,” she says. “We want a seat



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at that table, and the way we get it is to have the higher-performing products.”

Potential disadvantages

While the panelists acknowledged that there may be some potential benefits, they expressed serious concerns about the potential disadvantages and unintended consequences.

Increased costs of glazing. The panelists note that the performance

caps imposed by backstops could lead to higher costs for glazing products, as project teams would only be allowed to choose from more costly, higher performing value-added glazing options.

Reduction of WWR. An increased use of non-glazing products could lead to a lower window-to-wall ratio.

Zaremba says, “since U-factor caps also cap the ability of glaziers to respond to a building owner’s cost concerns,

performance ‘caps’ will inevitably lead owners to look for alternative ways to reduce costs. That will very likely mean using less glass and more opaque wall area,” he says.

Limited flexibility in glazing design. According to Zaremba, “caps on glazing in the performance path will severely and unfairly limit the flexibility that glaziers need to develop cost-effective glazing packages for ever-increasingly complex commercial buildings.”

Glaziers need this flexibility, Zaremba says, so they can best work with building owners to address a wide range of building conditions, such as different orientations, climate zones, wind loads; requirements for hurricane impact or fire-resistance or seismic conditions; the need for views and natural daylighting; historic applications; and more.

Next steps

The energy codes will continue to become more stringent and will continue to drive use of higher-performing products. However, the way those stringency requirements are set remains uncertain.

The National Glass Association and Glazing Industry Code Council have opposed backstops, due to their potential downsides and limits on flexibility, Zaremba says. “We see, and have always seen, backstops as a detriment and limitation on choices, and we’re opposing them now,” he says. Other industry associations have also agreed with these concerns, with NGA, GICC, AEC, FGIA, and WDMA all voicing similar opposition to backstop proposals during the latest round of proposals for the 2024 IECC (Read more about the industry organizations’ opposition to backstops at glassmagazine.com).

Nonetheless, no matter what happens with backstops in the codes, Zaremba says the positive result of these high-profile conversations regarding the proposals will result in higher-performing envelopes. “This discussion will drive better performance by driving more stringent prescriptive codes,” he says. ■



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Quanex workers handling commercial vinyl extrusions in Kent, Washington, plant.

EXPLORING VINYL FOR YOUR COMMERCIAL APPLICATIONS? IT'S WORTH CONSIDERING

BY JOE ERB



It's no secret that sustainability and energy efficiency are major, still-growing trends in the commercial construction space. New building codes in major municipalities are driving builders and architects to design buildings, and retrofit existing ones, with the highest levels of efficiency in mind. Window and glass systems contribute significantly to a building's efficiency. For commercial professionals, it's worth exploring the available technology to meet today's demands.

Commercial-grade vinyl window systems represent one of those technologies. For years, aluminum and other metallic framing have been the materials of choice for their structural strength and availability of raw elements. Architects and other stakeholders have trusted metallic windows to hold up to the demands of commercial applications.

But metal transfers heat, leading to a huge loss of energy, and that could become a bigger concern as the model code crunch inevitably continues. There have been advancements, of course—thermal break (strut or pour-and-de-bridge) technologies are used to isolate the conditioned space from the outside environment. These basic strategies are not overly complex, but as thermal performance targets become more stringent, these simple thermal break designs become increasingly complex and costly.

Vinyl has the potential to offer a simplified solution. Recent breakthroughs in domestically produced vinyl framing technology can provide the thermal efficiency and structural integrity required in a variety of commercial applications. While not yet widely adopted, high-performance vinyl framing offers a simplified, cost-effective solution to the thermal and structural challenge for most commercial punched-opening and window wall applications. But not all commercial vinyl systems—and not all vinyl suppliers—are created equal. If you're looking to develop commercial vinyl systems, here are some things to think about when vetting a potential vendor.

Support and stability

If you're considering adding vinyl options to your product line, you may be entering new territory in terms of production. While vinyl has dominated the residential marketplace for several years, it's still a burgeoning technology in more challenging commercial applications.

If you're generally familiar with fabricating metallic commercial windows, a vinyl supplier that can help get your new systems up and running can be invaluable. Ideally, your supplier will be able to help you determine some production efficiencies, such as line layout ideas, provide advice on how

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to optimize raw material control, and suggest best practices for assembly or other recommendations. They may be able to help you better understand how to best work with the material and how it behaves. Better yet, if your supplier has a well-rounded understanding of all parts of commercial window manufacturing, they may be able to offer some solid tips for the entirety of your production process.

And if you're new to vinyl, another good quality to look for in a supplier is experience. Selecting vinyl systems that have demonstrated, proven performance in the field and are backed by service and support from a vendor that has established expertise in commercial vinyl applications can be beneficial.

New ways to differentiate

While thermal efficiency is one of the most significant benefits commercial vinyl systems can bring to the table, it's not the only one. Some of today's high-

performance vinyl extrusions provide a wide range of desirable attributes that can elevate commercial spaces. A few of them include:

Sound control. Acoustic performance can be important to commercial construction, especially in multifamily high-rise and hospitality applications that exist in noisy metropolitan environments. The multi-chamber design of commercial vinyl extrusions can mitigate noise, compared to a metallic frame that reverberates more readily. Metallic framing can be designed to eliminate noise through the incorporation of dampening technology as well, but this can make the design and manufacturing process more complex. A fusion-welded, multi-chamber, vinyl profile that helps lessen noise ingress from the busy city bustle can be a striking feature.

Color options. Unconventional color options in vinyl framing have been popular in the single-family residential space for a while, but apartment or

condominium dwellers have desires too. Commercial vinyl technology can pair well with modern color technology. For example, coextruded color technology incorporates color as an integral part of the vinyl profile itself. Coextrusions can deliver outstanding color durability, enhanced scratch resistance versus painting or laminates, and the ability to withstand harsh weather conditions that commercial windows face. Further, they eliminate any labor involved with paint or laminates.

If you're considering vinyl in your commercial offerings, these factors are all highlights worth investigating to ensure you select the right products and providers for your needs. High-performance products that meet increasingly stringent efficiency targets are one thing—but the right supplier can make all the difference. ■

Joe Erb is the national account manager for Quanex.

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Project incorporating both ceramic frit direct-to-glass printing for the design with a custom blue water-based silicone back-painting for this opaque wall cladding application.

UNDERSTANDING IDEAL APPLICATIONS FOR CERAMIC FRIT AND SILICONE COATINGS

BY SPENCER RAYMOND



For wall cladding, spandrel glazing and more, ceramic frit and silicone coatings are two ways to apply color onto glass. Offering a broad array of colors, high-quality ingredients and low volatile organic compounds, or VOCs, both ceramic frit and silicone coatings are go-to glass decoration technologies.

A good understanding of the two options is helpful to assist architects and building owners in determining which approach is better suited for a given application.

What is ceramic frit?

Suited for both exterior and interior applications, ceramic frit is made from finely ground glass mixed with colored pigments. Flood-coat applications are applied using a roll coater or curtain coating process. For more high-end decorative

options, digital inkjet technology can be utilized for direct-to-glass printing.

In either case, the coating is applied and then heat-treated onto a glass surface to create a partial cure. When the coated glass is ready for final processing, the partially cured ceramic frit is then baked into the glass through a tempering or heat-strengthening process. Fritted glass is typically used on the No. 2 surface of monolithic glass, or the No. 4 surface of an insulating glass unit or laminated glass configuration. Surface No. 1 options are also available, which are ideal for bird protection glass.

What are the advantages of ceramic frit?

When digitally applied, the ceramic frit can be adjusted to produce varying levels of opacity or as overlapping designs, depending on the fabricator's production capabilities and level of expertise. High-resolution imagery can be applied, and varying fades and gradients can be created as well.

The silkscreen printing process is exclusive to ceramic frit paint and is best suited when only a single color is required with a large number of repetitive patterns such as lines, dots or holes.

