

Quality stressed

AFG management changes are clear as glass

Company: AFG Industries
Address: Blue Ridge Plant, Lincoln Street, Kingsport
Phone: 229-7200
Product: Glass
Founded in: 1978 (Merger of ASG and Fourco Glass Co.)
Number of employees: 2,700 in AFG's U.S. Glass Group by first of April

By SHARON CASKEY HAYES
Times-News Staff Writer

AFG Industries is undergoing a change in management.

Well, sort of.

The company is adopting a different management style as part of the quality movement sweeping across America.

And at AFG's Blue Ridge Plant in Kingsport, the management change is as clear as glass.

"When I came to work here, the management pretty much ran the whole show. They knew all the numbers and kept all the numbers to themselves. Now, we're trying to do almost a 360 turnaround. We don't have any hidden secrets from our people anymore, whether they're hourly or salaried," said Isaac Overbay, materials manager at the Blue Ridge Plant.

Overbay and Bill Sunderland, manager of technical & total quality commitment, are part of a steering committee at Blue Ridge to help foster quality improvements at the plant, and to develop the overall direction for total quality commitment at the facility.

Sunderland said the plant started down the quality road about three years ago, first working with employees about what the quality con-

"We've tried to restructure our process — not change the basics, but restructure it to make sure that hourly and management are working together as a team so we can be the best possible company that we can be."

— Bill Sunderland

cept is and how employees could work together as a team to solve problems.

"From that we've evolved into making it a total management system for this factory, in the direction that we want to go to achieve quality and customer satisfaction," Sunderland said.

To help them in the process, the plant developed what's called a "BEST Process," emphasizing quality, customers, team work, employee involvement, and continuous improvement.

The BEST Process is administered by a "Bridge Team," made up of about 10 members representing both hourly and salaried employees.

Breaking down the barriers between hourly and salaried employees is one goal of the quality movement. And so far, it seems to be working.

Sunderland said that about 50 percent of the plant's workers have opted to join in the quality process and become part of teams.

He explained that the process has been a voluntary one at Blue Ridge, which is a unionized facility, with employees represented by the American Brick & Glass

Workers Local 496. The plant employs about 400. AFG Glass Group operations in the United States employ a total of about 2,700.

"We've tried to restructure our process — not change the basics, but restructure it to make sure that hourly and management are working together as a team so we can be

the best possible company that we can be," Sunderland said.

He pointed out that human nature tends to make people wary of change in their lives, including changes at work. But overall, quality changes now occurring at Blue Ridge will make the plant — and the overall company — a better

place to work, he said.

"I think we have a higher level of people satisfaction, worker satisfaction now, and a higher level of customer satisfaction. How much of that you can relate to our total quality effort, I can't lay my hands on, but I do think it has an impact on it," Sunderland said.

"We feel it is definitely a vital part of our future that we have to be going in this direction if we want to succeed. And our leader (AFG President) Jim Bradford is definitely committed to total quality organization and direction, and I think with his leadership, we'll achieve that," he said.

35 YEARS OF HEADACHES GONE
Dee Greer
Gift Certificates Available
Jackson's Muscle Therapy
Call 378-5500



Microtel
VERY AFFORDABLE
REMARKABLY COMFORTABLE
A SMART WAY TO SPEND THE NIGHT
Recommend us to your family, friends and business associates. They'll be glad you did!
New Complimentary Morning Coffee!
1708 East Stone Dr.
Kingsport, TN 37660
For Reservations Call
800-965-4400
615-378-9220



Florence Williams & Jackie Hicks
Our cooks extraordinaire



Vicki Woodruff,
Administrative assistant



Sherry Jessie & Opel Carrier,
Resident assistants



When you need a warm smile, gentle touch, and a helping hand... the staff at The Oaks At Brandy Mill are here to serve you.

When a nursing home is too much care, finally you have another choice.

For more information call (615) 378-3100 or write to the Oaks At Brandy Mill, 2424 East Stone Drive, Kingsport, Tennessee 37660



AFG shatters 'glass ceiling'

Firm enjoys banner year in 1995

By SHARON CASKEY HAYES
Times-News Business Editor

For AFG Industries, 1995 was a banner year — not only for the company here in East Tennessee — but also for AFG plants and subsidiaries across North America.

And Jim Bradford couldn't be happier about it.

Bradford is president and chief executive officer of AFG Industries, the second largest glass manufacturer in North America.

The company operates its North American headquarters here in Kingsport.

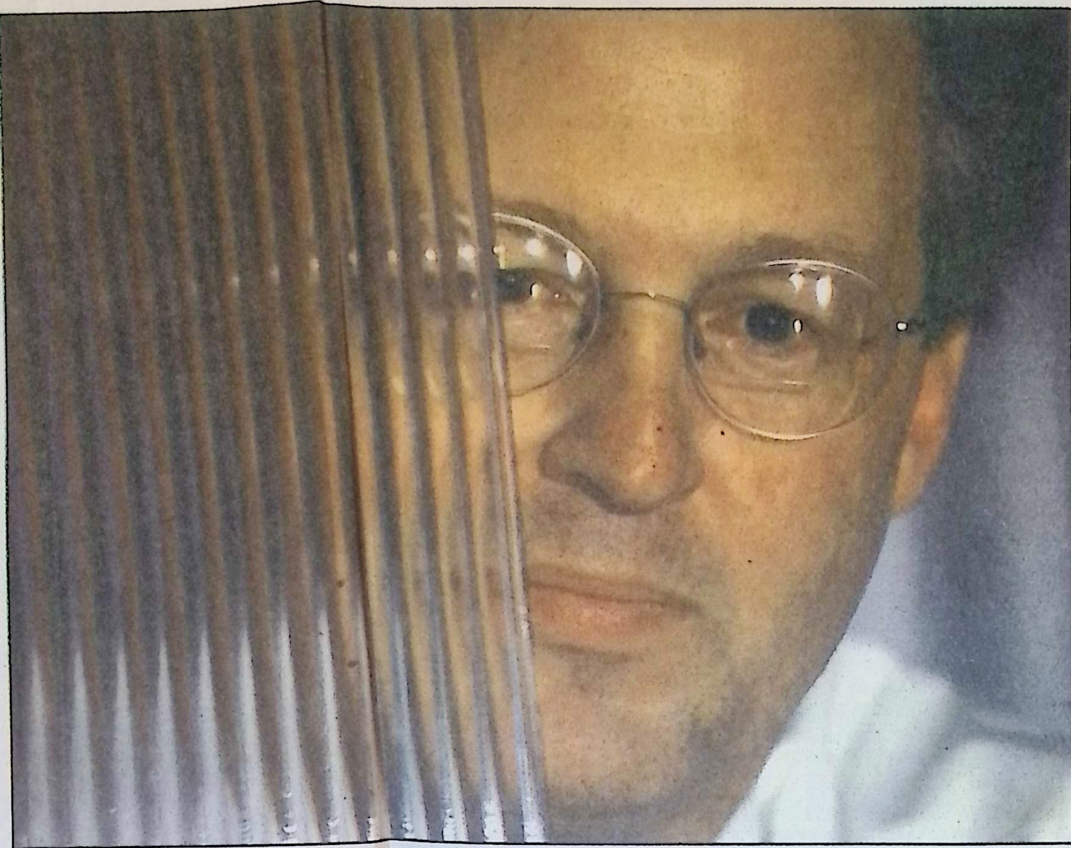
"What most people in Kingsport don't know, we have 54 locations across North America that fly an AFG flag, and we're the second largest glassmaker in North America.

"So while our headquarters are here, we have primary plants from California to Quebec, and we have vertically integrated downstream organizations that are all across the United States and Canada. That's the entity we're talking about," Bradford said.

And an impressive entity it is.

AFG's primary plants — which take sand and melt it into glass — are located in California, Kansas, West Virginia, New Jersey, Toronto, and Quebec, in addition to those in Kingsport and Hawkins County.

The company's subsidiary, AFGD Inc., which serves the wholesale distribution and fabrication market, operates plants in Georgia, Florida, Alabama, North Carolina, Ohio, Massachusetts, New York, Virginia, Louisiana, Colorado, Texas, Pennsylvania, Canada, and Knoxville, Tenn.



Times-News photo — David Grace

And the company just announced plans last week to acquire Capitol Glass and Aluminum Corp., with operations in Salt Lake City, Utah; Albuquerque, New Mexico; and Denver, Colorado.

In all, the company employs about 4,300 in North America, including 1,400 workers in East Tennessee.

AFG Industries is owned by two shareholders, Asahi Glass Corp. of Japan, and Belgium-based Glaverbel.

Because AFG is privately held, Bradford said he could not divulge specific sales and earnings figures for the company. But he said AFG had one of its best years to date in 1995.

"AFG established its best ever record for operating in-

Please see AFG, page 7C



Photo courtesy of AFG

AFG's Jim Bradford, top, is pleased with his company's 1995 performance. Bradford looks at the future not through a glass darkly, but with optimism that AFG will be publicly held once again. Hawkins County's Greenland Plant, above, reached some milestones of its own, achieving ISO 9002 certification last year.

AFG enjoys banner year in 1995

Continued from page 1C

come and its second best record for net income in the history of the company.

"And we set a bunch of individual records on sales and manufacturing throughout North America," Bradford said.

For instance, the Hawkins County AFG plant — commonly referred to as Greenland — set new records on both its float glass production lines. Line 1 set records for production and yields in 1995, and set its best record for quality of glass production. The line also set records for "achievement of Glass Making Goals," an internal measurement for consistency of production.

Greenland Float Line 2, in its 12th year of operation, set some records as well, in quality, Glass Making Goal achievement, and yields.

The Greenland Plant also achieved ISO 9002 certification in record time, becoming the first AFG facility to achieve the internationally recognized quality certification.

Bradford said the plant set the example for the rest of the AFG organization.

"This is where we're going with the whole company. We expect all our plants to be ISO 9000 certified by the year 1997," Bradford said.

The Kingsport plant — commonly called Blue Ridge — set some records of its own in 1995.

The plant set quality and production records for its K-3 furnace, while the K-1 furnace set a new record for operating longevity. A new state-of-the-art glass tempering line was installed at the plant during the year in record time.

Plant records for productivity and product quality were also set at company facilities in California, West Virginia, Toronto and Quebec.

AFG's Kansas plant set new productivity records for energy performing glass, and met goals for cost reduction.

And the company's New Jersey facili-

ty, which had been idled for five years, was restarted in 1995. "We brought it back into operation in March 1995. Nobody before has mothballed a plant and then brought it back up again. So that's an accomplishment. And they are now running their best quality ever in the history of that plant," Bradford said.

