FAMILY OWNED AND OPERATED FOR 70 YEARS IN THE METAL AND GLASS INDUSTRY

PROVIDING SUPERIOR SOLUTIONS TO YOUR MOST CHALLENGING PROJECTS.

W&W GLASS, LLC

W&W Glass is the NY metropolitan area’s largest architectural glass and metal contractor, specializing in Curtainwalls, Storefronts, Entrances, Ornamental Metal, Skylights, and Pilkington Planar™ structural glass systems.

W&W IS EXPERIENCED WITH VARIOUS PROJECT DELIVERY METHODS INCLUDING THE DESIGN ASSIST/DESIGN BUILD PROCESS. WE WORK WITH ARCHITECTS AND CONTRACTORS ALL OVER NORTH AMERICA AND THE CARIBBEAN.

THE PILKINGTON PLANAR™ SYSTEM

UNRIVALED PERFORMANCE FOR OVER 45 YEARS—THERE IS NO EQUAL.

Pilkington Planar™ structural glass systems have a proven track record in the most demanding applications. Architects can have absolute confidence in our ability to create soaring facades, roofs, canopies, or even clad an entire building. Architects can be comforted that their clients will receive the most highly engineered system in the market backed by the most respected glass manufacturer in the world. Pilkington Planar™ readily adapts to the design team’s requirements for designing backup structures that are simplistic or complex.

THE COMBINED EXPERIENCE OF ONE OF THE OLDEST AND LARGEST GLASS MAKERS IN THE WORLD ALONG WITH ONE OF THE LARGEST GLAZIERS IN THE UNITED STATES ASSURES A SAFE AND SUCCESSFUL RESULT!

MANUFACTURER

Pilkington has been one of the world’s leading glass manufacturers for over 150 years. Pilkington provides the complete glazing system as a sole source to insure undivided responsibility. One of the world’s largest glass research facilities supports a rigorous continual in-house testing program. This allows Pilkington to offer their 12 year comprehensive warranty that covers design, manufacturing, and installation.

Pilkington maintains a separate facility designed strictly for the manufacturing of the Pilkington Planar™ system. This results in exclusive glass features found only in the Planar System.

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WHEN YOU SELECT THE PILKINGTON PLANAR™ SYSTEM, YOU ARE SELECTING THE MOST TESTED SYSTEM AVAILABLE IN THE MARKETPLACE.

ARCHITECTS, ENGINEERS AND CONSULTANTS ARE CONTINUALLY DEMANDING HIGHER PERFORMANCE AND CREATING NEWER AND MORE COMPLEX DESIGNS.

When you select the Pilkington Planar™ system, you are selecting the most tested system available in the marketplace. You are selecting a system backed by over 45 years of IN-HOUSE testing where the end product gives your client unparalleled levels of comfort in the knowledge that all systems are backed by the Pilkington 12 year total warranty.

RECENT TESTING
Testing never stops with the Pilkington Planar™ System. Recent testing has been carried out on Pilkington Planar™ Integral hidden bolt laminated glass, energy efficient Pilkington Planar™ Triple/insulated units, Pilkington Activ™ self-cleaning glass, and Pilkington Intrafix concealed bolt IG units.

Advantages and benefits

<table>
<thead>
<tr>
<th>MAJOR ADVANTAGES</th>
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</thead>
<tbody>
<tr>
<td>1. Sole Source Manufacturing &amp; Engineering</td>
</tr>
<tr>
<td>2. Superior Tempering</td>
</tr>
<tr>
<td>3. Research and Testing</td>
</tr>
<tr>
<td>4. 12-Year Warranty Gives You Absolute Confidence</td>
</tr>
<tr>
<td>5. Rollerwave Distortion Control</td>
</tr>
</tbody>
</table>

Fail-Safe Redundancy of Fins
A consultant demanded an unprecedented fail-safe, redundancy test that had never been done before. Under design load (40 psf), we remotely broke a glass fin to prove that the system would stay in place with a broken structural element on the wall. In addition, we tested for dynamic water, air, and seismic loading.

Hurricane Testing
With the development of the Planar™ SentryGlas® Plus System, and with the growth of hurricane impact codes, Pilkington has successfully tested an impact resistant Planar™ facade for both large missile impact and cyclic loading in accordance with ASTM E 1886.

Bomb-Blast Testing
Pilkington leads the way with recent testing allowing Pilkington to design systems to the level 1 standard of the GSA when tested to both GSA level C and D standards.