The digital inkjet technology avoids the cost and warehousing of silkscreen printing and is a more cost-effective strategy for producing lower-volume orders, designs with little or no repetition, and custom artwork as all designs are stored digitally, making reordering much easier.

Ceramic frit coated glass is exceptionally durable, scratch-proof and offers glare-free shading.

Applications for ceramic frit painted glass include:

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- Glass marker boards



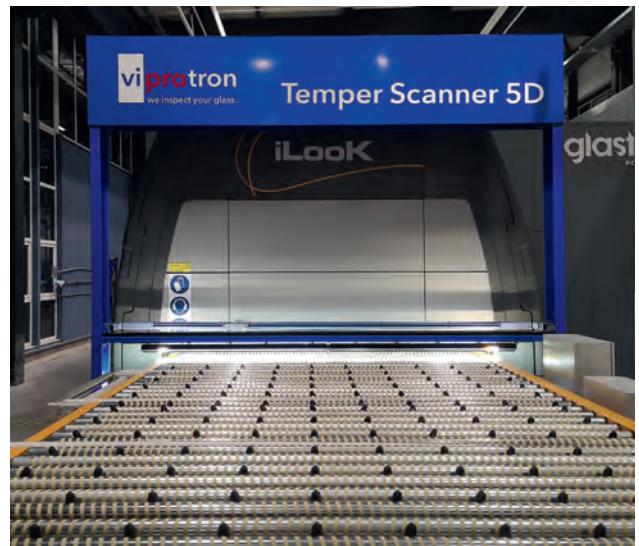
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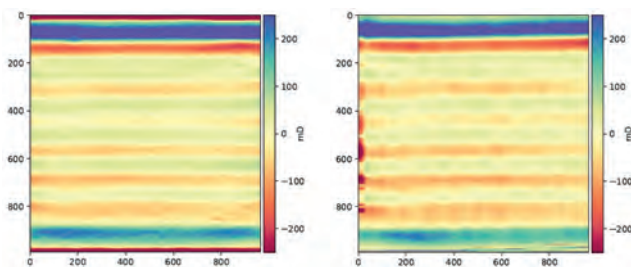
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What are silicone coatings?

Suited for both exterior and interior applications, glass opacification is achieved when a silicone water-based elastomer liquid is combined with colored pigments and applied to the glass substrate.

Flood-coat applications are applied by spraying (automatic or manual), roll coating or curtain coating. Since the coating does not require heat treatment

to cure, it can be applied to annealed, heat-strengthened or tempered glass after the tempering or heat-strengthening processes. Silicone-coated glass is typically used on the No. 2 surface of monolithic glass, or the No. 4 surface of an insulating glass unit.

In addition to regular glass, silicone coatings can also be applied to tinted and pre-approved, hard-coat, low-emissivity, reflective surfaces. Since the

silicone coating has a tack-free rubber-like finish and doesn't require heat treatment to cure, it does not alter the strength of glass and provides fallout resistance for 6-millimeter monolithic tempered applications when applied at 13-millimeter wet film thickness, or WFT. In the rare occurrence that a minor scratch happens, it can be quickly touched up onsite, prior to installation.

Applications for silicone-coated glass include cavity-backed, spandrel, wall cladding, backsplashes, shower walls and glass marker boards.

Comparing the two technologies

Both ceramic frit and silicone coatings offer a very extensive color palette, exact color matching, batch consistency, and are both well-suited for flood-coat spandrel and wall cladding applications. Ceramic frit has added benefits when applied with state-of-the-art digital printing technology, or by screen printing, as it can be used for interior and exterior applications and is ideal for decorative applications, including public art displays and installations where light transmission is desired through the decorated glass.

Ceramic frit and silicone options are both lead-free with low VOCs in liquid form and zero VOCs when cured, but silicone coatings are water-based, which means they are more environmentally friendly. With heavy-metal-free pigment usage, transparency documentation and Red List Free ingredients, silicone coatings qualify as green for sustainably focused building projects.

Spandrel glass units must be tempered or heat-strengthened. Silicone coatings can be used for both tempered or heat-strengthened units, but ceramic frit can only be tempered. For interior wall cladding applications, silicone has the advantage in that it can be applied to annealed glass, whereas ceramic frit again must be tempered.

In the event of 6-millimeter tempered glass breakage, the silicone coating, when applied at 13-millimeter WFT, keeps the broken glass pieces intact, thereby naturally providing glass fallout



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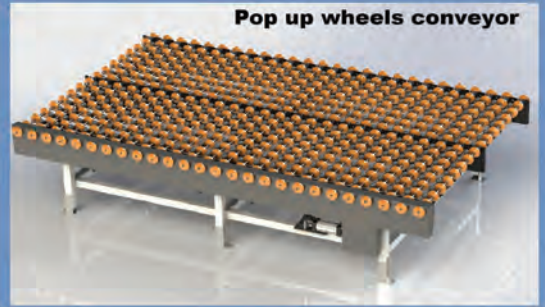
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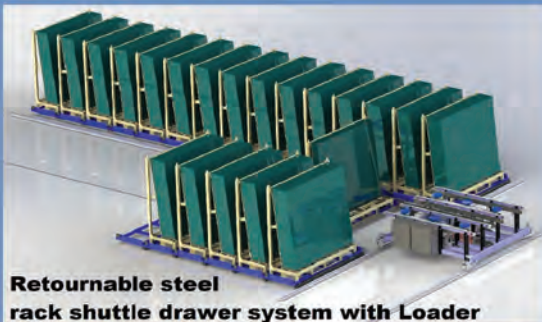
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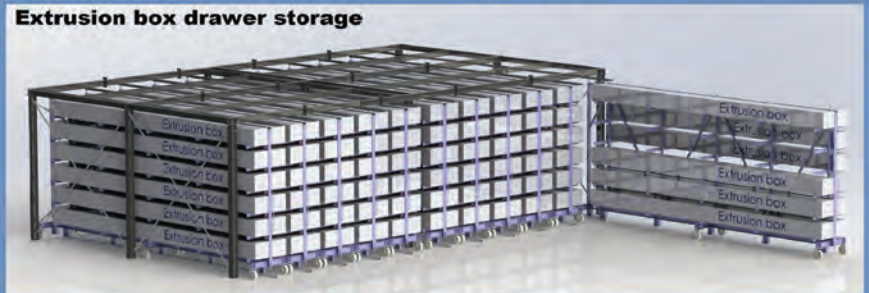
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resistance. An additional film must be applied to the back of the fritted glass to create this same level of protection for ceramic frit.

Silicone-coated glass must be fully cavity-backed and installed in applications that provide no access for human interaction post-installation. If specific levels of solvent and/or water soak resistance are required for interior applications, silicone coatings should be perimeter-sealed for projects like wet backsplashes, shower walls and writable surfaces.

Ceramic frit can be exposed to human interaction post-installation and has higher solvent and water soak resistance, meaning there is increased design freedom for project applications like glass partitions, railings, shower enclosures, marker boards and furniture.

Typical applications

A common application for ceramic frit and silicone paint coatings is a fully opaque spandrel glass for glass façades. Spandrel is non-vision glazing that is typically incorporated into an insulating glass unit and used to conceal areas between floors, or in vertical perimeter areas, where mechanical, electrical, structural systems, components, columns, floors or ceiling lines are located. It is both functional and aesthetic since the spandrel glass must complement the building envelope.

Wall claddings, curtain wall and storefronts are other exterior applications for these color-rendering technologies. For example, designers might specify a creative mosaic of opaque colors in a building's glass façade to achieve an architect's vision.

For decorative applications, ceramic frit can be used to infuse an image, logo or brand message onto the glass façade or wall cladding and may include vision applications such as glass wall partitions, windows, doors, skylights and glass railings where light passes through. ■

Spencer Raymond is a product manager at GGI. He can be contacted at sraymond@generalglass.com.

