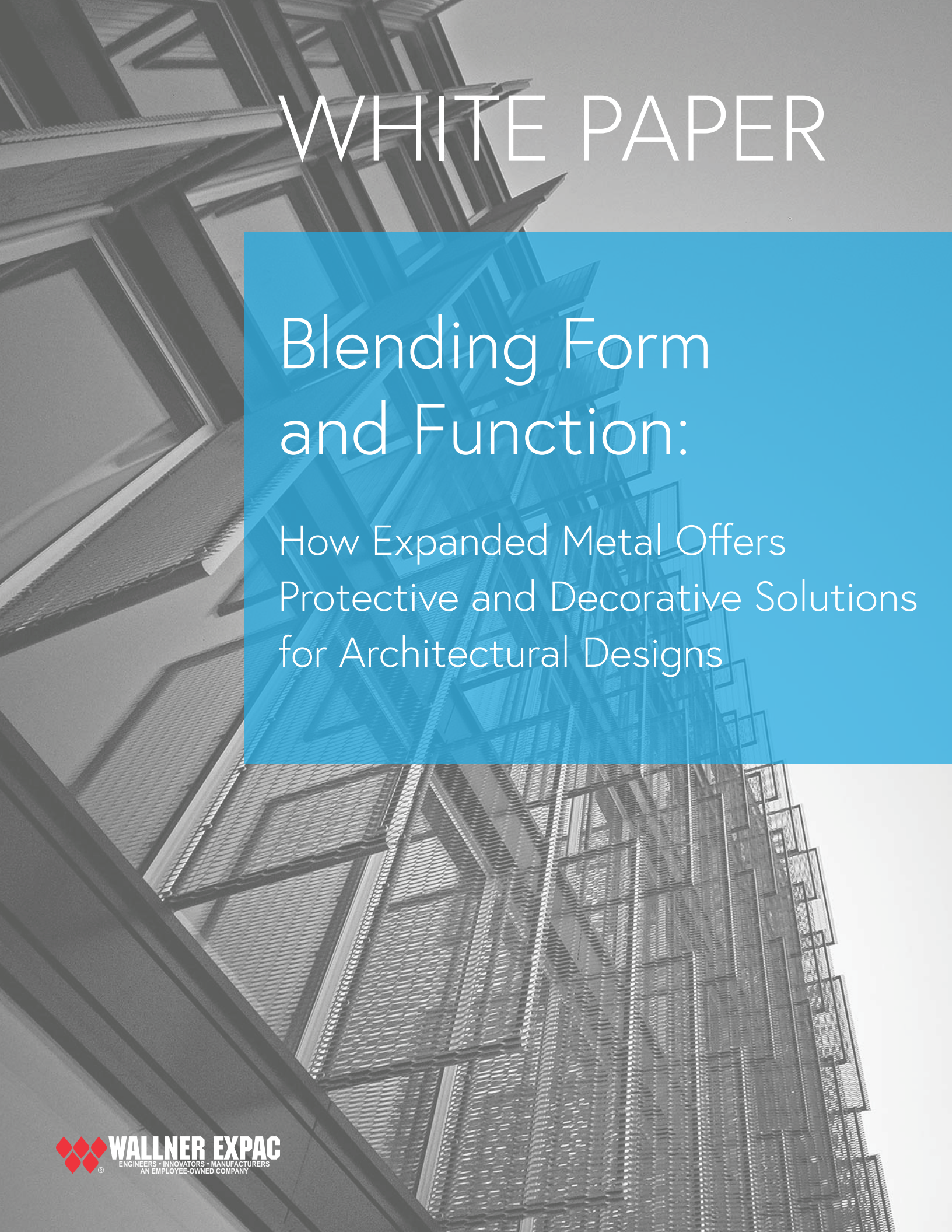

WHITE PAPER

Blending Form and Function:

How Expanded Metal Offers Protective and Decorative Solutions for Architectural Designs

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OVERVIEW

"The purpose of Architecture is to improve human life. Create timeless, free, joyous spaces for all activities in life. The infinite variety of these spaces can be as varied as life itself and they must be as sensible as nature in deriving from a main idea and flowering into a beautiful entity. The overriding essence is found in the intangibles, life–heart–soul–spirit–freedom–enduring within the structure."

–John Lautner, Architect F.A.I.A.

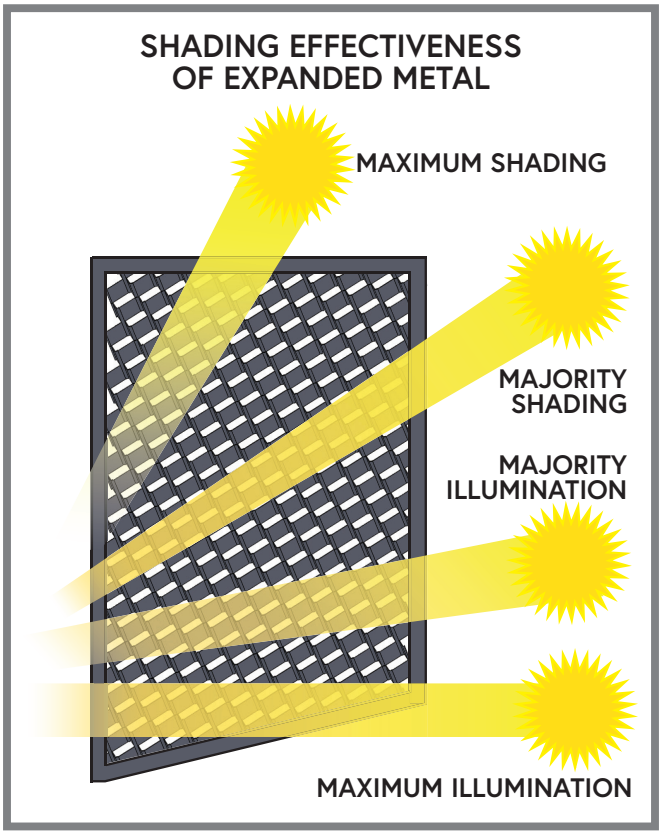
This goal can be reached; however, there will be many obstacles: How do I bring my creation to fruition while staying in budget? How do I satisfy the lofty goals of my client? What are my material and geographical limitations?