AFGD Inc. also set records for sales and operating income as well, he said.

Bradford credited the company's strong showing to strong demand for flat glass products in the first quarter of 1995, and modest growth in the third and fourth quarters, coupled with AFG's operating efficiencies.

He said the glass industry is driven by three primary movers — the automotive industry, the construction market, and the remodeling market.

The glass industry, he explained, peaked in 1988-1989, but then began to decline.

"AFG at that same period of time went through a period where we took on a substantial amount of debt. And we were operating under a fairly difficult debt-to-equity ratio, and competing in a marketplace that was very difficult from an economic viewpoint," Bradford said.

The market however began an upward shift in the early 1990s. And the glass industry — and AFG — began pulling out of the slump.

Bradford pointed out about 70 percent of glass manufactured in North America is used in the construction industry, while the automotive industry gets about 25 percent. The remaining glass production goes to specialty markets, such as furniture, appliances and mirrors.

AFG sells its products to all three markets, Bradford said. AFG glass can be found in the new Olympic Stadium in Atlanta and the Charlotte Coliseum in Charlotte, N.C.

Locally, AFG is supplying glass for the new Eastman Chemical Co. office buildings at the corner of Lincoln and Wilcox, Bradford said.

"I think the real success story for AFG was exceptional operating performance on the manufacturing end. Fabrication and distribution efforts set record performances in almost every location. In addition to that, we had a very strong sales effort," Bradford said.

"I think a key also is a very much improved effort on quality. We had the best year of performance as far as the base quality of our products in the history of the company.

"I think it was a collective effort of lots and lots of individuals in the manufacturing and sales efforts and distribution and fabrication that led to this result," Bradford said.

"We're enjoying a few minutes of celebration. Unfortunately in the business world, you get to concentrate on that about five minutes, and then you get to go on to the next plan," he said.

As for the future, Bradford said the goal is to eventually take AFG back into the public arena.

AFG Industries was traded on the New York Stock Exchange until 1988, when it became privately held. Asahi Glass and Glaverbel acquired the company in 1992.

Both Asahi Glass and Glaverbel are public companies.

"So our goal is to take this company public again. But that's not one of the things I see happening in the near future," Bradford said.

He said he foresees AFG going public as "a turn of the century kind of event."

"We're all interested in seeing it happen, but there's some things we want to accomplish first to get there," Bradford said.

He said he believes 1996 will be a good year for AFG and the glass industry as a whole. "But we see another downturn coming for the marketplace in probably 1997 or 1998. I hope it will not be severe and we're certainly trying to take steps so that we can actually grow in that market and do well," Bradford said.

AFG produces tons of glass in NET

By SHARON CASKEY HAYES
shayes@timesnews.net

The glass in your shower or oven door. The windows of your house or car.

We may not think about it, or even realize it, but much of the glass that surrounds our everyday lives is made by AFG Industries — and much of it is made right here in Northeast Tennessee.

AFG Industries, the second largest glass maker in North America, manufactures its products on 11 furnace lines at nine plants in the United States and Canada.

The company's corporate headquarters is located on Lincoln Street in Kingsport, along with its Blue Ridge plant, which manufactures about 300 tons a day of specialty glass on two furnace lines.

Just 17 miles away in Hawkins County, AFG operates its largest plant, called Greenland. There, the company produces between 1,000 and 1,200 tons each day of glass on two furnace lines, one of which was recently rebuilt in a \$20-million upgrade.

"It's a lot of glass — I don't think the public realizes how much," said Jim Bradford, president and chief executive officer.

Bradford said the Blue Ridge and Greenland plants are very different in the products they produce.

The Greenland facility has traditionally supplied the residential construction market, making glass for windows and appliances. In the past few years, the plant has taken on another market — glass for mirrors.

Bradford said this market requires "an extraordinary, high-quality product" without any surface or interior defects. Through trial and error, the company has been able to consistently provide those high-quality products, which are shipped to mirror makers in Virginia, Georgia and the Carolinas.

At the Blue Ridge plant in Kingsport, one furnace is designed to produce patterned glass products that are typically used in the tub and shower door enclosure market.

The plant also produces one of AFG's fastest-growing products — glass for the solar market.

Bradford said the market actually stems back several years when solar power was first hailed as an alternate energy source.

"In the '80s, it was what I call a toy or trinket industry. It might light your garden path or charge the battery on your boat, but that was it," Bradford said.

Today, he said, the indus-



Earl Carter — ecarter@timesnews.net

Jim Bradford, president and CEO of AFG Industries, said the company will offer new products beginning this year.

try "has come a huge way."

Bradford said the interest centers around photovoltaics, a method that converts the sun's energy to electricity. The base material for the technology is glass.

"And the Kingsport plant is one of the largest suppliers in the world for that product," Bradford said, adding the plant ships solar glass to customers throughout the United States, Europe and Asia.

AFG predicts the solar market will grow about 40 percent each year for the next few years. And the company is planning to keep up with the demand.

AFG is now partnering with other companies interested in photovoltaics to provide them with new glass products to enhance their products.

Bradford said the solar industry is no longer a "trinket" one. He said the industry can now bring electricity to the masses, lighting not only individual houses but cities as well. The technology, he said, would be particularly valuable in developing countries, where rough terrain has made the transmission of electricity via lines and cables virtually impossible.

"Photovoltaics could make it possible," Bradford said.

Moreover, photovoltaics provides civilized countries a cheaper alternative for electrical generation.

"I think in a couple of years, you'll probably have a photovoltaics plant that will make megawatts of energy cheaper than fossil fuel plants and far, far cheaper than a nuclear plant," Bradford said.

"The energy growth profile for this is just outstanding. It's almost frightening because you really can't believe an industry can grow that fast," he said.

Still, solar glass isn't AFG's fastest-growing prod-

"I think (the 'Reader's Choice' award) says a lot for not only our sales force but our manufacturing and service organizations as well. This is really what service is about, the recognition for quality of service we provide, and that means consistent service."

— **Jim Bradford**
president, CEO
AFG Industries

uct. Bradford said he expects the company's new product offerings scheduled for debut this spring or summer to represent the fastest-growing segment.

Although he wouldn't divulge what those new offerings will be, he said they will grow rapidly, simply because of the markets they will serve.

Bradford explained that about 25 to 27 percent of the glass produced in North America has traditionally been used in automotive production. "So as we develop a product, for example, for the automotive industry, the potential for its application is significant just because of that demand," he said.

The same is true for the construction glass market, he said, pointing out that roughly 55 percent of glass produced in North America is used in the construction market.

AFG already is a major supplier to the construction market, and is the largest supplier in North America for the appliance business.

And AFG recently began concentrating its efforts in the automotive glass business as well.

In 1988, the company bought Ford Motor Co.'s glass division in Canada. But it didn't focus on the business until just three years ago.

"Then we made a commitment to be in that marketplace, and consequently, not only have we devoted one plant's full-time energy toward that effort, but also, we're now constructing a new plant in Richmond, Ky., as a state-of-the-art automotive plant," Bradford said.

The new facility is expected to be operational in May.

In addition AFG, through a joint venture with California-based GL Coatings, is building a new plant in Hampton, Iowa, to make low-emissivity glass. New technology is being incorporated at the facility to give products less reflective color and quality transmission at the same time.

The plant is currently undergoing product testing. Full production is expected to start this month.

AFG is the only glass company worldwide to be fully ISO certified at all its primary manufacturing operations and at its corporate offices. ISO is an international stan-



Courtesy AFG Industries

AFG Industries produces much of the glass found in shower and oven doors, cars and houses. The company has two manufacturing plants in Northeast Tennessee.

dard designed to ensure quality and consistency in manufacturing.

Bradford said AFG considers ISO certification as "a serious endeavor."

And it's paying off. In February the company was noti-

fied that it was the "Reader's Choice" as the most preferred supplier in North America. The award was presented by U.S. Glass, the largest glass publication in North America.

"I think that says a lot for

not only our sales force but our manufacturing and service organizations as well," Bradford said. "This is really what service is about, the recognition for quality of service we provide, and that means consistent service."

From staff reports

AFG President and Chief Executive Officer Jim Bradford recently recalled the company's past decade, and the hurdles and challenges it's overcome.

Bradford said a series of events occurred in 1988 that laid the foundation for further changes in AFG's future.

Later that year, the company went from being traded on the New York Stock Exchange to being privately owned. Bradford said the company's management made an offer to buy the stock and take the company private.

"In order to complete the buyout, we went looking for an equity partner, and in 1988, signed an agreement with Glaverbel in Europe," Bradford said.

Glaverbel also acquired the right to buy AFG at a future date if it so desired.

Then in early 1992, AFG was seeking to raise capital to lighten its long-term debt load.

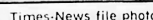
The company filed with the Securities & Exchange Commission to again return to the open market in an Initial Public Offering.

But the IPO market had turned sour, and AFG abandoned its IPO plans.

In stepped Glaverbel once again, along with its partner companies.

In the summer of 1992, AFG announced it was being acquired by Glas International, a Netherlands-based company owned by Glaverbel and Asahi Glass Group of Japan.

"So if you look at the company's future, it's being owned by the Japanese."



year.

AFGD is the glass fabrication and distribution arm of AFG Industries.

In all, AFG now has nine plants with 11 glass manufacturing lines, and 52 fabrication facilities.

The company employs 5,150 in the United States and Canada, including about 240 at AFG's Blue Ridge plant in Kingsport, 600 at the company's Hawkins County facility, and 170 at its corporate offices on Lincoln Street.

— Jim Bradford
AFG president,
chief executive officer

• Lube & Oil • Full Brake Service

Glaverbel acquired the right to buy AFG at a future date if it so desired.

Then in early 1992, AFG was seeking to raise capital to lighten its long-term debt load.

The company filed with the Securities & Exchange Commission to again return to the open market in an Initial Public Offering.

But the IPO market had turned sour, and AFG abandoned its IPO plans.

In stepped Glaverbel once again, along with its partner companies.

In the summer of 1992, AFG announced it was being acquired by Glas International, a Netherlands-based company owned by Glaverbel and Asahi Glass Group of Japan.

"So if you look at it, the company's future as far as being owned by either a European or Japanese glass maker was really cast in 1988 and then became full fruition in 1992," Bradford said.

A month later, Bradford was appointed president of AFG Industries.

Bradford had joined the company in 1984, and had previously served as director, vice president, and general counsel and secretary.

After being named president, Bradford implemented a plan to get AFG back on solid financial ground, he said.