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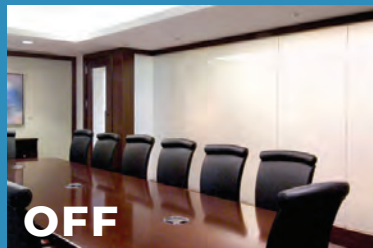
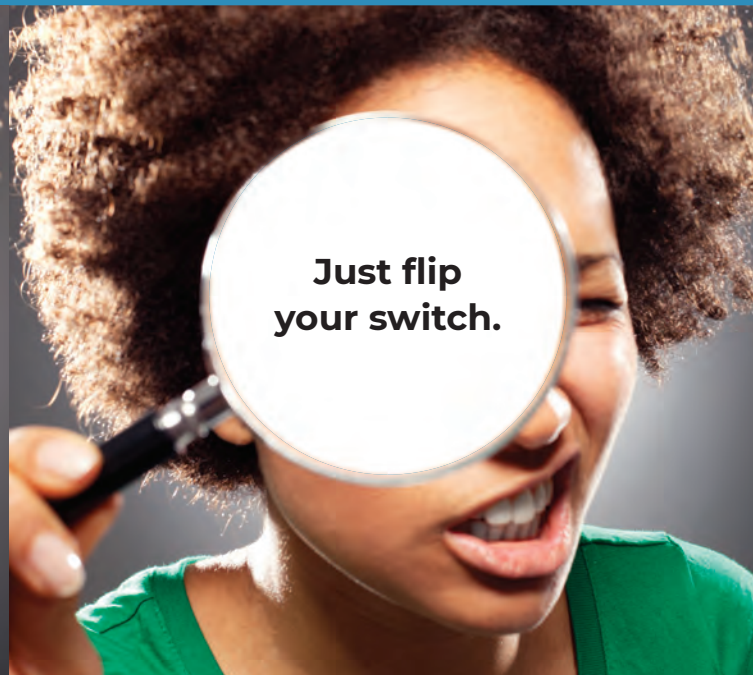
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The new 70 Rainey building, which rises above the Austin skyline at 34 stories, incorporates Solarban R100 Glass. Designers selected the product for its ability to achieve energy requirements without sacrificing the visual clarity which allowed residents to appreciate panoramic views. Win-con was the glazing contractor and Northwestern Industries was the glass fabricator. Photo by Albert Vecerka /Esto



**FLOAT
PRODUCERS
OVERCOME
SHORT-TERM
HURDLES
AS THEY
PLAN FOR
LONGER-TERM
INDUSTRY
CHANGE**

By Norah Dick

For the global glass industry, 2022 was a dramatic year, to say the least. The Russian invasion of Ukraine in February, an ongoing conflict which as of this writing does not have an end in sight, destabilized lives, countries and industries. The conflict has severely affected energy supply to Europe, causing the price of natural gas to surge, further adding to costs and causing cascading effects around the world.



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Guardian Glass's Kingsburg, California, float glass plant.



These challenges piled on top of a situation that was already complicated by continued supply issues from a global pandemic. As floats come online, change hands or go offline, companies mitigate shorter-term instability, while also planning for long-term success by exploring sustainable solutions.

North American supply to remain tight in 2023

Glass demand is likely to again outstrip domestic glass production in North America in this new year. Stephen Weidner, president and head of Architectural Glass North America and Solar Products Groups, NSG Pilkington, says that market demand continues to grow about 2 to 3 percent per year. “That equates to almost a need for a new float not exactly every year, but every other year,” he says.

The strain on domestic supply hits

downstream companies hard, as most raw glass comes from North American manufacturers. Glass Magazine’s Top Glass Fabricators survey, which gathered responses from leading fabricators in North America, found that 95 percent of domestic fabricators sourced raw glass from North America in 2021, 24 percent from Europe and 18 percent from Asia.

NSG’s Weidner estimates that about three float lines worth of glass are imported offshore, comprising about 8 percent of total supply in North America. This last year, that supply was severely restricted due to China’s continued COVID lockdowns. “With the COVID restrictions and the lockdowns, the periodic opening and reclosing, the amount of glass coming out of China was severely restricted around the world,” he says.

Despite the gap in domestic supply, no significant new float construction is likely, Weidner says, due to the cost

and lead times of raw materials needed for a new plant. As of this writing, the only addition to North American float supply is coming from Vitro, which is in the process of adding a third float line to its Garcia float plant located near Monterrey, Mexico.

Canadian Premium Sand, a silica sand producer, now in the process of planning and constructing a new solar glass facility in Selkirk, Manitoba, has no specific plans to include traditional float lines at this time, says President Glenn Leroux, though future phases of development could see an expansion of glass product types, depending on market demand.

In addition to supply, inflation remains a huge headwind for customers of float companies in North America. “Inflation will continue to have an impact as we move into fiscal year 2023,” says Weidner. “Some commercial developers seem to be delaying because of the costs of the project.” Weidner

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feels North America will see flat to low single-digit growth from a demand perspective.

Mark Seeton, vice president of sales for Vitro Architectural Glass, says the challenges facing the industry remain complex. “Our customers and Vitro, alike, are definitely facing challenges due to inflation, ongoing supply chain challenges, labor supply, as well as increases in the cost of raw materials needed to produce a wide range of architectural products.”

Global investment continues, but an energy crisis challenges production

While major investment in the North American market remains unlikely in the near future, Mexico-based Vitro Architectural Glass is expanding markets, investing in two facilities in Egypt,

according to an official statement by the Egyptian Cabinet. The \$400-million investment will be exporting product. Saint-Gobain, which already operates a float plant in a joint venture with Şişecam in Egypt, also showed interest in expanding in this market, according to reporting in Zawya. The building materials company announced it will be adding two new facilities, which between them will produce flat glass for local and export markets.

The European market, of course, saw major stresses this year. Due to the continued war in Ukraine, Guardian Glass ultimately decided to sell its two float manufacturing facilities in Russia, which affected 600 employees.

The fallout from the war has also meant energy surcharges, especially in Europe, a significant headwind for glass-making, an energy-intensive

The UCI Middle Earth Housing Expansion, located in Irvine, California, features Vitro's Solarban 67 glass. Kovach Building Enclosures was the glazing contractor, and Northwestern Industries Inc. was the fabricator. Photo by Tom Kessler Photography.

sector. Data reported by the European Central Bank estimates that in 2019 Russia's energy production accounted for 16 percent of the global supply of natural gas, and the European Union is particularly dependent on Russia for these imports. AGC Glass France announced in October that the company would be closing its Boussois Industrial Unit in France, citing the energy crisis as a major reason. The facility had two float lines.

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To weather instability, Şişecam, a float producer based in Turkey, are exploring ways to ensure consistency through vertical integration. “This new era is characterized by volatile conditions globally,” says Şişecam Chairman of the Board Prof. Dr. Ahmet Kirman. “The ability to adapt effectively to changing conditions due to breaks in the supply chain is now one of the most important competencies that we should all have.”

To weather supply chain issues early in 2021, the company purchased the refractory material manufacturer Refel, in order to help stabilize the company’s lead times. “The acquisition of refractory manufacturer Refel will ensure that the supply risks Şişecam may face will be eliminated,” says Kirman. “The acquisition will remove any obstacles to realizing our investments in the planned schedule and reaching capacities that are in line with our growth projections at the right time. The Refel acquisition will positively affect our profitability and will ensure sustainability in Şişecam’s manufacturing investments. Acquiring Refel will strengthen Şişecam’s strategic position in the European and global glass industry.”

The Inflation Reduction Act opens a new market for photovoltaic glass in North America

Canadian Premium Sand, a silica sand producer, made headlines in 2021 when they announced intentions to build a new architectural glass facility in Canada, representing a return to architectural glass manufacturing. Since the original announcement, the company has shifted to focus on solar patterned glass which will supply manufacturers of photovoltaic modules, an industry which is emerging quickly in the North American market due to the incentives provided in the Inflation Reduction Act.