PROJECT   LOCATION   ARCHITECT
---   ---   ---
Bank of America Trading Floor  Charlotte, NC  SOM
PILKINGTON PLANAR™ FITTINGS

THE CONCEPT IS CLEAR: DESIGN, TEST, AND PLACE INTO SERVICE THE BEST ENGINEERED AND YET THE SMALLEST, MOST AESTHETICALLY PLEASING FITTING WITHOUT COMPROMISING PERFORMANCE.

Rigorous testing has led to the development of a standard set of fittings using 316 grade stainless steel. These fittings are designed to deal with extraordinary forces from seismic, snow and wind loads.

Four and two point castings, as well as various 905 series fittings, represent only some of the many types of stainless steel connectors designed to connect the glass to the backup structure.

PILKINGTON PLANAR™ INTEGRAL

A fully tested and patented method of fixing laminated glass panels to a backup structure without any exterior bolts, caps or washers! All fittings are concealed within the laminated glass. This fixing system allows a much wider variety of glass types, including art and textured glass, to be used in a structural glass application. Integral allows us to horizontally glaze an entire roof or canopy without any fasteners in the exterior glass!

PILKINGTON PLANAR™ INTRAFIX

Intrafix can be specified for applications in which the design team wants an insulated wall without any external bolts, caps, or washers. This fixing mechanism captures the tempered or laminated inner leaf of an insulated unit with a stainless steel disk system which does not penetrate the outer glass. Planar Intrafix allows high performance coated glasses to be used for the external lite of the IG unit. Intrafix carries the Pilkington Planar™ 12 year warranty.

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GLASS PERFORMANCE FIGURES

INSULATED GLASS

<table>
<thead>
<tr>
<th>10mm Outer Pane</th>
<th>16mm Cavity</th>
<th>6mm Inner Pane</th>
<th>VTc</th>
<th>R1/vis</th>
<th>SHGCc</th>
<th>SCc</th>
<th>'U' Summer</th>
<th>'U' Winter</th>
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<tbody>
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<td>Pilkington K Glass™</td>
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<tr>
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LAMINATED GLASS

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<th>6mm Inner Pane</th>
<th>VTc</th>
<th>R1/vis</th>
<th>SHGCc</th>
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<th>'U' Winter</th>
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</table>
STEEL SUPPORT STRUCTURES

STEEL BACKUP STRUCTURES CAN BE ANYTHING FROM SIMPLE PIPE COLUMNS TO COMPLICATED, EXPRESSIVE TRUSS SYSTEMS.

W&W and Pilkington can design and supply, as a sole source system, both the glass and steel. In some instances when the design is very simple, it may be advantageous to allow the steel to be furnished and erected within the steel package, with coordination by Pilkington and W&W.

When the steel design becomes expressive, and close integration of the two products is needed, then we will supply both steel and glass as a single source.
GLASS MULLION SYSTEMS

THE GLASS MULLION SYSTEM USES GLASS FINS AS A MEANS OF SUPPORT FOR MAXIMUM TRANSPARENCY.

These glass facades must be suspended from the structure above with the glass panels fastened to the mullions by Pilkington Planar™ fittings. This means the combined weight of both the panels and the mullions is carried by the connection at the head of each fin. This allows you to design very high facades that do not exert large in-plane loads on the Pilkington Planar™ panels. All projects, in high seismic zones, must be suspended in this way.

Pilkington Planar™ has been thoroughly tested for use in areas of high seismic activity, which has been demonstrated by the system’s excellent performance in previous seismic events in both California and Japan.

A PILKINGTON PLANAR™ GLASS MULLION FACADE HAS BEEN DESIGNED AND TESTED TO WIND LOADS OF 270 PSF (320 MPH) FOR 15 MINUTES.
TENSION STRUCTURES

WE GUARANTEE THE DELIVERY, COMPATIBILITY, AND PERFORMANCE OF THE COMPLETE FACADE.

Various forms of cable-stayed backup system designs can be used to support a Pilkington Planar® facade. They can take the form of simple strong back trusses, bow string trusses, or lighter weight, more filigree cable trusses. Designers have complete freedom and flexibility when designing these trusses.

In all instances, the capabilities and loading of the glass must be used as the basis of the design for the back-up structural system.

PROVEN PERFORMANCE

Pilkington Planar® Tension Structures have already met high performance requirements for seismic loads, live and dead loads and wind loading including hurricane force winds.