"That included restoring the balance sheet of the company to good standing with the help of our parent, and then returning the company to a profitable stance and focusing on quality manufacturing," Bradford said.

A year later, in July 1993, AFG Industries announced it would move its corporate headquarters from Fort Worth, Texas, to Lincoln Street in Kingsport.

Since then, the company has expanded its product line and opened new plants.

In 1998, AFG expanded its reach into the automotive glass market by opening a facility in Richmond, Ky., specifically designed for automotive glass.

The company also opened a new coating plant in Hampton, Iowa, last year.

Through the years, AFG has become a leader in the world's glass market.

It was the first glass manufacturer in North America to become fully ISO certified at all its operations, including its corporate office in Kingsport.

In addition, AFG was picked this year for the second year in a row by readers of U.S. Glass magazine as the best glass supplier.

And AFG's subsidiary, Atlanta-based AFGD, was presented the reader's choice award for the first time this

TIMES-NEWS

Money

VF Company files AFG

Celebrate!

AFG's Blue Ridge Plant marks 75th anniversary

By SHARON CASKEY HAYES
shayes@timesnews.net

KINGSPORT — It's weathered a violent labor strike, several ownership changes, and near closure over the years.

But today, AFG Industries' Blue Ridge Plant is running strong — not only surviving but thriving as one of Kingsport's oldest manufacturers.

The Blue Ridge Plant celebrates its 75th anniversary this year, and it's scheduled a host of activities this week for employees, retirees and the community to mark the occasion.

On Monday, retirees from the plant and corporate offices will be treated to a cookout and plant tours, and door prizes will be given away.

The plant will open its doors to the community on Wednesday, with plant tours and free hamburgers and hotdogs.

Friday is Employee Day, when employees and their families will be treated to tours, a cookout and door prize drawings.

Human Resources Manager Bob Weston said the plant hopes for a big turnout to mark the celebration.

"We're hoping to serve 700 hamburgers and 500 to 600 hotdogs each day," Weston said.

Located on Lincoln Street, the plant was constructed in 1917 to manufacture tear gas during World War I as the Edgewood Arsenal.

Serene refuge

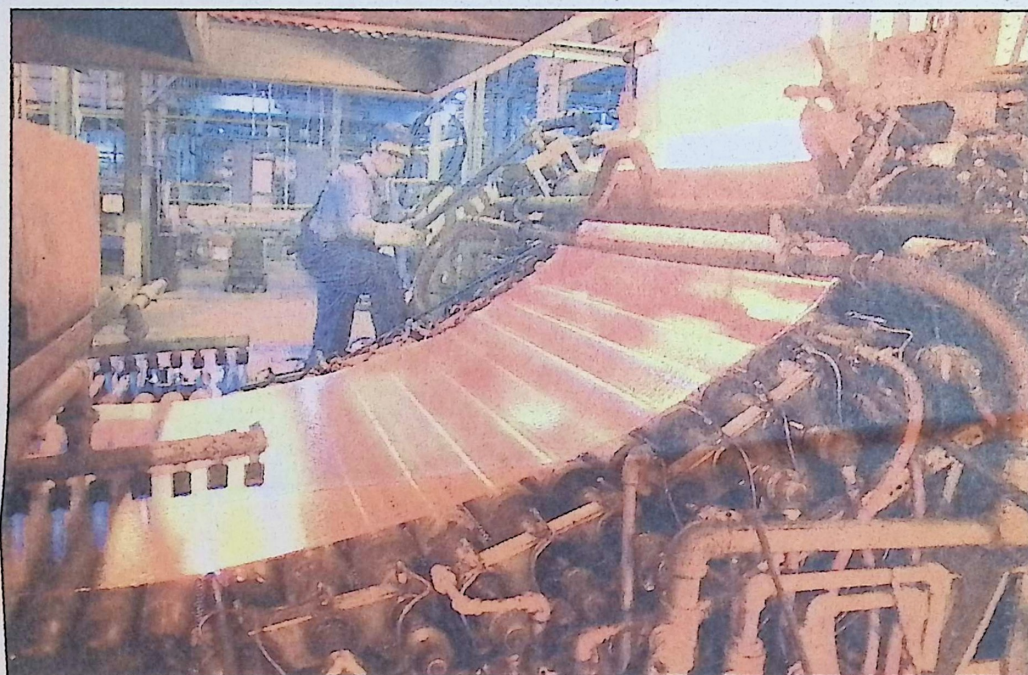
Garden in the Woods in Framingham, Mass., offers a reprieve from the stresses of daily life. Page 6E.



Editorial	4
Commentary	5
Travel	6

Kingsport Times-News

Sunday, June 3, 2001



At top, Phillip Hillman, a 33-year employee at AFG Industries' Blue Ridge Plant, adjusts machinery as hot glass rolls out of a furnace. At right is plant Manager Kerner Timmons, who plans to grill hamburgers and hot dogs during this week's festivities.



Ken Murray — kmurray@timesnews.net

Following the war in 1919, the plant was purchased by Corning Glass Works, which converted the facility to make Pyrex bake ware.

The plant closed in 1921, thanks to post-war depression.

Then Corning formed a partnership with Saint-Gobain and Saint Roch of Belgium in 1925, creating the Blue Ridge Glass Corp., which began production at the plant in 1927.

During the decades that followed, various

glass products including frosted and heat tempered were produced at the plant.

By 1952, employment had risen to 680 people.

Then a labor dispute engulfed the plant in 1956. Plant Manager Kerner Timmons said union workers went on strike, resulting in violence and job loss.

"Cars were burned, people's lives were

Please see AFG, page 6E

AFG plant marks 75th anniversary

Continued from page 1E
threatened. It was bad," he said.

The strike ended when the company fired all its union workers and hired all new employees.

Change came at the plant again in 1958, when Blue Ridge Glass joined with American Window Glass to form American Saint Gobain (ASG), which operated the plant for the next 20 years.

During the 1970s, the plant was facing possible closure due to disappointing performance.

In 1978, businessman R.D. Hubbard took an interest in the company, and combined Fourco and ASG to form AFG Industries.

But in 1980, Blue Ridge was still losing money — every month, Timmons said.

"It was on the verge of being shut down cold," he said.

To help turn the company around, Hubbard instituted a streamlining strategy, discontinuing unprofitable production lines and trimming work force numbers.

Timmons and Weston remember employee cuts nearly every Friday during that time.

"If they paged you on a Friday afternoon you knew you were dead meat," Weston said.

"Because you were going to be fired," Timmons added.

Timmons said he was engineering manager in 1980 when his boss ordered him to cut his staff of 50 in half.

"We were losing a quarter of a million dollars a month, and looking for ways to cut costs," Timmons said.

"The next day, I had figured out how to cut five or ten people. He looked at my numbers, and said, 'I'm going to lunch. I don't think you heard what I said yesterday. I want it cut in half,'" Timmons said. "When he came back, I had a plan."

He said it was a painful time, but the cuts were necessary to ensure the plant's viability.

"If we hadn't done those things we wouldn't be here today," said Isaac Overbay, ma-

terials manager.

The strategy worked, and the company began making money.

In 1984, a new mini-float glass line was constructed at the plant.

Then AFG Industries was acquired in the early 1990s by Asahi Glass of Japan and Belgium-based Glaverbel, which still own the company today.

Now, Blue Ridge produces 4.5 miles of glass a day — or 1,652 miles each year on four production lines.

Earlier this year, AFG invested \$12 million to rebuild the plant's No. 1 furnace, a gas-fired facility that makes 250 tons of glass a day.

Later this year, AFG plans to spend another \$7 million to rebuild the plant's other furnace, an electric-powered facility that makes 130 tons of glass a day.

The upgrades should last another 20 years, Timmons said.

"That's good for the economy — it says we'll be here for a long time to come," he said.

Blue Ridge also operates a tempering line, on which glass

produced at the site is strengthened before being packed and shipped to customers.

Products produced at the plant include glass for shower enclosures and table tops for lawn furniture. It makes patterned glass of various types — from high tech to low tech. Its fastest-growing product is the high-tech photovoltaic glass, which converts light to energy.

On the low-tech end, it makes glass for old-fashioned washboards, which are used in the states for decorative purposes as well as shipped and used in Third World countries.

Blue Ridge is AFG's oldest manufacturing facility. It generates sales of about \$70 million a year. Customers include Siemens, BP Solar, Astropower, and Kohler.

The plant gets its raw material from as far away as Spain and as close as Rogersville. All the sand used in its No. 1 furnace comes from Short Mountain Silica in Rogersville.

In all, Blue Ridge spends

\$900,000 in raw material purchases from local suppliers.

The plant employs 330 people today, and has an employee turnover rate that's half the industry average, Timmons said.

The average length of employee service is about 13 years. Weston said that number would be higher, if it weren't for a large number of retirements in the 1990s.

"That was all those people who were hired during the strike in 1956," he said.

Timmons said the future looks bright for the Blue Ridge Plant.

"The fact that we're spending \$19 million this year — that says we plan to be here for quite a few more years," he said.

Tri-Cities Regional Airport, TN-VA AIRFARES

Anchorage \$795	Chicago \$271	Cincinnati \$173	Pittsburgh \$208
Seattle \$438	St. Louis \$192	Detroit \$284	Rochester \$358
Portland \$438	Denver \$466	New York \$218	Boston \$226
Jackson Hole \$445	San Francisco \$445	Philadelphia \$288	Washington DC \$220
Los Angeles \$438	San Diego \$431	Richmond \$198	Lexington \$164
Las Vegas \$415	Phoenix \$406	Charlotte \$220	Nashville \$179
Honolulu \$1153	Albuquerque \$370	Myrtle Beach \$210	Charleston \$243
Dallas \$272	Houston \$226	Orlando \$198	Jacksonville \$212
Little Rock \$248	Memphis \$288	Tampa \$198	Miami \$198
New Orleans \$236	Birmingham \$276	Atlanta \$158	

NOTE: All domestic flights from Tri-Cities Regional Airport, TN-VA are non-refundable round-trip fares requiring advance purchase. Tax is not included. These fares are subject to availability and subject to change at any time so please check with your local travel agent or airline. For more information, contact your local travel agency. Airlines serving TRI with jet and regional services are USAirways, Comair, ASA, United Express and Northwest Airlines.

Courtesy Metro Travel of Kingsport

GATLINBURG ROYAL TOWNHOUSE MOTEL SPRING SPECIAL

\$29 ⁹⁵ TAX	Sun.-Thurs.
\$39 ⁹⁵ TAX	Fri.-Sat.