“[The Act] was a pivotal event in the industry,” says CPS’s Glenn Leroux. “It gave 10 years’ stability to solar manufacturers, so they feel comfortable expanding. We’ve heard existing companies [in North America] are going

WHAT’S THE FUTURE OF FLOAT FURNACES?

As companies in the industry face stricter energy-efficiency standards for manufacturing, many are working to innovate technologies and fuels that will make float production more energy-efficient. One person working on this part of greener industry is Erik Muijsenberg, vice president, Glass Service, which provides research and technology in glass melting, among other services. He says there are a few technologies architectural glass producers can consider as possible alternatives to fossil fuels, now or further in the future.

Hydrogen

NSG/Pilkington has shown that float manufacturing can be powered by hydrogen fuel. Hydrogen can be stored for long periods and transported long distances, says Muijsenberg, both advantages. Unfortunately, “green hydrogen,” or the most sustainable hydrogen, is not currently available in large enough quantities for manufacturing.

“Green hydrogen” is produced by electrolysis, using renewable electric energy. This type of hydrogen is also still too expensive to compete with natural gas. So today most available hydrogen is actually derived from natural gas via a methane steam reforming process and ideally capturing the carbon emission from it.

All-electric melting

Another option is all-electric melting, which has a proven history in manufacturing as well, says Muijsenberg. All-electric is twice as thermally efficient as fossil fuels, produces no emissions and generates no dust, meaning manufacturers have no filter investment, and would save on cleaning costs. The setup has similar cost barriers, as well as production barriers; producers are limited to less than 80 tons per day of glass with an all-electric setup, on average.

Hybrid melting or “electric boosting”

Hybrid melting means manufacturing using more than one heat source. Muijsenberg compares it to hybrid cars, where a battery-driven electric motor adds extra power to a car’s engine, the main power source. The electric boosting/melting is more efficient than combustion of fossil fuels, where about half of the energy disappears with the waste gas. This method still uses combustion, but 50 percent or more of the energy comes from electric heating. Hybrid melting allows for flexibility, as it does not require full dependence on electricity.



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NSG Group's Rossford, Ohio, float glass plant, with its new 1.4 megawatt photovoltaic solar array. The array was installed earlier in 2022, and is operated by AEP OnSite Partners. The array will provide energy to the facility for the next 20-plus years under a power purchase agreement.

to double or even triple capacity, and there are a lot of new entrants to this market. They are extremely motivated to buy from us, and they can't wait for us to produce glass."

NSG's Weidner says NSG has seen a similar "dramatic influence" of the IRA on PV investment. The new Act will incentivize PV manufacture, as well as products like smart windows, he says, but PV manufacturers, like others in the glass industry supply chain, will continue to face challenges due to the tight North American glass supply.

Working to achieve climate goals, major float companies develop low-carbon glass

Sustainability was a major theme at

this year's glasstec, the international tradeshow held in Dusseldorf, Germany. A major event of the proceedings was global player Saint-Gobain's formal introduction of its Oraé float glass, which represents a 40 percent reduction in embedded carbon. The reduction was achieved by maximizing pre-consumer cullet—about 70 percent—with a process powered by renewable electricity.

AGC Glass Europe also announced in July 2022 that the company would release a low-carbon glass range. "Following advanced testing and successful production trials, the company will be producing a new low-carbon glass range, with the possibility of delivering the first orders by the end of 2022," said officials, in a company release.

At a press conference for the official

release, Saint-Gobain representatives emphasized that while Oraé low-carbon glass meets current aesthetic standards of clarity, they are looking to architects to decide how to balance aesthetics, performance and energy consumption in future. "We need architectural leadership to show what that new glass is. What should it look like?" asked one of the Saint-Gobain reps.

Given the interest in reusing glass, there is also a conversation about creating a circular economy, providing an infrastructure for industrial glass recycling. Guardian Glass sees this focus continuing into 2023. "As a company, we are looking for ways to increase our consumption of cullet ... in our batch. As part of this, we recently completed a trial using 60

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percent cullet,” says Jacob Kasbrick, director, commercial segment and technical services, Guardian Glass North America. “We are continuing to investigate ways to increase our use of different types of internal and external cullet, including cullet from fabricators, installers and recyclers in our furnace, and the impact it has on our equipment, the energy consumption of our furnace, the glass quality and the embodied carbon of our products.”

Exploring sustainable manufacturing

In addition to addressing the embedded carbon of its products, the float industry continues to innovate in

making manufacturing greener.

After successfully pulling architectural glass using hydrogen power last year, Pilkington UK powered its St. Helen’s facility furnace with biofuel. Made of organic waste materials, the fuel powered the glass furnace for four days, creating 165,000 square feet of glass, and represents an almost 80 percent reduction in carbon emissions compared to natural gas.

Innovating energy type is not new, as shown by Vitro Architectural Glass, which pioneered oxy-fuel technology in the 90s. “[This technology] can reduce energy consumption by as much as 20 percent and cut greenhouse gas emissions in half. In addition to using oxy-fuel technology at three of our

plants in the U.S., Vitro also licenses this technology to other glass manufacturers around the world seeking to reduce their CO2 and other greenhouse gas emissions,” says Ricardo Maiz, president.

Guardian Glass continues to improve the energy efficiency not only of its furnaces, but also its other float equipment. “The Guardian Glass Kingsburg plant in California developed a bottom-up solution to reduce energy consumption and material wastage during periods of inactivity at its coater,” says Kasbrick. “This process is scalable to any of our glass coaters and has also been implemented at our Guardian Glass Geneva plant in New York.” ■

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23

PREPARE FOR WHAT'S NEXT WITH 10 TAKEAWAYS FROM LEADING CONSTRUCTION ECONOMISTS

By Katy Devlin

C A S T

ONE—

The overall U.S. economy is headed for a slowdown

The U.S. economy is already showing early signs of a slowdown in response to notable economic concerns, such as inflation and rising interest rates, and geopolitical uncertainty, most notably from the continuing conflict in Ukraine. That slowdown will be felt in some—though not all—parts of the construction economy in 2023, according to leading building sector economists.

“There is a growing list of troubling indicators for the broader economy,” says Kermit Baker, chief economist for the American Institute of Architects.

“As the clouds of uncertainty mount on the fate of the economy in 2023, the

construction sector has already started to feel the impact of rising interest rates,” says Richard Branch, chief economist for Dodge Construction Network. “The Federal Reserve’s ongoing battle with inflation has raised concerns that a recession is imminent in the new year. Regardless of the label, the economy is slated to significantly slow, unemployment will edge higher, and for parts of the construction sector it will feel like a recession.”

TWO—

Geopolitical concerns could upend forecasts

The economists note that all forecasts are based on current conditions. Any number of major domestic or international events could upend projections for the coming year. “Our forecasts assume that nothing else crazy happens in the world. What are those elements: China, Taiwan, further violent escalation in Ukraine, sustained production cuts from OPEC. There’s talk of a rail strike—that could be a revolutionary event,” says Branch. “We are walking on the razor’s edge. And in our estimation, there is a very narrow path to avoiding a technical recession.”

THREE—

Inflation will slow, and interest rates will peak in 2023

Despite the slowdown, construction industry companies should see some relief from rising costs as inflation begins to moderate. “Inflation seems to have crested,” says Baker.

Additionally, firms should also expect interest rates to peak in mid-year 2023 at 1.0 to 1.5 percentage points above current levels, says Baker. “The Fed is expected to begin cutting interest rates by late 2023 or early 2024,” he says.

FOUR—

If there is a recession, it won’t be a repeat of 2008

Baker estimates that any potential recession in 2023 will be short-lived—“at about eight months”—and less severe.