These structures require early cooperation between the design team and W&W Glass to solve both design and budget questions. We offer full technical design services, starting from the basic concept, through 2D and 3D analysis, up to full design and performance specifications, mock-ups, and testing.

TOP: Harvard Medical School, Boston, MA, Architectural Resources Cambridge CENTER: New York Presbyterian Hospital, New York, NY, Pei Cobb Freed & Partners BOTTOM: Santa Monica College Theater, Santa Monica, CA, Renzo Zecchetto Architects
CANOPY SYSTEMS

THE DESIGN FLEXIBILITY OF PILKINGTON PLANAR™ AND THE REDUCTION OF METAL FRAMING, WHICH CAN CAUSE MAINTENANCE PROBLEMS OVER TIME, MAKE PILKINGTON PLANAR™ THE PERFECT CHOICE FOR HORIZONTAL AND OVERHEAD GLAZING.

Pilkington Planar™ overhead glazing has undergone extensive seismic, impact, water and wind load testing. Backup structures can be supplied as a completely engineered sole source package for guaranteed performance of the complete skylight or canopy.

TECHNICAL CONSIDERATIONS

The backup structure is required to carry snow and other loads and resist negative wind pressures through the fitting locations. Large spans are possible if underlying purlins are reinforced with cable tension rod rigging. Pilkington Planar™ requires a minimum of 3 degrees of slope to eliminate ponding of water in the center of the glass.

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>LOCATION</th>
<th>ARCHITECT</th>
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<tbody>
<tr>
<td>Twelve Oaks Mall</td>
<td>Novi, MI</td>
<td>Neumann/Smith Architecture</td>
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<tr>
<td>Bowling Green Station, New York, NY</td>
<td>Neumann/Smith Architecture</td>
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<td>3rd Street Light Rail, San Francisco, CA</td>
<td>City of San Francisco Bureau of Architects</td>
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</tr>
<tr>
<td>High Museum of Art, Atlanta, GA</td>
<td>Renzo Piano Building Workshop</td>
<td></td>
</tr>
</tbody>
</table>
ROOFS AND SKYLIGHTS

WHEN TRYING TO CREATE TRANSPARENT VIEWS OF ARTICULATED STRUCTURES, PILKINGTON PLANAR™ IS THE PERFECT WAY TO SIMPLIFY THE ALL GLASS SKYLIGHT. PILKINGTON PLANAR™ APPLICATIONS HAVE AN EXTENSIVE IN-SERVICE TRACK RECORD FOR SAFETY AND DURABILITY.

Horizontal applications are warranted for 12 years against delamination, leakage and seal failure (IG units). Early coordination with the building structure is needed, as well as consideration of snow and drift loads, seismic zone, drainage, etc. Steel can be engineered to use combinations of glass mullions and/or cable and steel structures.
PLANAR NET
PILKINGTON AND W&W HAVE DEVELOPED AND TESTED THE PLANAR NET SYSTEM.

COMBINED WITH PLANAR INTEGRAL OR INTRAFIX DESIGNS, CABLE NETS CAN BE SUPPLIED WITHOUT ANY EXTERIOR FITTINGS OR PATCHES.

Planar Net uses the same principles used by the Pilkington Planar™ System by attaching Planar countersunk panels to pre-tensioned cables which are then attached to a coordinated boundary structure.
PILKINGTON PLANAR™ TRIPLE INSULATED GLASS

PILKINGTON INTRODUCES THE WORLD’S FIRST TRIPLE GLAZED FRAMELESS GLASS SYSTEM.

Triple glazing offers substantially lower U Values than traditional double glazed Pilkington Planar™. There are three layers of glass giving the architect multiple choices for increased solar performance and noise control. Performance figures available upon request.

CANADIAN MUSEUM OF NATURE
“THE QUEENS’ LANTERN”

THE LANTERN AT THE CANADIAN MUSEUM OF NATURE IS A 65’ HIGH TRIPLE GLAZED 3-SIDED GLASS CUBE PLANAR SYSTEM.

The glass type of the units are 12mm Optiwhite™ T-Plus, with a 6mm Optiwhite™ T-Plus middle lite, and the interior lite is 6mm energy advantage T-Plus. It was designed to handle the harsh Canadian winters common to the Ottawa area. The system is a combination of Pilkington Planar™ seismic 905 fittings on glass fins, which in this unique situation penetrate the face glass and protrude from the building. The corner units are attached to steel columns which are hung from the cantilevered roof structure.
NEW YORK PRESBYTERIAN HOSPITAL

The dual skin “climate wall” was designed to allow significant quantities of natural daylight into the space and to act as a natural insulator.