Rooms limited and subject to availability. Restrictions and blackout dates apply. Rates are per night.

1-800-433-8792

VANCOUVER MOTEL

2601 S. Ocean Blvd. Myrtle Beach, SC 29577

1-800-262-2908

Oceanfront Family Motel Open Year Round

Ideal for Tour and Church Bus Groups

Immaculately clean rooms/kitchen with Caribbean tile floors, Pool w/kiddie pool, cable TV with HBO & ESPN, room phones, daily maid service, Laundry facility on premises. Near stores, fishing piers, golf and shops. Small dogs accepted with their owners.

HEART OF EUROPE

Exhilarating 15-day, Escorted Tour

See Holland, Belgium, Germany, Austria, Italy, Switzerland & France

\$2500 October 9 & 14 Departures

Book by June 28. Save \$100

Also offering Sep. Nov. & Mar. Specials

Price includes air fare from Knoxville, motor coach, hotels, sightseeing, tour escort, 25 meals, tips and taxes. Price is p. 100.

We also offer this tour with London

For a brochure of this and other tours to Europe, call Image Travel - Ph: 1-800/530-9089

Times-News graphics — Karen Crigger



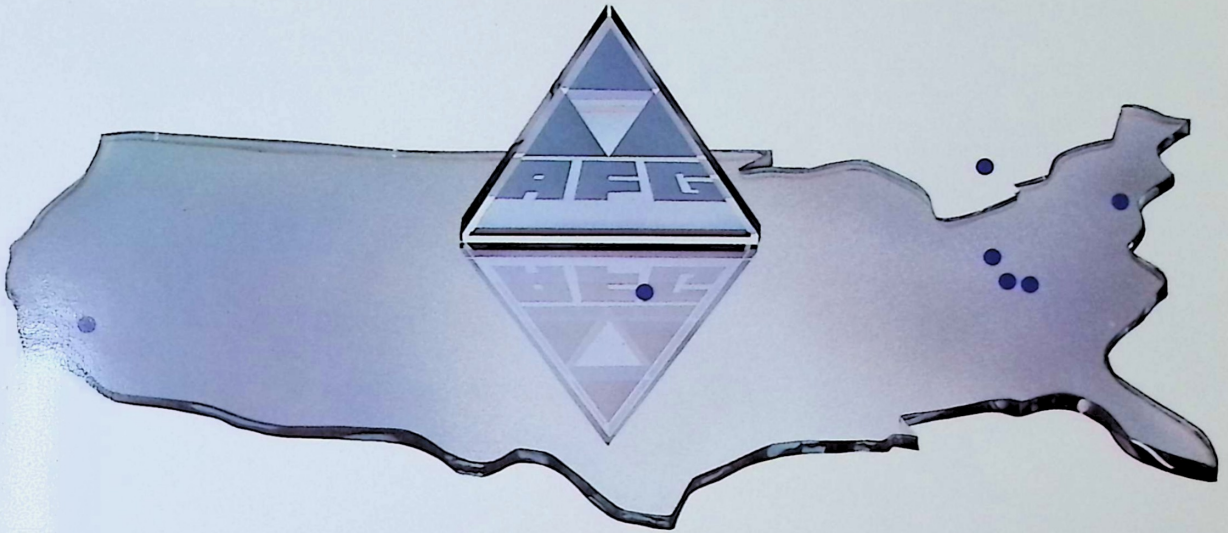
VF
COMPANIES

A TOTAL COMMITMENT TO GLASS

.....
AFC INDUSTRIES, INC.

1	AFG Profile
2	Thin & Heavy Float Glass
4	Tinted Glass
6	Tempered Glass
8	Patterned Glass & Silkscreening Glass
10	Comfort-E™ Glass
14	Insulating Glass
16	Solar Glass
17	Lighting Glass
18	Box Glass, Packaging & Picture Frame Glass
19	Technical Data
21	AFG Product Warranties & Footnotes

AFG Profile

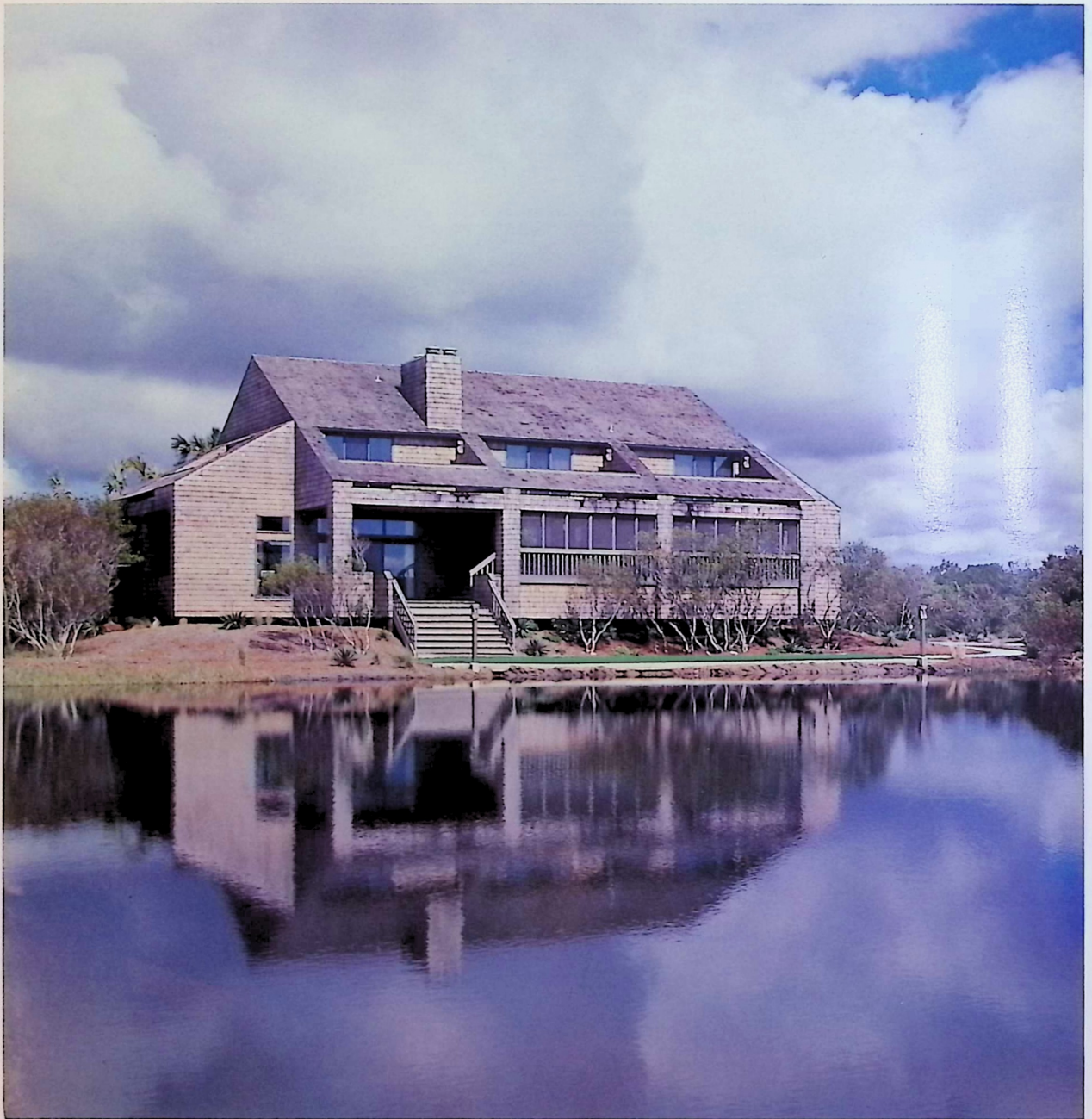


AFG Industries is one of the nation's premiere flat glass manufacturers, primarily for the residential and commercial construction markets, and the automotive replacement glass market. Our product line emphasizes a broad range of value-added, specialty glass products including: tempered, laminated safety, appliance, low-emmissivity, solar and energy-absorbing colored glass. These specialty glass products now account for over one-half of our annual revenues.

AFG focuses all its resources on developing, producing and delivering the highest quality products and service possible for our customers. AFG's continuing effort to expand and upgrade production capabilities, as well as the ongoing introduction of innovative specialty products will enable AFG to serve our customer's changing needs.

We manufacture glass using both float and rolled glass processes on ten manufacturing lines in five U.S. plants and one Canadian plant. Our eleventh manufacturing line will be located in our new Kansas City, Kansas plant, operational in late 1988. Our existing manufacturing facilities are located in Kingsport and Greenland, TN; Bridgeport, WV; Cinnaminson, NJ; Victorville CA; and Scarborough, Canada.

Thin & Heavy Float Glass



Thin & Heavy Float Glass



Thin Float Glass

AFG clear float glass brings the scenic beauty of the outdoors into homes, offices, apartment complexes, schools, hospitals, or shopping malls. The exceptional clarity of AFG clear float glass makes it ideal for a wide range of applications. So when aesthetics and performance are key criteria, the advantages of AFG float glass are crystal clear.



Heavy Float Glass

AFG's heavy float glass is ideal for furniture, table tops, store fronts, and many other architectural applications. Beauty, versatility and performance provide an aesthetically pleasing product for both residential and commercial markets.

Dimensions and Descriptions

AFG Thin Float	Thickness and Tolerances	(1)* Max. Std. Sizes	Average Net Wt. Lbs./Sq. Ft.	(2)* Average Visible Light Transmittance %	(3)* U-Value BTU/Hr./Sq. Ft./°F Winter	(4)* U-Value BTU/Hr./Sq. Ft./°F Summer	(4)* Shading Coefficient	(5)* Relative Heat Gain BTU/Hr./Sq. Ft.	(7)* Solar Transmittance %
Mirror	1/4" .219"-.244"	96" x 120"	2.9	89	1.13	1.04	.96	207	80
Glazing	SS .085"-.101"	60" x 84"	1.1	91	1.16	1.04	1.02	219	87
	Lami .102"-.114"	60" x 96"	1.4	91	1.16	1.04	1.01	216	86
	1/8" .115"-.134"	96" x 130"	1.6	90	1.16	1.04	1.00	215	85
	5/32" .149"-.165"	96" x 130"	2.0	90	1.15	1.04	.98	211	84
	3/16" .180"-.199"	130" x 204"	2.4	90	1.14	1.04	.97	209	82
	1/4" .219"-.244"	130" x 204"	2.9	89	1.13	1.04	.96	207	80

AFG Heavy Float	Thickness and Tolerances	(1)* Max. Std. Sizes	Average Net Wt. Lbs./Sq. Ft.	(2)* Average Visible Light Transmittance %	(3)* U-Value BTU/Hr./Sq. Ft./°F Winter	(4)* U-Value BTU/Hr./Sq. Ft./°F Summer	(4)* Shading Coefficient	(5)* Relative Heat Gain BTU/Hr./Sq. Ft.	(7)* Solar Transmittance %
Glazing	3/8" .355"-.406"	128" x 204"	4.8	88	1.11	1.03	.90	194	72
	1/2" .469"-.531"	128" x 204"	6.3	86	1.09	1.03	.86	186	67

*Footnotes and Warranty Information appear on page 21.