Branch adds, “Next year will not be a repeat of what the construction sector endured during the Great Recession when the financial system collapsed. Residential construction, already reeling from rising mortgage rates, will continue to contract and will be joined by nonresidential construction as the commercial sector retrenches. The funds provided to the construction industry through the Infrastructure Investment and Jobs Act, the CHIPS and Science Act, and the Inflation Reduction Act will counter the downturn, allowing construction to tread water. During the Great Recession, there was no place to find solace in construction activity; 2023 will be quite different.”

FIVE—

Big-picture construction indicators offer a mixed picture for 2023

One key indicator for future industry performance began to show signs of weakening in late 2022. The Architectural Billings Index from the American Institute of Architects provides a glimpse at construction activity nine to 12 months down the road. Following a very positive 2021, readings continued in positive territory throughout the first three quarters of 2022. However, the October reading fell to 47.7 (any number below 50 indicates a decline in design firm billings).

“Economic headwinds have been steadily mounting, and finally led to weakening demand for new projects,” says Baker. “Firm backlogs are healthy and will hopefully provide healthy levels

of design activity against fewer new projects entering the pipeline should this weakness persist.”

However, the Dodge Momentum Index posted increasingly strong numbers throughout 2022. The DMI is produced by Dodge Data & Analytics and measures the initial reports of nonresidential building projects in planning, which provides a roughly 12-month forecast for future construction spending.

In October, the DMI increased 9.6 percent over the previous month, led by a massive performance in the commercial building segment (up 13 percent) in addition to smaller gains in institutional building (up 2.9 percent).

“The sustained upward trajectory in the Momentum Index shows optimism from owners and developers that projects will continue to move forward, even with rising concerns of an economic recession,” says Sarah Martin, senior economist for Dodge Construction Network. “Specific nonresidential segments, such as data centers and life science laboratories, have thrived in 2022 and continue to support strength in planning activity. As we move into next year, however, labor and supply shortages, high material costs and high interest rates will likely temper planning activity back to a more moderate pace.”

SIX—

Economists eye retail, hotel and health care for growth in 2023

Leading construction forecasts vary in projects for the coming year, ranging from more optimistic (a 6-percent increase in nonresidential spending, per the AIA Consensus Construction Forecast Panel), to a more tempered outlook (a 3-percent dip in overall construction spending, when adjusted for inflation, from Dodge Construction Outlook).

Segments to watch:

Retail and hotels could be a bright spot in the coming year. ConstructConnect forecasts an impressive 11.8-percent growth in retail for 2022 and another 3.8-percent gain in 2023. Meanwhile, the hotel sector is an “upside surprise,”

says Dodge’s Branch. “It’s revenge travel. Planes are full, hotels are full. It’s hard to get a rental car. The occupancy rate in the third quarter [of 2022] was at 76 percent.” Branch says the sector is expected to “eke out mild gains” in 2023.

Projections for **commercial office** spending vary across the forecasts. ConstructConnect anticipates a rebounding year in 2023. The segment, which has suffered double-digit declines in recent years (including a 29.2-percent falloff in 2020), could rebound in 2023, with projected 15.2-percent gains, according to Alex Carrick, ConstructConnect’s chief economist.

However, Dodge anticipates the sector will “continue to underwhelm,” says Branch. “The real core of new office construction will be pretty bleak in 2023,” he says. That said, the long-term forecast for the segment is more positive. “What happens if there is a recession? You’ll see more job losses. And that could alter the balance of power [between employers and employees], which could start to push people back into the office,” he says. “There is upside potential once we get further down the road.”

Health care, including hospitals and clinics, built off a monster year in 2021 where it saw a 40.3-percent uptick in spending, with an additional 7.7-percent increase in 2022. In 2023, the sector should increase a more modest 3.2 percent, with additional gains coming through 2026, according to Carrick.

“We are seeing a huge uptick in hospital projects, which is pushing spending considerably higher,” adds Dodge’s Branch.

Education spending was up 17.7 percent in 2022. The sector is forecast to slip 1.2 percent in 2023, according to ConstructConnect, but should see gains of at least 5 percent from 2024 to 2026. Dodge, however, offers a more optimistic forecast for education, with 5-percent projected growth in the coming year. “Traditional education starts (classrooms) have languished as slow demographic growth eats away at overall demand; however, life science buildings have flourished and will continue to do so in the new year,” according to the Dodge Construction Outlook.

SEVEN—

Slowdown has already started for residential construction

Residential spending, which was among the strongest of segments in 2020 and 2021, has already started to falter and is expected to continue its decline in 2023. The residential sector is expected to constrict by 2.7 percent in 2022 and to fall another 0.4 percent in 2023, according to ConstructConnect. “There’s been extraordinary strength in residential construction over the last several years, which is about to subside and give a higher weighting to nonresidential work,” says Carrick.

The Dodge Construction Outlook also shows slowdowns in residential, with single-family starts down 5 percent when adjusted for inflation, and units will fall 6 percent. Multifamily will also drop 7 percent when adjusted for inflation, and units will fall 9 percent. Though, Branch notes the downturn for residential will be “pretty mild.” “The sector is three million units shy of full supply. Once it gets its legs back, we see stronger growth for single-family. For multifamily, we don’t think that recovery happens until early 2024,” he says.

EIGHT—

Construction inflation is easing

The construction sector should see an easing in material costs in the coming year, says Ken Simonson, chief economist for the Associated General Contractors of America. Material input costs have been slowing. Meanwhile, bid prices, which were sitting well below input costs, have increased, relieving some cost pressures for construction firms.

“We’ve seen huge declines in lumber, steel and aluminum. But we’ve seen increases for plastics, gypsums, cement concrete and architectural coatings,” says Simonson. “It really is quite a different story depending on what materials contractors buy.”

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cost changes, 11 materials have seen prices decrease in the third quarter of 2022. And among the other four, none have increased more than 4.5 percent, according to Carrick. “There are still some stunningly high year-over-year cost advances ... but the latest three-month results show clear signs of moderation,” he says.

NINE—

Labor struggles may ease in 2023 for nonresidential construction

Construction labor could also be a bit easier in 2023, in part due to the slowdown in the residential market. As of October, residential construction employment was up 6.8 percent compared to pre-pandemic levels. However, nonresidential employment recovery has continued to lag. It sits 2.3 percent under pre-pandemic levels.

“This could be helpful to nonresidential contractors. [The residential slowdown] frees up some workers who would be needed in nonresidential,” Simonson says.

However, Simonson notes that long-term issues remain. “One reason contractors are not able to build up employment levels [is that] there just aren’t enough workers out there. Openings are at an all-time high. ... The industry wants to hire twice as many people as it was able to bring on board,” he says.

Adding to labor challenges are construction wages. “Other industries have increased pay more sharply than construction. ... Industries that paid minimum wage boosted pay to \$16 to \$18 an hour,” Simonson says. Adding to the challenges, “construction work has to be done onsite in any kind of weather starting early. Other jobs offer more flexibility,” he says. “Construction will have continued difficulty filling jobs.”

TEN—

Long-term outlook points to a net-zero energy revolution

The world is headed toward a net-zero energy revolution, which will offer major growth opportunities for the construction industry, says Carrick. “I am really optimistic about the outlook for construction over the longer term,” Carrick says. “There is a longer-term movement underway that will be as important as the industrial revolution and the technology boom. The whole world is moving toward [net-zero energy] by mid-century. ... This will have huge implications.”

Carrick’s outlook for the net-zero energy revolution includes: more renewables, a proliferation of NZE-related mega projects, green-friendly spending initiatives (such as those in the Inflation Reduction Act) and more. ■

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From left to right: Brian Frea, Rob Gardner Black and Greg Gronthoff.