The outer wall of laminated glass is mounted to a series of stainless steel tension rods by countersunk Planar fittings and cast stainless steel “spiders”. The inner wall of insulated laminated glass is separated by a 3’ gap that acts as a thermal barrier and allows for the deployment of computer controlled shading devices as well as cleaning. In the winter the facade acts as a large thermal blanket for the space, reducing heating costs.

DUAL SKIN CLIMATE WALL

PROJECT New York Presbyterian Hospital
LOCATION New York, NY
ARCHITECT Pei Cobb Freed & Partners

BOTH WALLS OF GLASS ARE MADE FROM Pilkington OptiWhite™ Low Iron Glass. The outer wall utilizes a SentryGlas interlayer for both structural integrity as well as transparency.

Interior view of atrium wall supported by a series of horizontal steel and cable trusses to take both wind and dead load

The exterior and interior facades are separated by a 3’ gap that accommodates both shading devices as well as stainless steel tension trusses for structural support.
UNIVERSITY OF SOUTHERN CALIFORNIA
STEM CELL RESEARCH BUILDING

THE EXTERIOR PLANAR FACADE IS A CABLE WALL SPANNING APPROXIMATELY 63’ MADE UP OF Pilkington OPTIWHT™, LOW IRON, LAMINATED GLASS MOUNTED TO STAINLESS STEEL CABLES BY PLANAR 905 TYPE STAINLESS STEEL MACHINED FITTINGS. THE FITTINGS ARE CLAMPED ONTO THE CABLE WITH SPECIALLY MADE RODS AND BOLTS.

The interior facade is a conventional window wall spanning floor to ceiling with insulated Low-E glass with a 50% acid etch frit pattern.

The cavity of 3’ between facades is filled with walkways for access to the exterior facade and for maintenance. This space creates a thermal barrier to better insulate the interior of the building.

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DUAL SKIN CLIMATE WALL
PROJECT University of Southern California Stem Cell Research Building
LOCATION Los Angeles, CA
ARCHITECT ZGF Los Angeles

THIS DUAL SKIN CABLE WALL, ON THE WEST COAST, ACTS AS BOTH AN ACOUSTICAL AND THERMAL BARRIER FOR THIS NEW RESEARCH BUILDING.

The exterior facade is supported by a series of pre-tensioned stainless steel cables that span top to bottom and are laterally braced at each floor. The glass panels are mounted to the cables by 905 countersunk Planar fittings.
The focal point of the project is the single span cable wall that faces Broadway and serves as the main entry into the complex. A series of stainless steel cables up to 1.25” diameter span heights of 45’ and are tensioned up to 60kips each. 3/4” Pilkington Planar™ clear laminated glass mounted to the cables by use of both Planar Integral fittings and stainless steel patches serves as the skin to this facade.

Other Planar facades utilize bolted, insulated laminated glass for insulation, security and acoustical control and are supported by laminated glass fins.

Stainless steel fittings in both countersunk and patch plate forms were used to mount the laminated glass to the stainless steel cables. The larger patch fittings were used at the four way intersections and the small Planar integral fittings were used at the intermediate locations to reduce deflection.
The architect utilized the Pilkington Planar™ Net system for this lobby enclosure because of its light weight appearance underneath a massive 50-story skyscraper. The entry lobby spans 37’ and utilizes a single span ¾” stainless steel cable, pre-stressed to 30 kips, to hold up low iron SentryGlas laminated panels mounted by 905 type countersunk Planar fittings. The contrast between the massive vertical columns and the light weight stainless steel cables allows the facade to disappear.

At the north elevation of the tower is the Stephen Sondheim Theatre whose facade was maintained during construction. Immediately adjacent on both sides are two 30’x70’ Planar Net walls which helped unite the classic brick facade and the all glass tower.
After a change in ownership of this high-rise building, a new lobby was created out of low iron Optiwhite™ glass.

The new facade is supported by 19mm low iron Optiwhite™ glass fins and utilizes a “fly-by” at the head and jambs to create the illusion of a floating facade. Custom laminated glass transfer beams were introduced to help create an all glass entry portal to encase both the revolving and balanced doors.