Tinted Glass

Tinted Glass, Gray/ Bronze

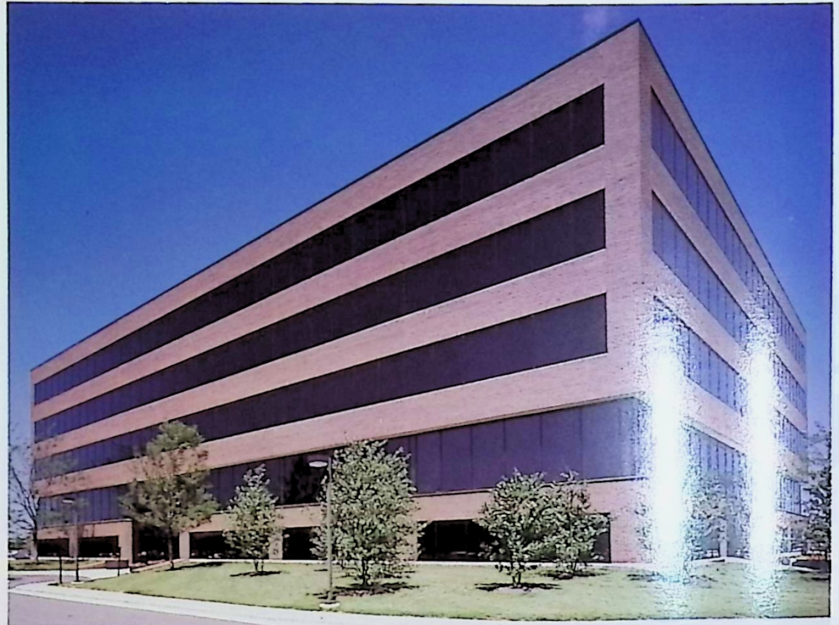
AFG offers a variety of tinted glass products for commercial and architectural glazing. The lower solar light transmission of AFG's bronze/gray glass helps reduce glare as well as absorbing the sun's heat to create more comfortable interiors while securing the view outside.

Koolvue™

Energy-saving principles long used in commercial applications are incorporated into Koolvue Bronze. AFG specially developed Koolvue for the residential construction market. Koolvue Bronze increases home energy efficiency by blocking 23% of the sun's heat, thereby lowering heat gain inside the residence. This product is ideal for warmer climates where air-conditioning costs are greater than heating costs. The beautiful bronze tint of Koolvue will compliment any home exterior.

Low-T Gray

AFG's Low-T Gray offers the lowest light transmission of AFG's tinted products. Low-T Gray transmits only 14% in 1/4" thickness and a 31% transmission in 1/8" thicknesses.



Tinted Glass



Dimensions and Descriptions

AFG Tinted Float	Thickness and Tolerances	(1)* Max. Std. Sizes	Average Net Wt. Lbs./Sq. Ft.	(2)* Average Visible Light Transmittance %	(3)* U-Value BTU/Hr./Sq. Ft./°F Winter	(4)* U-Value BTU/Hr./Sq. Ft./°F Summer	(4)* Shading Coefficient	(5)* Relative Heat Gain BTU/Hr./Sq. Ft.	(7)* Total Solar Transmittance %
Koolvue	SS .085"-.101"	60" x 84"	1.1	74	1.16	1.08	.88	191	72
Bronze Float	1/8" .115"-.134"	96" x 130"	1.6	69	1.16	1.08	.85	185	66
	3/16" .180"-.199"	130" x 204"	2.4	59	1.14	1.10	.76	167	55
	1/4" .219"-.244"	130" x 204"	2.9	52	1.13	1.10	.71	157	48
Gray Float	1/8" .115"-.134"	96" x 130"	1.6	62	1.16	1.08	.84	183	65
	3/16" .180"-.199"	130" x 204"	2.4	50	1.14	1.10	.75	165	53
	1/4" .219"-.244"	130" x 204"	2.9	41	1.13	1.10	.69	153	46
Low-T Gray	1/8" .115"-.134"	96" x 130"	1.6	31	1.16	1.08	.78	171	54
	1/4" .219"-.244"	130" x 204"	2.9	14	1.13	1.10	.63	141	38

*Footnotes and Warranty Information appear on page 21.

Tempered

An added dimension of safety is engineered into AFG tempered glass, making it ideal for use in areas highly accessible to people.

During the production process, a special heat treatment and quenching process increases its strength three to five times vs. annealed glass. If subjected to strains beyond its capacity, AFG tempered glass simply disintegrates into innumerable small pieces . . . significantly reducing the risk of serious injury.

AFG tempered safety glass is recommended for residential and commercial installations where human contact is anticipated, especially entrances and adjacent areas, shower doors, tub enclosures, sliding doors, and walls where glass is installed eighteen inches or less above the walking surface. AFG tempered safety glass meets both the Federal Consumer Product Safety



Commission (CPSC) Safety Standard for Architectural Glazing Materials 16CFR-1201C II and ANSI Z97.1-1984 for Safety Glazing Materials Used in Buildings.

Please Note:
Exact sizes must be specified prior to tempering. All holes, cutouts, edgework, etc. must also be done prior to the tempering process.

Dimensions and Descriptions

Product	Thickness	(1)* Maximum Sizes Normally Available	Approx. Wt. Lbs./Sq. Ft.
Clear Tempered Float	1/8"	46" x 100"	1.6
	5/32"	59" x 100"	2.0
	3/16"	59" x 120"	2.4
	1/4"	59" x 120"	2.9
Bronze Tempered Float	1/8"	46" x 100"	1.6
	5/32"	46" x 76"	2.0
	3/16"	59" x 120"	2.4
	1/4"	59" x 120"	2.9
Gray Tempered Float	1/8"	46" x 100"	1.6
	3/16"	59" x 120"	2.4
	1/4"	59" x 120"	2.9

*Footnotes and Warranty Information appear on page 21.

Tempered Pattern Glass Data

Product	Thickness	(1)* Maximum Sizes Normally Available	Approx. Net Wt. Lbs./Sq. Ft.
Aquatex®	.156"	36" x 78"	1.9
	.200"	48" x 96"	2.4
Pattern 62	.156"	36" x 78"	1.9
	.200"	48" x 96"	2.4
Rain®	.156"	36" x 78"	1.9
	.200"	48" x 96"	2.4
Leaf	.156"	36" x 78"	2.0
	.200"	48" x 96"	2.5

Tempered

.....



Patterned Glass & Silkscreening

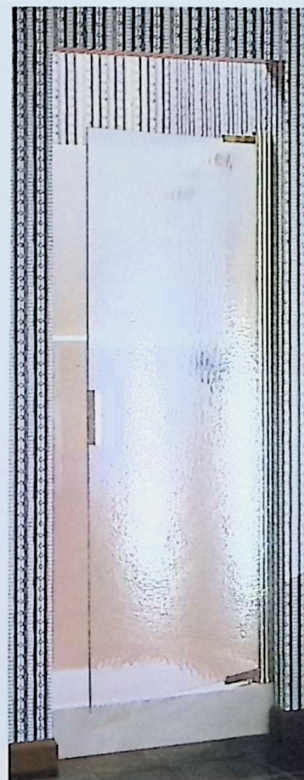
AFG patterned glass offers architects, designers, and builders many creative possibilities with a wide variety of patterns from which to choose.

Frequently chosen for its decorative value alone, patterned glass has the unique capacity to separate space while sharing light. Available in a variety of tempered patterns, this glass is frequently used for shower doors and tub enclosures, patio furniture and interior partitions. AFG patterned glass is available in varying degrees of obscurity or diffusion.

Silkscreening Glass

AFG prides itself for keeping abreast of the latest trends in the marketplace.

Tempered silkscreened table-tops are now available from AFG Industries in a wide variety of designs ranging from classic to contemporary. These uniquely designed table-tops are a great finishing touch, bringing elegance to any glass usage.



Dimensions and Descriptions

Product	Nominal Thickness	Approx. Net Wt. (Lbs./Sq. Ft.)	(1)* Maximum Standard Size
Aquatex®	.156"	1.9	60" x 132"
	.200"	2.4	60" x 132"
Pattern 62	SS .095"	1.2	48" x 60"
	DS .119"	1.5	48" x 60"
	.156"	1.9	60" x 132"
	.200"	2.4	60" x 132"
Pattern 124	.187"	2.0	
Flax®	.156"	1.9	60" x 132"
	.200"	2.4	60" x 132"
Florex®	.156"	1.9	60" x 132"
Flutex® Textured	.200"	2.4	60" x 132"

*Footnotes and Warranty Information appear on page 21.

Dimensions and Descriptions

Product	Nominal Thickness	Approx. Net Wt. (Lbs./Sq. Ft.)	(1)* Maximum Standard Size
Hammered	.156"	2.0	60" x 132"
Industrex®	.156"	1.9	60" x 132"
	.200"	2.4	60" x 132"
Velvex®	.156"	1.9	60" x 132"
	.200"	2.4	60" x 132"
Rain®	.156"	1.9	60" x 132"
	.200"	2.4	60" x 132"
Leaf	.156"	2.0	60" x 132"
	.200"	2.5	60" x 132"
Hammered Wire †	.270"	3.4	60" x 132"

*Footnotes and Warranty Information appear on page 21.

†AFG Nuweld Diamond patterned wired glass is classified by Underwriter's Laboratories as a fire-resistant glazing material, but DOES NOT MEET ANSI Z97.1-1984 or 16 CFR-1201 for safety glazing. For glazing limitations, consult the Building Materials Directory published by Underwriter's Laboratories.