GLASSFAB LOOKS TO THE FUTURE

HOW A CALIFORNIA-BASED GLASS FABRICATOR IS PREPARING FOR THE CHALLENGES AND OPPORTUNITIES AHEAD



BY KATY DEVLIN
ASSOCIATE
PUBLISHER,
EDITOR-IN-CHIEF

The glass industry is poised for tremendous growth and change in the coming years. Architects and owners continue to demand larger sizes with more minimal sightlines, higher-performing glass products to meet increasingly stringent energy codes, and multifunctional glass products that can protect occupants while meeting myriad additional requirements. Additionally, many glass businesses are changing. The experienced generation of glass industry leaders is moving to retirement and companies are tasked with managing succession plans while finding and training a new generation of glass professionals.

In late 2022, I interviewed a trio of leaders from Glassfab Tempering Services Inc. about how they are preparing for the challenges and opportunities that lie ahead. Glassfab is a glass fabricator based in Tracy, California, that has grown tremendously over its 16-year history. The company started as an eight-person shop in 2006, looking to produce high-quality heavy fabricated tempered glass for the expanding shower door and glass partition business. Today, it operates four manufacturing facilities and employs over 300 people. The company offers a wide range of glass fabrication capabilities, including tempering, insulating, laminating, digital printing, jumbo sizes, hardware, Solarfab and more.

In recent years, Glassfab leaders have been actively pursuing new investments to meet evolving market demands, all while undergoing a major management transition as several founding members of the team move toward retirement. I spoke with Rob Gardner Black, president, Brian Frea, COO, and Greg Grothoff, vice president of strategic business development, about this transition and the company's trajectory going forward. Frea has been with the company since nearly the beginning, starting as vice president of operations in 2007. Meanwhile, Black joined the firm in 2015 as operations manager and Grothoff in 2021 as part of the company's efforts to build a new generation of leaders.

Glassfab is currently at a pivotal moment in terms of management succession. What has the company done to prepare and execute its succession plan?

Brian Frea: We have made a sizable investment in our people. The succession plan started back about 10 years ago with the next generation. This group is smarter, more creative and thinks outside of the box, while supportive of the culture that drives us as Glassfab.

Greg Grothoff: The challenge of people provides us with our biggest opportunity to train the next generation at all levels. Cross-training our employees creates the opportunity for advancement within our organization and helps our employees grow their careers. We are intentional in our approach of cross-department and cross-function training, which provides the platform to

grow. This will fuel our geographical expansion as well as set the foundation for future generations of leaders. We also utilize tools provided by industry partners such as myglassclass.com, as well as vendor partner experts who provide onsite training for our staff. We feel this is the best way to fuel our growth and create the next generation of leaders at all levels.

Rob Gardner Black: Initial exposure comes from hands-on experience working in customer service, procurement, production, equipment installation and maintenance, for example. The next generation of supervisors, managers and leadership all have a granular understanding and deep working knowledge of the business, industry and customer needs. In conjunction with this learning, the Glassfab culture is a pivotal aspect of our company as it guides not only how we embrace our customers but our employees too. At Glassfab we believe that ‘culture will eat strategy for lunch every time.’ Using a system of progressive overload, future leaders work through positions of increasing responsibility and opportunity during which mentoring and results are used to assist and refine performance.

What changes are coming to the glass industry, and to Glassfab, in the next 10 years?

BF: The future of the glass industry will require more innovation and technology to keep up with growing demands. [Building integrated photovoltaics] and Solarfab are two examples. For Glassfab, looking ahead, we are going to continue to focus on profitable and manageable growth—on making the right investments into our business that will add the most value to our customers.

RGB: We’re seeing a continued increase in oversized regular insulating glass and laminated IG. Asymmetrical IG is also becoming very popular and is

driving the anisotropy aspect of quality control.

GG: I agree with Rob. We will continue to see an increase in overall glass size, especially in podium applications. There will be an equal push to drive energy performance in post-temperable coatings combined with new technologies like vacuuming IG. Finally, we will continue to see massive growth in laminated security applications. ... For Glassfab, our growth will occur in both new products and new geographies. Our next major addition will be on the architectural aluminum side of the business. I’m very excited about the move into this side of our industry. Soon we will also offer bent-tempered products, which is something we have not offered before.

What are some major market shifts happening in the industry and how is Glassfab prepping for those changes?

GG: The industry seems to have shifted to larger independent fabricators stepping up and servicing the industry with a focus on localized customer service. I believe we will also see major advancements in post-temperable, low-emissivity glass advancing high visible light while meeting the values that allow us to win the battle for the wall. In some of these cases, we will see these low-e’s combined with [vacuum insulating glass]. I also believe we will continue to see a bigger shift to value-added security glazing products.

RGB: Anisotropy measurement and classification are being seen more often. ... To better support this growing trend, Glassfab purchased the latest generation of LiteSentry measurement equipment that combines RWD and anisotropy. Large-scale digital printing using vibrant and more complicated designs is being specified by architects as the benefits and almost limitless capabilities of digital printing are being seen by a wider audience. These are

being used in building façade designs, sky bridges and canopies. Glassfab has the largest Dip-Tech ERA digital printer that can print oversized lites, which can also be laminated in our oversized laminated line offering customers both flexibility and many options when it comes to design and product styles.

Glassfab has experienced rapid growth in recent years. What capital investments have been made and what drove these investments?

BF: Glassfab made a sizeable investment three years ago when we purchased the new 36-acre/210,000-square-foot under-roof [facility] in Tracy. ... The new site allows us to expand using the most advanced industry equipment. We can conquer the quality expectations through the eyes of the end user and meet market demands for better quality glass products.

RGB: We’ve added oversized tempering, digital printing and laminated to better serve the need for larger-sized glass. Customer feedback is the biggest driver [of investment]. As our customers come across new products, requirements and trends, they partner with us and we look to respond with appropriate manufacturing equipment, products or distribution tools.

GG: The well-being of our employees and their families, vendor partners, and overall community drive our capital investment strategy. We have added multiple buildings and countless pieces of equipment, but our biggest investment lies in our people, which have fueled our exponential growth over the past 16 years. ■



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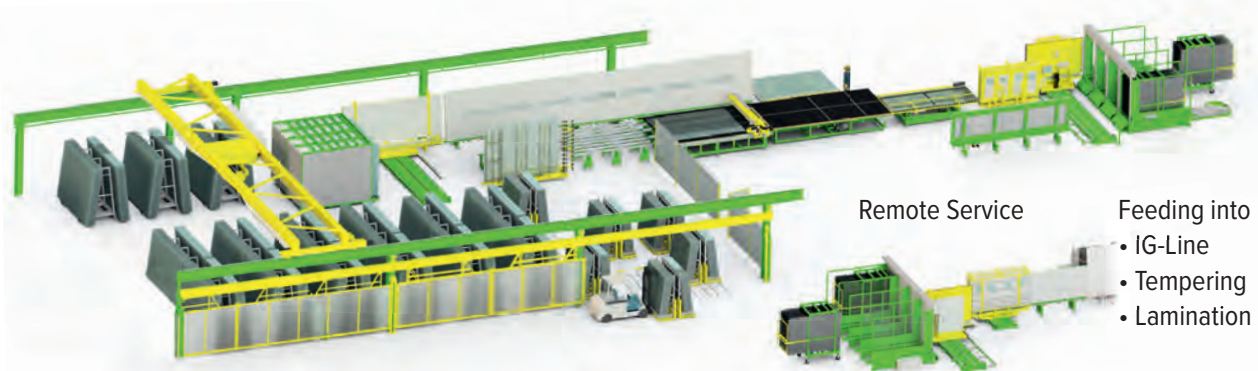
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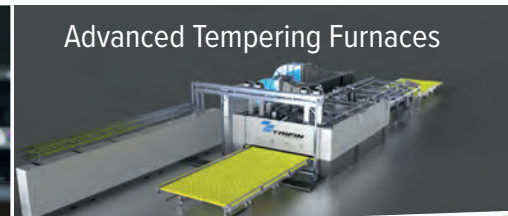
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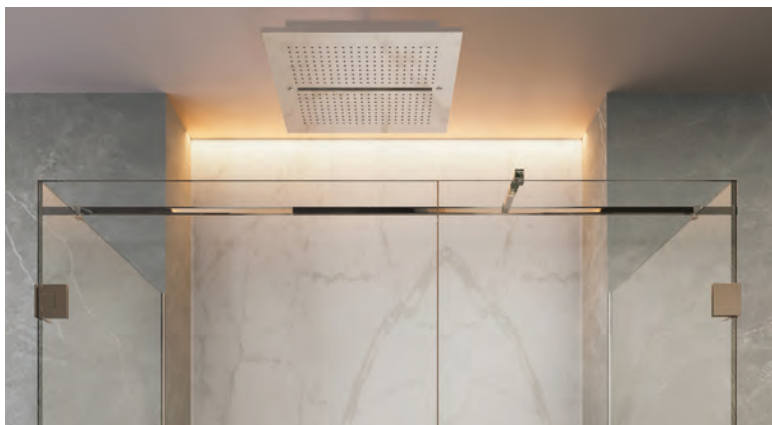
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01