<table>
<thead>
<tr>
<th>PROJECT</th>
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<th>ARCHITECT</th>
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<tbody>
<tr>
<td>Indianapolis Motor Speedway</td>
<td>Indianapolis, IN</td>
<td>Browning Day Mullins Duerief Architects</td>
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</tbody>
</table>

**Yankee Stadium, Bronx, NY**

Populous f/k/a HOK Sport

Off in the distance is the “Batter’s Eye” which is a grey tinted Pilkington Planar™ integral laminated glass facade that conceals a sports bar in center field.

**Citifield (NY Mets Stadium), Flushing, NY**

Populous f/k/a HOK Sport

Vertical glass fins support laminated glass mounted by 905 Planar fittings to create this large viewing window from the right field dining club.
AMC THEATRE

W&W worked with Westfield, the mall’s owner, and the architect to create the ultimate transparent glass wall for this movie theater addition in Century City.

Panels are made from 12mm Pilkington low iron Optiwhite™ glass and span 45° and lean out at a 10 degree angle. The facade is held up by ¾” low iron Optiwhite™ glass fins and 905 type stainless steel Planar fittings. Laminated glass canopies supported by laminated glass fins were introduced over each entry portal. These canopies are particularly invisible and also utilize low iron Optiwhite™ glass.

COLUMBIA CENTER

Optiwhite™ low iron glass was utilized for the vertical glass fins, the horizontal glass beams supporting the canopy, the return lights on the roof and the entire facade.

Stainless steel countersunk Planar fittings join the panels together and allow for a structureless glass corner that help make the illusion of a floating cube.

THE LOW IRON ALL GLASS JEWEL BOX THAT FORMS THE CORNER OF THIS OFFICE BUILDING IS THE FOCAL POINT OF THIS PROJECT.
NOVARTIS

PILKINGTON PLANAR™ INSULATED GLASS ON THE VERTICAL WALL AND INSULATED LAMINATED GLASS ON THE SKYLIGHT.

The glazing system is made up of a series of horizontal steel plate beams and vertical stainless steel tension rods. Glass is mounted to the rods and/or plate beams with stainless steel countersunk Planar fittings. The glass panels are made up of low iron Pilkington Optiwhite™ glass with a high performance Low-E coating for energy efficiency.

Horizontal painted steel plate beams resist wind load from the glazing and transfer it to the vertical steel jambs.

Side mounted spider stainless steel castings and Planar 912 countersunk fittings attach the laminated glass to the vertical plate beams.

BOSTON PROPERTIES, THE OWNER OF THE CITICORP TOWER WAS LOOKING TO CREATE A NEW, CLEAN AND ELEGANT ENTRY AT THE REAR OF THE TOWER ON LEXINGTON AVENUE.

A simple design of painted steel plate beams (1.5" thick) were used to support an exterior wall of Pilkington Optiwhite™, low iron, laminated glazing spanning over 35’ and returning to form a small skylight at the roof. Glass panels were mounted with stainless steel countersunk Planar fittings.

This was a design assist project with W&W, Kling Stubbins architects and Thornton Tomasetti engineers. The result is a true jewel box entry into this iconic NY skyscraper.
THE ROSE CENTER FOR EARTH AND SPACE REPRESENTS THE PINNACLE OF CABLE STAYED STRUCTURAL GLAZING IN THE UNITED STATES TODAY.

The glazing system is made up of a series of laminated glass panels with a ceramic frit silk screen pattern for solar control. It is supported by a combination of painted steel plates and stainless steel truss assemblies. Pilkington Optiwhite™ low iron glass and custom stainless steel casings make up the vertical enclosure around the glass roof. W&W was responsible for the entire enclosure including engineering, glass and steel, fabrication and erection.

This project truly represents a coming of age for classic architecture combined with state of the art glazing technology!
All glazing components in this brochure have been supplied by Pilkington. Certain backup structural elements displayed in photographs within this brochure have been supplied by others. This publication gives a general description of the product. It is the responsibility of the user to ensure that any use of the system fully complies with all relevant building codes, industry standards and other requirements. Pilkington and W&W hereby disclaim all liability arising from any error in or omission from this publication. Pilkington Planar™, Pilkington Optifloat™, Pilkington K Glass™, Pilkington Activ™ Pilkington Optiwhite™, Pilkington Insulight™ are all trademarks of Pilkington United Kingdom Limited. DuPont™, the DuPont Oval and SentryGlass® are registered trademarks or trademarks of E.I. DuPont De Nemours & Co. or its affiliates and are used under license from the trademark owner. SPECIFICATIONS SUBJECT TO CHANGE. 2011 © COPYRIGHT, W&W GLASS, LLC. PRINTED IN USA.