Patterned Glass



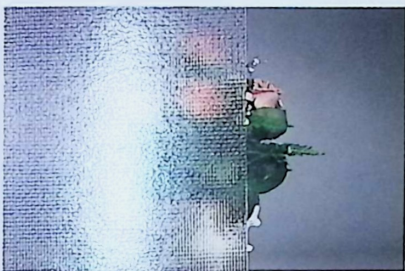
Aquatex®



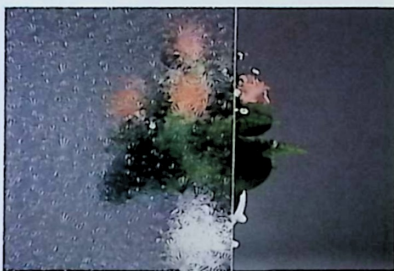
Pattern 62



Pattern 124



Flax®



Florex®



Flutex® Textured



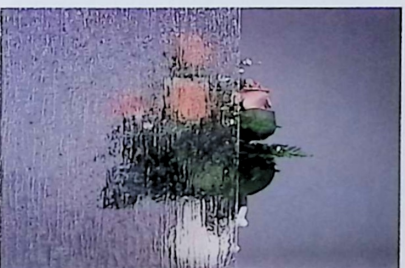
Hammered



Industrex®



Velvex®



Rain®



Leaf



Hammered Wire

Comfort-ETM Glass

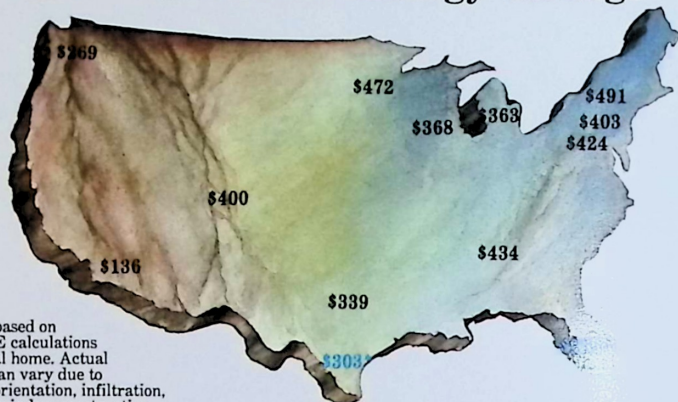


Comfort-ETM, a low emissivity glass, is manufactured with a special micro-thin transparent coating which is fired into the glass surface during the production process. Comfort-E glass actually reflects re-radiated heat from sun warmed objects and furnace heat back inside your home. This is heat that usually escapes through ordinary glass.

Because they reflect heat, double pane windows made with Comfort-E save 66% of the heat normally lost through single pane windows. And they save 20% of the heat lost through double pane windows made with ordinary glass.

Comfort-E glass works to reduce energy costs year-round. In the north, Comfort-E and clear glass is used in dual pane insulated glass units to keep the heat in during winter. In the south, the Comfort-E Sunscreen Glazing SystemTM combines Comfort-E with tinted glass to help keep the heat out in the summer. Look at the map to see how much Comfort-E can save in your area of the country.

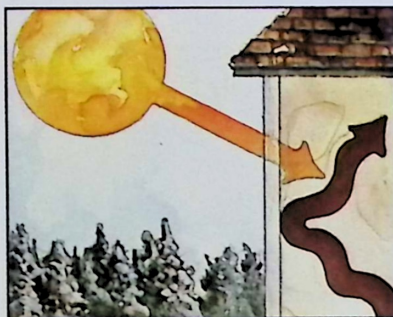
Estimated Annual Energy Savings



Savings based on ASHRAE calculations for typical home. Actual savings can vary due to window orientation, infiltration, window, window construction and numerous other factors.

*Comfort E Sunscreening Glazing System

Keeps you warmer in winter



New Comfort-E glass reflects the heat from your furnace back inside your home—heat which normally escapes through your windows. Comfort-E glass also helps capture the free solar heat of the low winter sun.

Reduces winter drafts and cold spots

Window glass can be a major cause of winter drafts and cold

spots in winter. Here is what happens.

When it's 0°F outside and 70°F in the house, the inside surface temperature of the glass in a single pane window is a cold 14°F. You feel a cold spot next to the window. The warm air in the room interacts with this cold air and creates convection currents—what we feel as winter drafts.

Under the same conditions (0°F outside, 70°F inside), heat reflected by the Comfort-E coating in an insulated unit warms the inside surface temperature of the glass to about 56°F. The warmer glass temperature helps reduce cold spots and drafts near windows, plus reduces condensation formation on the glass.

With Comfort-E glass you remain more comfortable at lower thermostat settings, even when you sit next to a window.

Comfort-ETM Glass

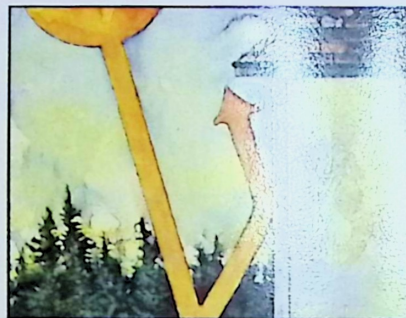
.....



Comfort-ETM Glass



Keeps you cooler in summer



New Comfort-E glass reflects heat re-radiated from patios, lawns and shrubbery back outside. Overhangs and the leaves from surrounding trees block most of the direct rays from the high summer sun.

For extra protection from the summer sun Comfort-E Sunscreen Glazing SystemTM combines Comfort-E and tinted glass to reduce solar heat gain even more.

Comfort-E Sunscreen Glazing SystemTM

In the south where air conditioning costs exceed heating costs the Comfort-E Sunscreen Glazing SystemTM is recommended. This unique glazing system combines a pane of Comfort-E glass with a pane of tinted glass to reduce direct and re-radiated solar heat gain.

Windows made with Comfort-E Sunscreen glazing can reduce direct solar heat gain 35% compared to clear insulated

Comfort-ETM Glass

AFG Comfort-E Low Emissivity Glass Product Specifications

Glass	Glass Thickness	(2)* % Transmittance Visible	(7)* Solar	Air Space Thickness	(3)* Winter U-Value	(4)* Summer U-Value	(4)* Shading Coefficient	(5)* Relative Heat Gain
Monotone Comfort-E	Single	86	77	—	.87	.75	.92	195
	1/8"	85	76	—	.87	.75	.92	195
	3/16"	84	72	—	.87	.76	.88	187
Dual Glazed Comfort-E	Single	78	68	1/4"	.50	.54	.86	180
	Single	78	68	1/2"	.40	.44	.87	180
	1/8"	77	66	1/4"	.50	.55	.85	178
Clear	1/8"	77	66	1/2"	.40	.44	.85	176
	3/16"	76	60	1/4"	.50	.55	.80	168
	3/16"	76	60	1/2"	.40	.45	.81	168
Comfort-E With Bronze	Single	63	55	1/4"	.50	.55	.73	154
	Single	63	55	1/2"	.40	.44	.73	152
	1/8"	59	51	1/4"	.50	.56	.69	146
	1/8"	59	51	1/2"	.40	.45	.69	144
	3/16"	50	40	1/4"	.50	.56	.59	126
	3/16"	50	40	1/2"	.40	.45	.59	124
Comfort-E With Gray	1/8"	53	49	1/4"	.50	.56	.68	144
	1/8"	53	49	1/2"	.40	.45	.68	144
	3/16"	42	40	1/4"	.50	.56	.59	125
	3/16"	42	40	1/2"	.40	.45	.58	123
	1/8"	26	41	1/4"	.50	.56	.59	119
	1/8"	26	41	1/2"	.40	.45	.58	119
Storm Window	Comfort-E Glass	Storm Window Over		Storm Air Space		(3)* Winter U-Value		
	Single	Single Glazed		1"		.42		
	Single	Double Glazed		1"		.27		

*Footnotes and Warranty Information appear on page 21.

glazing and 41% compared to single glazing. Plus the Comfort-E coating reduces conducted heat gain by an additional 20% compared to clear insulated glazing and 66% compared to clear single glazing. The combination of a low shading coefficient and a low U-value provides the best protection from the summer sun and heat.

Reduces fabric fading

The combination of Comfort-E glass and tinted glass blocks 74% to 83% of the solar ultraviolet light transmission. These are the destructive rays that can fade expensive fabrics, draperies, and carpets.

Keeps you comfortable

Since the Comfort-E Sunscreen Glazing SystemTM reduces both direct and indirect heat gain, it helps eliminate hot spots near windows. Your air conditioning system works more efficiently because cooling loads are reduced.

Wide selection of tinted glasses

You can combine Comfort-E glass with a wide variety of bronze, gray, or green tinted glasses that reduce heat gain. First, select the color of tinting desired to accommodate the architectural style. Then, select

the desired glass thickness to determine the shading coefficient and visible light transmission of the window. Your choice of glass thickness may be limited by additional architectural, wind load and strength requirements.

Special promotional sales aids are available from AFG

AFG can provide you with Comfort-E stickers to apply to your windows during manufacture. Additionally, consumer information pamphlets, point of purchase displays, and a Comfort-E videotape are available.

In the Comfort-E videotape, computer animation is used to illustrate how Comfort-E glass works to keep heat in during the winter and keep heat out in the summer.

A Comfort-E glass computer software program is also available. This IBM compatible software package calculates the estimated annual energy savings associated with the use of Comfort-E glass compared to regular glass for major cities in the United States.



Insulating Glass

AFG's single seal insulating unit represents a logical cost-efficient solution to energy efficiency in modern construction. The durability of AFG's single seal insulating unit underscores the quality and performance engineered into the product.

For best performance in thermally insulated windows and doors, AFG offers the state-of-the-art Dual Seal Insulating Unit. The units are manufactured on a fully automated insulating line to assure consistently high quality products with many unique benefits over traditional single-seal insulating units.

- Primary seal of polyisobutylene to provide maximum protection against moisture vapor transmission.
- High-strength organic secondary seal to provide maximum strength in bonding the glass and metal spacer.
- New 10 year warranty against seal failure.*

All AFG Dual Seal Insulating Units can be made with any combination of AFG clear, gray, bronze or Comfort-E™ glass to maximize thermal insulating protection. For example: An insulating unit utilizing one lite of AFG bronze glass and one lite of AFG Comfort-E™ will reduce total solar heat gain 41% compared to a clear single glazing, dramatically reducing energy costs in warmer climates.

*Footnotes and Warranty Information appear on page 21.