02

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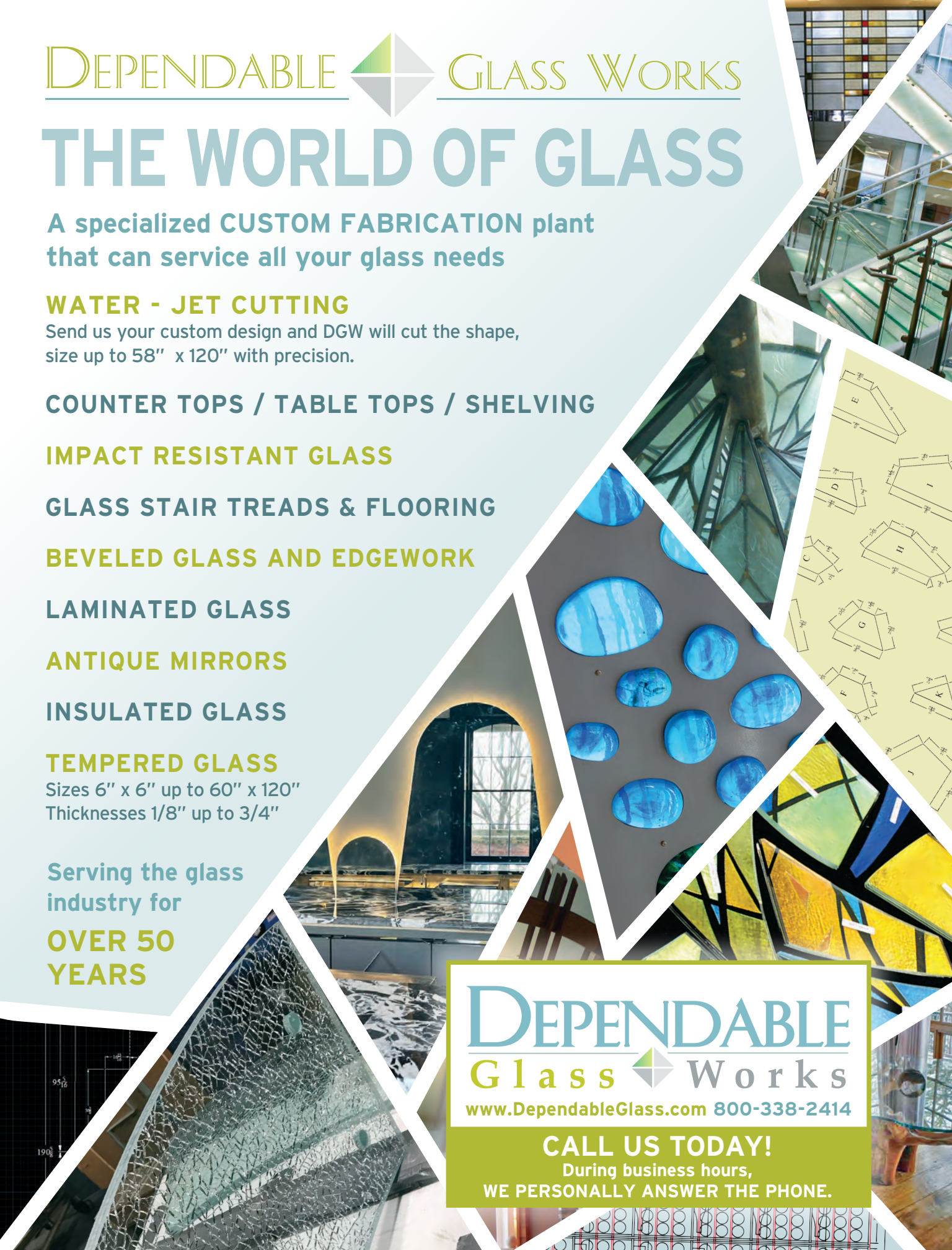
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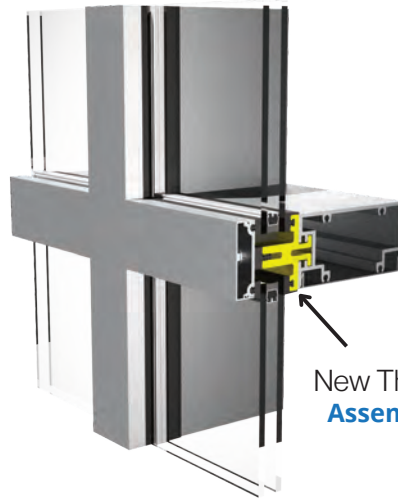
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It is well documented that as much as **40%** of all energy consumed in this country is used to heat and cool buildings. Of this, as much as **45% is wasted by escaping out of inefficient window systems**. This results in a \$20 billion loss each winter in commercial building operations. In addition, buildings account for nearly 40% of our annual carbon emissions through construction and operation. **The current pace of code reform will NOT allow us to meet global carbon reduction goals.**

Most commercial buildings share a common design element – curtain walls. When we consider design improvements to curtain wall systems over the past 50 years, there have been only marginal gains regarding overall thermal performance. When looking at the final assembly, thermal performance has only improved from an R-2 to R-2.7... **Is that really the best we can do?**

This is mostly credited to the glass. In the same timeframe, thermal performance of glass has increased by **10 times!** This has allowed manufacturers to keep up with the incremental changes in codes, while ignoring the framing. Our global carbon issues place us in a position where we can no longer ignore the weakest link. We **MUST** demand advanced technologies in all curtain walls and thermal barriers to make an impact on reducing carbon emissions.

The old technologies have limitations in thermal performance, design, and structural integrity that limit their effectiveness. However, there are a few manufacturers in the industry that have invested heavily in research and development of new thermal barriers and product designs that substantially improve thermal performance of the frame and overall assembly of the curtain wall.



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Because of these new technologies, the market now has access to curtain walls that perform up to **35% better than the market's previous best**. The demand for more efficient systems will continue to move codes in a direction that will require other manufacturers to design and develop advanced framing technologies that will meet these demands- which some are struggling to do.

HIGH Performance = HIGH Cost **WRONG**

A common misconception in our industry is that high-performance requires a higher cost for the building owner. High-performance curtain walls will save building owners hundreds of thousands of dollars. The right system can improve a buildings' performance allowing building owners to downsize and/or eliminate mechanical requirements (perimeter heating and cooling) bringing costs down. In addition, building owners will save thousands of dollars each year by reducing energy used to heat/cool their building.

If architects and general contractors collaborated with manufacturers/suppliers in the schematic phase of a project, they would be able to provide building owners the best performance, at the best price point - together we could provide economic solutions that will minimize every building's carbon footprint.

"The GREENEST energy is energy we do NOT use."
-Todd Frederick, Owner of FreMarq Innovations Inc.

