



PENN MEDICINE GARAGE | PHILADELPHIA, PA.  
AGI member glaziers prove their mettle with innovative design and installation of a metal screen wall

# CASE STUDY

## AGI Glazier

Advanced Glass & Metal, LLC

Palm, Pa.

## Team

Architect - TimHaas

Construction Manager: L.F. Driscoll

## Supplier

Keymark Corporation

## Timeline

January - May 2015

## Scope

24,000 sf of sunshades designed, fabricated, and installed



All photos © Advanced Glass & Metal, LLC

## MORE THAN GLASS

AGI contractors are respected far and wide for their knowledge and expertise in the design and fabrication of architectural glass. However, they are less likely known, but equally imaginative when it comes to metal projects.

Advanced Glass & Metal, LLC, of the Lehigh Valley displayed vision and resourcefulness on the recent Penn Medicine parking garage at 3600 Civic Center Boulevard. The precast concrete garage is clad in an aluminum screen wall that required a custom metal design and creative logistics.

## SMART ALTERNATIVE

Architect TimHaas envisioned a screen wall to provide sun shade and architectural interest on the parking structure. The conceptual design included projecting fins on a 45-degree angle. When Advanced Glass & Metal reviewed the project, president Ron Kudla and his team realized that the sun shade would add considerable weight to the building and suggested an alternative.

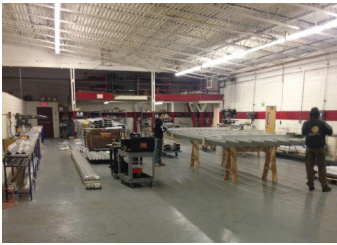
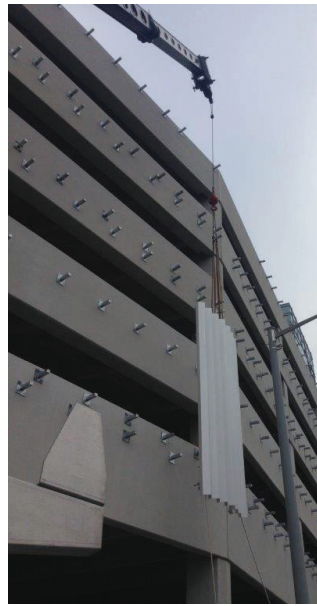
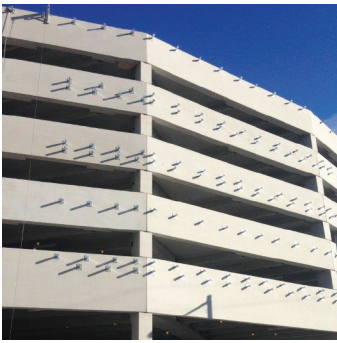
A custom extrusion could reduce size of the fins from 3/8-inch to 3/16-inch thickness, allowing the team to also reduce the size of the anchors. The reduction in metal reduced cost while providing an elegant, slender visual. The alternative was chosen.

The parking garage is post-tensioned, limiting placement options for the anchors and necessitating longer spans. Most of the fins are 20 feet in length. Advanced Glass & Metal developed the extrusion and pushed the dies through Keymark Corporation to ensure the thin profile. The fins were prefabricated in the shop and combined into units for faster installation.

## TEAMWORK

"It was a testament my field crew and shop that we accomplished this project in a short amount of time," explains Kudla. He credits shop foreman Bill Stein, superintendent Mike Zumar, and his engineers with working together to come up with ideas that impacted schedule and efficiency.

Left to right: anchors in place, fin section being lifted into position, fin wall daytime installation, night installation; lower left: fabrication



## FLUTTER

Prefabrication proved beneficial in this project because the Advanced Glass & Metal team noticed flutter in the first few fabricated pieces of aluminum. Flutter generally refers to vibration in metal; when metal begins to vibrate, it can't stop. The excessive movement can negatively affect the building structure. Stiffening measures can be designed to prevent this effect.

One of the most disastrous cases of vibration occurred when the 1940 Tacoma Narrows Bridge in Washington experienced aeroelastic flutter, famously causing the suspension bridge to collapse. The garage project had a much more fortunate outcome.

When early tests revealed the possibility of vibration, Advanced Glass & Metal added stiffeners to the sun shade design. Along the main portions of the building in locations outside the public's view, stiffening angles were used to laterally tie the fin blades together and reduce vibration. Gusset stiffeners were installed inside the fins at the building's corners. Kudla recalls that the experience taught a great lesson in the benefits of precautionary testing and a strong engineering team.

## CHALLENGING LOGISTICS

The tight corner site left only nine feet between the garage and Health Sciences Drive. To minimize lane closures and disruption to the area's busy ambulance and hospital visitor traffic, the team scheduled much of the install at night. Kudla credits his field personnel who laid out over 1,000 anchor clips in advance so they could lift the sun shade components into place quickly and efficiently.

The team couldn't use conventional cranes or store any material on site. Even the roof was off-limits because a boom couldn't make the tight swing to drop materials. Instead, smaller trucks were used, beginning at 11 pm and running through the night.

The crew designed and built crates that functioned as lifting frames to hold the fin sections in place during installation and then serve as waste receptacles. The crates were loaded back onto the trucks, returned to the shop for waste disposal, and then filled with new sets of fins. The process - and the ingenious crate system - enabled just-in-time delivery and allowed the crew to rotate 16 units per night.

L.F. Driscoll, LLC, managed construction. Dave Bravo served as project manager and Steve Ciallella was the superintendent. Project Executive John D. Haught spoke highly of the Advanced Glass & Metal performance. "Ron Kudla does an especially good job on the installation aspects of the projects he works on. This project was tough logistically because it was very tight to a very active road in University City. Ron's team improved the contract schedule and performed a high quality installation and a fair price."



For more information about glass and metal, visit AGI's sister organization, the Architectural Glass and Metal Association (AGMA), which serves regional contractors: [www.agmaonline.org](http://www.agmaonline.org).