Insulating Glass

AFG Tempered Insulating Glass Standard Specifications and Tolerances

Product	2 Lites 1/8"	2 Lites 5/32"	2 Lites 3/16"	2 Lites 1/4"
Air Space	1/4", 5/16", 3/8", 7/16", 1/2"	5/16"	1/4", 5/16", 3/8"	7/16", 1/2", 5/8"
Maximum Short	46"	50"	50"	59"
Maximum Long	100"	100"	120"	120"
Maximum Area	25 sq. ft.	30 sq. ft.	35 sq. ft.	42 sq. ft.
Minimum Dim.	12" x 24"	12" x 24"	12" x 24"	12" x 24"
Applied Net Weight Sq. Ft.	3.3 lbs.	4.1 lbs.	5.0 lbs.	5.0 lbs.
Dimensional Tolerance up to 48"	± 1/16"	+ 1/8" - 1/16"	+ 1/8" - 1/16"	+ 1/8" - 1/16"
Over Thickness	+ 1/8" - 1/16"	+ 3/16" - 1/16"	+ 3/16" - 1/16"	+ 3/8" - 1/16"
Overall Thickness	A.S. + 1/4" ± 1/16"	A.S. ± 5/16" ± 1/16"	A.S. + 3/8" ± 1/16"	A.S. + 3/8" ± 1/16"

*Footnotes and Warranty Information appear on page 21.

Dimensions and Descriptions

Product	Glass Thick	Air Space	(2)* Average Visible Light Transmittance %	(3)* U-Value BTU/Hr./Sq. Ft./°F Winter	(4)* U-Value BTU/Hr./Sq. Ft./°F Summer	(5)* Relative Heat Gain BTU/Hr./Sq. Ft.	(4)* Shading Coefficient
Clear	1/8"	1/4"	81	.58	.63	189	.90
		1/2"	81	.50	.56	188	.90
		5/8"	81	.50	.54	188	.90
	3/16"	1/4"	81	.58	.64	181	.86
		1/2"	81	.50	.57	180	.86
		5/8"	81	.50	.55	180	.86
Bronze	1/8"	1/4"	62	.58	.64	157	.74
		1/2"	62	.50	.57	156	.74
	3/16"	1/4"	53	.58	.66	137	.64
		1/2"	53	.50	.58	136	.64
Gray	1/8"	1/4"	56	.58	.65	155	.73
		1/2"	56	.50	.57	154	.73
	3/16"	1/4"	45	.58	.66	135	.63
		1/2"	45	.50	.59	132	.62
Clear with Comfort-E	1/8"	1/4"	77	.50	.50	178	.85
		1/2"	77	.40	.44	176	.85
	3/16"	1/4"	76	.50	.55	168	.80
		1/2"	76	.40	.45	168	.81
Bronze with Comfort-E	1/8"	1/4"	59	.50	.56	146	.69
		1/2"	59	.40	.45	144	.69
	3/16"	1/4"	50	.50	.56	126	.59
		1/2"	50	.40	.45	123	.59
Comfort-E with Gray	1/8"	1/4"	53	.50	.56	144	.68
		1/2"	53	.40	.45	144	.68
	3/16"	1/4"	42	.50	.56	125	.59
		1/2"	42	.40	.45	123	.58
Comfort-E with Low-T Gray	1/8"	1/4"	26	.50	.56	119	.59
		1/2"	26	.40	.45	119	.58

*Footnotes and Warranty Information appear on page 21.

Solar Glass

AFG, the industry leader in solar glass development, offers low-iron glass suitable for active and passive solar applications, photovoltaics, and commercial greenhouse glazing. This rolled glass product is available in two distinct patterns:

Solite™

Formed with a stippled pattern on one surface which provides desired obscurity while retaining its high transmission values. Solite is our recommended product for most active applications where obscurity of the absorber plate in active solar panels is an important factor.

Solatex™

Formed with smooth rolls, Solatex is a light diffusing glass providing slightly higher transmission values at acute angles of incidence. Solatex is recommended where the ultimate in transmission is desired. It has been used effectively in flat plate solar collectors, photovoltaics, and commercial greenhouse glazing where high light transmission and light diffusion are necessary for good plant growth.

Solar glass for use in active collectors, photovoltaic modules, and commercial greenhouses should be fully tempered. AFG's fully tempered rolled glass will conform to federal specifications ASTM C-1048.



Common Physical Properties of AFG Tempered Solar Glass

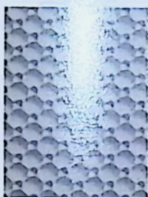
Product	Nominal Thickness	Width	(6)* Maximum Sizes Area Length	Sq. Ft.	PAR Values	Approx. Net Wt.	(7)* Approximate Solar Energy Transmitted
Solatex	1/8"	46"	102"	31	91.8%	1.6	91.0%
	5/32"	48"	108"	32	91.7%	2.0	90.7%
	3/16"	48"	120"	42	91.6%	2.4	90.4%
Solite	1/8"	46"	102"	31	91.8%	1.6	91.0%
	5/32"	48"	108"	32	91.7%	2.0	90.7%
	3/16"	48"	120"	42	91.6%	2.4	90.4%
Float	1/8"	46"	102"	31	89.4%	1.6	85.0%
	5/32"	48"	108"	32	88.7%	2.0	84.0%
	3/16"	48"	120"	42	88.0%	2.4	82.0%

*Footnotes and Warranty Information appear on page 21.

Lighting Glass



Crystal 70



AFG 112



Crystal 73



Fire can cause plastics to release toxic fumes and start other fires by melting and dropping on to furnishings.

Any lighting specification is enhanced by AFG Lighting Glass. Whatever the application, it blends longevity and energy-efficiency with a minimum of maintenance.

AFG Lighting Glass panels offer maximum light transmission with minimum absorption. Multiple prisms efficiently blend transmitted light down to the working plane.

Glass is abrasion-resistant and non-combustible. Its static-free

surface means minimal maintenance. Fires can cause plastic panels to release toxic fumes and spread flames by melting onto other surfaces.

AFG Lighting Glass panels can be tempered for added protection against thermal differences and mechanical stress. Fluorescent, incandescent, or HID, indoors or out, AFG can fit your needs with quality and practicality unmatched by plastics.

Crystal 70

Crystal 70 is the premium prismatic panel, long recognized as the standard of the industry. Crystal 70 is of low-iron composition with large raised hexagonal pyramidal-prisms that provide maximum brightness control for visual comfort in highly illuminated areas.

AFG 112

AFG 112 is specifically designed for the speculative building market. Its light neutral color and indented hexagonal and square pattern make it a quality lighting panel at an economical price. Tempered 112 is especially popular for sports facilities.

Crystal 73

Crystal 73 offers an excellent cost/benefit ratio. A raised square based conical glass, Crystal 73 offers low brightness, high utilization, and maximum lamp hiding power.

The excellent obscurity permits shallower fixture construction and wider lamp spacing. It is ideally suited to square fixture applications encountered in modular building design. Resistance to heat and freedom from ultraviolet discoloration makes it a good choice for lower wattage HID luminaires. Tempered Crystal 73 is recommended for high wattage HID sources.

Dimensions and Descriptions

Product	Thickness at top of Pattern		Weight Lbs. Sq. Ft.
	Nominal	Tolerance	
Crystal 70	3/16"	.172"-.219"	2.0
Crystal 73	5/32"	.142"-.172"	1.9
AFG 112	5/32"	.135"-.165"	1.8

NOTE: Maximum sizes of annealed glass limited by Underwriter's Laboratories.

*Footnotes and Warranty Information appear on page 21.

Box & Picture Frame Glass, Packaging

Box Glass

Single and 1/8" float glass is available in 50 foot boxes (up to 12 sq. ft.) and 100 foot boxes (over 12 sq. ft.). Our standard 50 foot skid pack requires varying numbers of boxes depending on size of glass for both single strength and 1/8" thick glass. Contact the AFG Sales Office for exact number of boxes for each standard size. These 4-way entry skids can be unloaded with forklift equipment and can be triple stacked in your warehouse.

Our many years of experience in packing 50 and 100 foot boxes assures you the safe arrival of this high quality float glass.



Packaging

At AFG, we've set the industry standard in innovative glass packaging. Our packaging, imitated by virtually every other glass company, meets three vital criteria: safety, easy visibility, and easy removal.

In addition to our cases, pallets, racks, and uncased glass, AFG now offers stretch-wrapped pallets which virtually eliminate disposal problems associated with wooden crates. At AFG, we believe in putting quality glass in a quality container to assure your glass arrives intact and undamaged.



Picture Frame Glass

AFG offers the widest variety of picture frame glass products in the glass industry. Pattern 122 non-glare glass will enhance the finest photographs or paintings while reducing glare and

protecting against moisture and fingerprints.

Picture frame glass, 14 oz. and 16 oz., is also available from AFG. These products are high quality clear float glass and are available in many standard picture frame sizes.

Technical Data

Design Considerations

Safety: Annealed glass must not be glazed in hazardous locations as defined by applicable building codes and the Consumer Product Safety Commission. These locations must be glazed with an appropriate safety glazing material. In addition, some glazing situations not specifically addressed by the codes, may require safety glazing. AFG will be happy to consult with your architect, concerning special glazing situations.

Fire: AFG Hammered Wired glass is classified by Underwriters Laboratories as a fire resistant glazing material. See UL Building Materials Directory for listing and glazing limitations. Note that AFG Hammered Wired glass *does not* meet ANSI Z97.1 or CPSC 16CFR1201 and must not be used in situations that require safety glazing.

Thermal Stresses: Tinted glass and tinted insulating glass require special architectural design consideration and extra care during manufacture and installation to prevent breakage from thermal stresses. Exterior shading, interior shading, HVAC outlets, drapery packets, etc., must be evaluated along with the solar properties of the glazing.

Glazing: The type of glazing system and the glazing material must be mutually compatible. See the Flat Glass Marketing Association's "GLAZING MANUAL" for general information on clearances, setting blocks, shimmiing, sealing materials, handling, etc. Certain glazing systems (such as flush, or stopless, glazing and butt-joint glazing) require singular matching of system to glazing materials and must be approached with caution. Note that the AFG insulating glass warranty contains specific glazing restrictions and requirements, including weep systems. Consult with AFG Technical Services for recommendations.

Surface Damage: Although glass has an extremely durable surface, it may be damaged by alkaline or ferrous solutions, causing an etching or staining of the glass. This can be avoided by designing a "drip barrier" to prevent run-off from surrounding masonry or steel. Frequent inspection and cleaning during construction is also recommended. See section on glass cleaning. Protect glass from wall treatments such as sealing, waterproofing, sandblasting, acid treatments, plastering, etc. For additional cautions for tempered glass, see page 21.

Glass Breakage: Some risk of glass breakage from a variety of causes is always present. While this risk is very low, the designer should address the consequences of breakage and the ease of replacement. Note that AFG does not warrant against glass breakage for any reason.