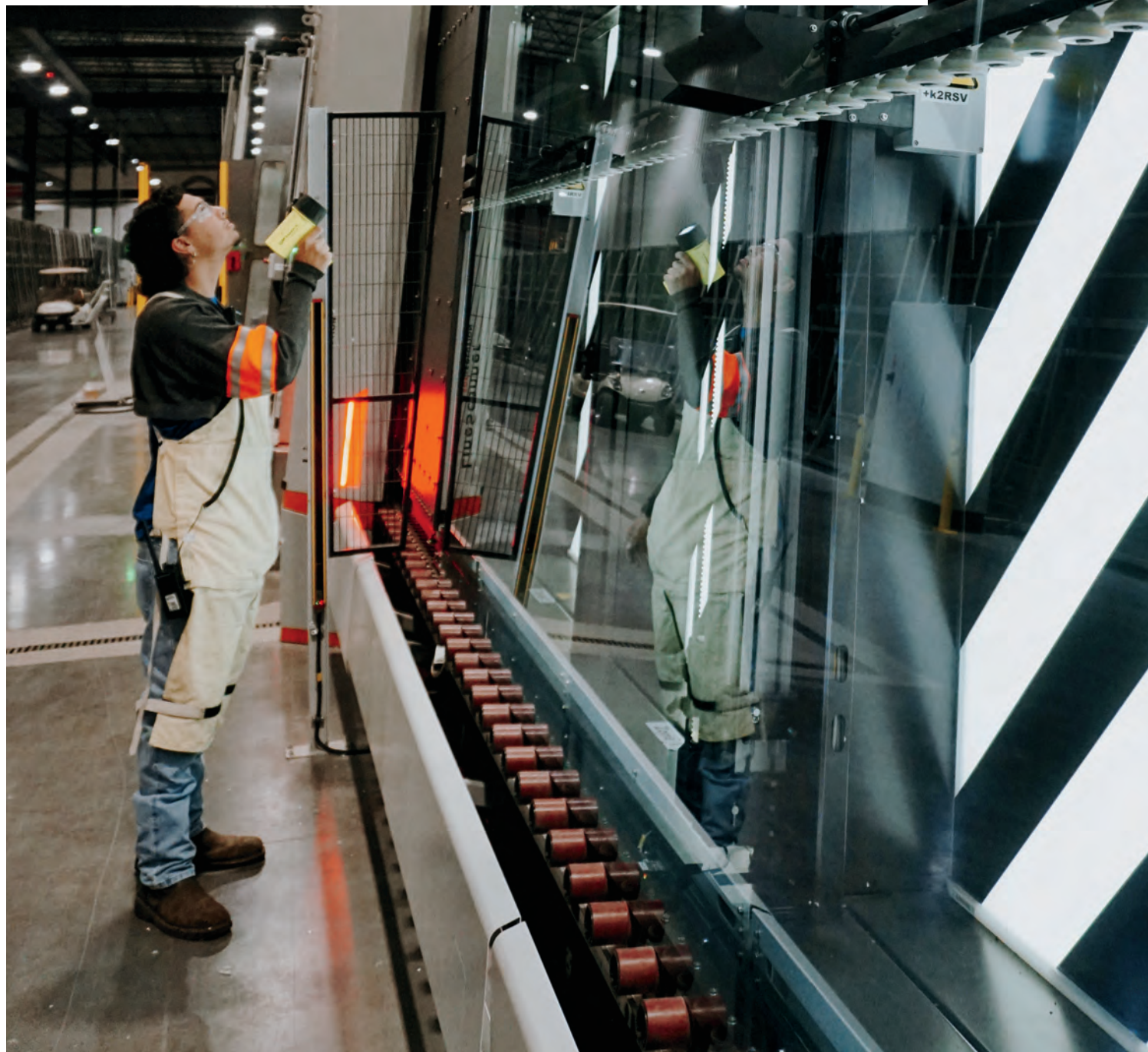
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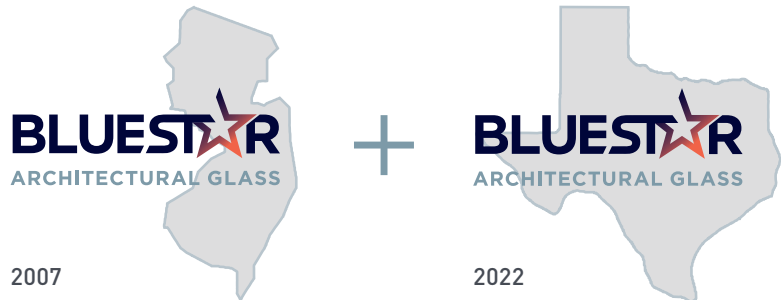
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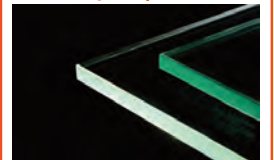


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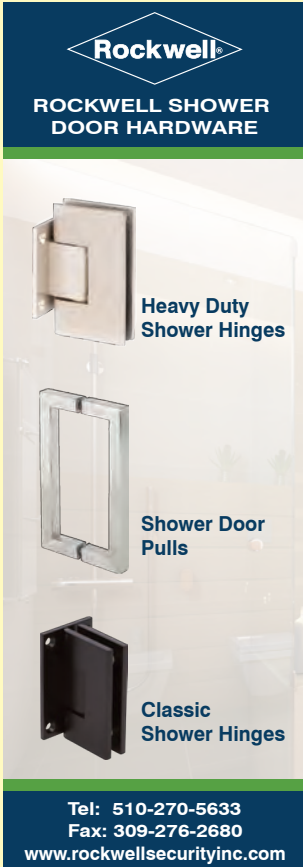
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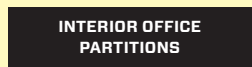
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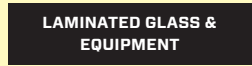
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THE MUSINGS OF A VERY PREGNANT FENESTRATION INDUSTRY WORKER

BY SARA BARCHAK



As I type this, I find myself in the unique position of simultaneously feeling the baby my body is creating hiccup inside of me. Type. Hiccup. Type. Hiccup.

The few weeks left until this little girl makes her grand entrance into the world seem impossibly short. My days are filled with doing my best to remain focused on the work tasks at hand, while my evenings revolve around preparing my husband's and my world to change dramatically and irreversibly. It's an interesting dichotomy. One that billions of women have had to juggle and navigate before me. How is it that something so common also seems revelatory and difficult?

Working while pregnant

I think part of this is due to the fact that I can't shut down this very personal area of my life and solely focus on the work existing before me. When I enter a

meeting, this little life must enter with me. I feel her kicks and movements as an ever-present reminder of what is to come. We have a market announcement coming up. Kick. We need to update this on the website. Headbutt. I am often curious as a woman, if a man in the workforce experiences that same kind of opposing-forces phenomenon so aggressively and apparently in their regular workday.

Supporting diversity, in and outside of work

This is why diversity in the workforce is so important. This is why there has been such a push to grow a more representative industry from the world we live in and build for. The benefits of diversity have been heralded already so I won't digress there. My musings simply come as the result of being a woman in the industry who currently feels that distinction factor every second of every day.

When we cease to remember that humans—who have lives outside of these construction sites and manufacturing facilities, and off these computer screens—are who make up our industry, then we are missing an

integral part of those who can help this industry grow and innovate. But the more we can support, grow and foster the diversity in our teams, the better we will be at creating environments where humans prefer to work.

Caring for those in our lives

Overall, this has been an incredible learning experience for me. I have sat in meetings, and humorously had the thought that none of them in that room have any idea that something inside my body just punched my bladder. It's such an interesting position to be in, but that's okay.

Hopefully, my experiences will help me to better support other women in this workforce who also are tasked with physically growing or caring for another life. And hopefully, as I finish up creating this human in the near future (and finish my maternity leave plan), we continue to remember that being human is the most impactful and powerful tool we possess. ■

Sara Barchak serves as a marketing manager at EFCO. She can be reached at sbarchak@efcocorp.com.



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