Handling And Storage Of Glass

Unloading: Proper equipment and protection of personnel during unloading and handling of glass is essential. Cranes, mobile equipment and slings must be appropriate and properly sized. The truck should be unloaded in a sequence and manner that will not impair the truck's stability or the stability of the remaining glass. Use of temporary bracing to restrain cases of glass may be required. Do not unload one side of a truck, but unload individual segments alternately from side to side to maintain balance of load.

Storage: Store glass in a dry, protected, indoor location. If stored packed glass becomes wet, it will stain and possibly stick together in a short time. Inspect stored glass regularly to insure it has not become wet thru condensation, leakage, etc. Glass that has become wet must be washed and dried quickly to prevent damage. Adequate shielding and retention of stored glass is essential to prevent breakage and accidental tip-over or leafing-off of the glass.

Unpacking: Prior to opening, the container must be tilted back against a wall or suitable support (preferably an unpacking stand) at an angle of 5° to 10° and blocked at the front to keep the container stable before cutting any bands or removing any boards. AFG's unpacking instructions should be carefully followed.

Glass Cleaning: Glass is best washed with well designed industrial washing machines equipped with a pre-rinse, brushes, water heated to at least 130°F, detergent meters, clean water rinses, and a good dryer. Washing of installed glass requires a proper cleaning solution applied with a clean, grit-free soft cloth. The cleaning solution may be a mild soap or detergent or a slightly acidic solution designed specifically for glass and not harmful to the framing, sealants, or glazing beads. Heated cleaning solutions and rinses will promote loosening of dirt and accelerate drying. Completely rinse and dry the glass after washing. Do not use metal or hard material scrapers, steel wool, or abrasives as they can easily mar the glass. Worn, damaged, or gritty squeegees will scratch the glass. Particular care must be taken with squeegees at exposed unframed glass edges to prevent contact of the squeegee's frame into the glass edge, as the squeegee rides off or onto the glass.

Technical Data

Chart I is of limited scope and is offered as a guideline only and is not for final design selection. AFG Industries should be consulted for confirmation of the glass selection. Chart I does not apply to sloped or skylight glazing or to butt-glazed two sided support. Avoid sizes and loads in the dashed line areas.

Design windloads and design factors must be specified by the architect/designers and conform to the applicable building codes. Chart I is based on a design factor of 2.5 which is the generally accepted minimum. The architect/designer may specify higher design factors, especially in critical areas which experience severe conditions. To use Chart I at a higher design factor, multiply the specified design load by the specified design factor divided by 2.5:

$$\text{Load For Use With Chart I} = \left(\frac{\text{Specified Design Load}}{\text{Design Factor}} \right) \times \left(\frac{\text{Specified Design Factor}}{2.5} \right)$$

Design factors relative to statistical probability of failure

Design Factor	Number and Percentage of Lites* That Will Probably Break at Initial Occurrence of Impact. (Per 1,000 Loaded)		
1.0	500.0	—	50.0%
2.5	8.0	—	.8%
3.0	4.0	—	.4%
5.0	.7	—	.07%
10.0	.15	—	.02%

*Rectangular lites properly supported on all sides in weather-tight rabbet, assuming statistically normal strength distribution and a coefficient of variation of 25%.

Chart I is for monolithic annealed AFG glass. If the glass has been processed further, apply the following adjustment factors by dividing the architect/designer's windload specifications by the appropriate factor prior to using Chart I.

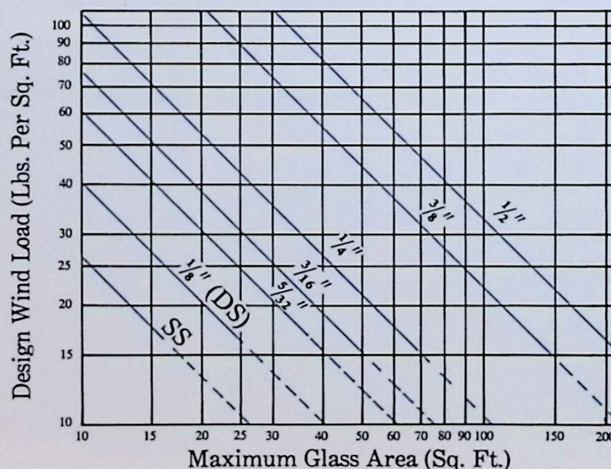
Glass Type	Adjustment Factor
Fully Tempered Monolithic Glass	4.0
Heat Strengthened Monolithic Glass	2.0
Laminated Glass ¹	0.75
Insulating Glass ² (2 Lights Hermetically Sealed)	
Both Lights Annealed	1.7
Both Lights Heat Strengthened	3.0
Both Lights Fully Tempered	5.0

¹Assumes two plies of identical thickness and type. Use overall thickness of laminate, not just one ply.

²Assumes both lights are of equal thickness and type and hermetically sealed. Enter Chart I with the thickness of one light. Consult AFG Industries if lights are of different thickness or different types.

Chart I

For uniform windloads of one minute duration at a design factor of 2.5. Applicable to rectangular shapes with length/width ratios of 5:1 or less and with glass firmly supported by cushioned rabbets on all four edges.



AFG Product Warranties

Limited Warranties

1. Express Warranties

AFG Industries Inc., hereafter known as AFG, warrants its products, to its original purchaser only, subject to the following conditions and restrictions for the period of time set forth for each product:

- a. Tempered Glass: AFG warrants for a period of one year from the date of AFG's sale that its tempered glass will meet, at the time of sale, specifications as defined by ASTM Standard Specification for Heat Treated Glass C-1043, Kind F, or Specification A and either ANSI Z97.1-1981 or 1988 or 16 CFR 1201 Category II or AIAA S-6.1-1983 (AS-2 or AS-3) as specified by its purchaser.

Caution: AFG tempered glass must not be modified or receive any fabrication such as grinding, drilling, sand blasting, etc., subsequent to tempering. Such modification or additional fabrication may seriously weaken the glass or impair its tempered characteristics and also voids any AFG warranty provisions.

- b. AFG Insulating Glass Units: AFG warrants its AFG Insulating Glass Units against material obstruction to vision due to defects in material or workmanship which results in film formation or dust collection on the internal glass surfaces caused exclusively from the failure of the hermetic seal, other than through glass breakage, for a period of five (5) years for AFG Single Seal units or ten (10) years for AFG Dual Seal (AFGDS) units from the date of manufacture. This warranty shall be void under any of the following circumstances: if the unit is not continuously and adequately mechanically supported on all sides; if the unit seal is not fully protected by a minimum one-half inch face covering or "bite"; if the perimeter glazing materials are not compatible with the

organic hermetic seal; if the glazing cavity is not effectively weeped to prevent water accumulation; if the unit has been abused or has not been stored and/or installed in a good and workmanlike manner; if the unit is installed in high moisture environments (including swimming pool enclosures or saunas), a vehicle, a skylight or slope glazing; or if the unit is installed outside of the Continental limits of the United States.

- c. AFG Comfort-E™ Coating: AFG warrants that its Comfort-E™ coating will not crack, peel or deteriorate under normal environmental glazed conditions for a period of five (5) years from date of manufacture. This warranty shall be void if the glass is damaged by breakage, improper handling or installation, cleaning with or exposure to abrasive cleaners, sharp objects, wire brushes, steel wool, acids or other caustic material of any type.

- d. Other Flat Glass Products: AFG warrants for a period of one year from the date of AFG's sale that all its flat glass products other than products with their own individual warranties (preceding paragraphs 1a, 1b and 1c) will meet, at the time of the sale, specifications as defined by ASTM Standard Specification for Flat Glass C-1036-85.

2. Limit on Remedies in the Event of Failure

In the event any AFG product fails to perform as warranted, AFG's sole responsibility and PURCHASER'S SOLE AND EXCLUSIVE REMEDY under any warranty, contract, negligence or other claim of liability shall be limited to a refund of AFG's original selling price or, at AFG's option, furnish the purchaser with another product without charge F.O. B. the shipping point nearest the product's

installation. In no event shall AFG be liable for costs incurred in the removal of failed products, the installation of replacement products, OR FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES INCURRED AS NON-PERSONAL INJURY LOSSES. In the event a product is replaced pursuant to any applicable AFG warranty, the replacement product is warranted only for the remainder of the warranty period applicable to the original product.

3. Disclaimer on Implied Warranties For All AFG Products

AFG MAKES NO OTHER EXPRESS OR IMPLIED REPRESENTATION OR WARRANTY OF ANY KIND REGARDING THE PRODUCTS, WHETHER AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR USE, OR ANY OTHER MATTER. In particular, AFG assumes no responsibility for glass breakage, improper usage, failure of products on account of faulty installation or building construction or design, improper handling, customer processing or fabrication (including application of coatings, films, etc.) or failure to follow AFG's instructions regarding the products.

4. Additional Information

If you wish to obtain additional information or resolve questions concerning interpretation of any warranties of AFG please write:

AFG Industries, Inc.
P.O. Box 929
Kingsport, TN 37662

Footnotes (The following footnotes apply to the dimension & description tables in this catalog.)

- (1) Mechanical and/or thermal stresses in any specific design will generally limit sizes that can be used for each thickness.
- (2) Percent light transmitted values are calculated for incidence perpendicular to the surface of the glass and equivalent to I.C.I. Illuminant "C" (approximate total daylight).
- (3) Winter U-values are for 0°F outside temperature, 15 mph wind, night time and 70°F indoor temperature. (U-value BTU/Hr./Sq. Ft./°F temperature difference). Equivalent "R" values can be determined by dividing the U value into 1 (R=1/U).
- (4) Summer U-values and shading coefficients are for 89°F outside temperature, 7-1/2 mph wind, daytime, and 75°F indoor temperature. Shading coefficient, as defined by ASHRAE, is the ratio of the solar heat gain through a glazing system under a specific set of conditions to the solar gain through a single lite of double strength float glass under the same conditions.
- (5) For an outdoor/indoor temperature of 14°F and an ASHRAE solar heat gain factor of 200 BTU/Hr./Sq. Ft.
- (6) Photosynthetically Active Radiation (PAR) is a measurement of the visible portion of the spectrum from 400-700 nanometers and is regarded by many horticulturists as being critical for proper plant growth and development.
- (7) Solar energy transmitted values are calculated in accordance with ASTM-E-424-71 testing procedure.

The above data and other information contained herein is intended merely as a general guide in planning your glass requirements and we assume no responsibility for its use or application.



AFG INDUSTRIES, INC.
P. O. 929 / KINGSFORT, TENNESSEE 37662 / 615-229-7200