Architects design environments to improve the quality of life, and a key aspect is to select the right material. One that has been gaining more attention for its strength and versatility is expanded metal. Although there are similar materials that can be used, this narrative will explore and illustrate how it is an excellent choice to protect, safeguard, and even elevate designs.

ENVIRONMENTAL ADVANTAGES OF EXPANDED METAL

Creating a design that transcends both form and function is probably the biggest challenge for an architect. After all, the first thing someone sees of a building is the exterior. Immediately, opinions about the design are drawn: "Bold. Amazing. Meh. Stunning." Oftentimes, a façade or panels are fashioned to the exterior to serve multiple purposes: Shading and cooling, circulation of natural air, reduction of noise pollution, and of course, aesthetics.

Façades and panels using expanded metal are primarily used as an attractive option. Also known as Architectural or Decorative meshes, they are used to provide privacy, reduce air conditioning requirements, and to simultaneously control light while maximizing outward visibility. By its very nature, expanded metal has a percentage of open areas which can be modified to provide economical shading and ventilation. Effective adjustment of the strands and openings can dramatically affect interior lighting. When the sun is low in the horizon, maximum light passes though the openings. As the sun reaches its zenith– with proper optimization of the stands and openings– maximum shading is achieved: Up to 85 percent of light that normally penetrates the windows is blocked. By deflecting this light and its heat, less energy is required to operate HVAC systems, providing a more consistent interior temperature and may help earn both MR and EA LEED credits.



In lieu of panels, shutters can be used with the added ability to open and close. At the Education Campus Sonnwendviertel in Vienna, "More than 400 pantograph shutters at the new school assure perfect light ambiance and highlight the contemporary façade design." Furthermore, "Expanded metal presents a very interesting variation for modern façade design. The broad range of expanded metal and their measurements make individual planning and finishing to the desired expanded metal format possible. In addition, the contemporary expanded metal look offers shade but still allows light to enter a building."

Filtration doesn't have to be limited to light. Equally effective inside as it is outside, decorative expanded metal panels can be suspended from ceilings or used as partitions to muffle ambient sounds and provide privacy: The smaller the openings, the more effective it is.

Expanded metal shutters at the Education Campus Sonnwendviertel

The primary environmental advantage of expanded metal is its sustainability– it is 100 percent recyclable. From a supplier standpoint, expanded metal is routinely sourced from metal suppliers that typically include 20-35 percent recycled metal, with some suppliers using up to 40 percent. In accordance with the USGBC LEED 2009 recycled content requirements, "high-recycled content" steel contains 40–57.5 percent recycled content that can be utilized in calculating LEED MR Credit 4 - Recycled Content.

The manufacturing process is also environmentally friendly and relatively inexpensive. Instead of creating openings by punching the metal which produces a waste disc, the metal is slit and drawn producing almost no waste or the need to incorporate additional products. This in turn reduces the materials costs while yielding more finished product than raw.

STRONG. SAFE. STRIKING. Blending Form and Function

Strong and lightweight, expanded metal is ideal for use in both construction and architectural applications. Because of its single-piece architecture, it has very high strength-to-weight ratio. It is manufactured from a sheet of metal using a Shear-Form process: It is fed under a set of knives and is slit and simultaneously stretched producing a uniform diamond-patterned mesh. Unlike other products such as welded or woven wire, there are no points at which the material can fray or separate. The typical yield of finished to raw product is 3-to-1, and in many cases, greater with little to no waste. Since no additional components, processes, or additives are required for production, costs are minimal. Applicable for multiple uses, it can be made from aluminum, steel, or other corrosion-resistant metal, and various post-production coatings can be applied.

Safeguarding and protecting a building and its inhabitants is an important aspect for any design. For pedestrian walkways where maximum traction is needed, expanded metal is a viable option. Not only strong and light, it also has inherent anti-slip properties that can prove useful where of oils, ice, or other slick substances pool. Matching railing and balconies can be fabricated using the same pattern.

Pedestrian walkway railing using expanded metal infill panels

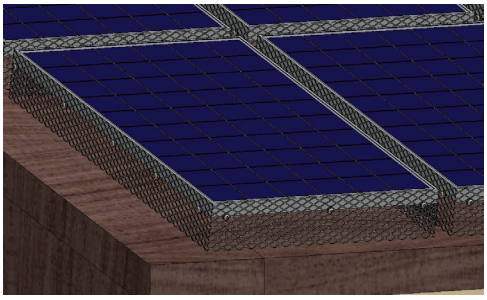
Expanded metal sunshades not only protect from the sun, but also reduce the chance for a break-in. Since most are a crime of opportunity, they are usually quick. Because expanded metal has no points that can separate, it will take quite a while a criminal to cut through each strand. By securely attaching the panels to the building, the window is no longer a security liability– and looks better than traditional security bars. Security doors can be fortified with expanded metal, and when larger areas require access control, expanded metal perimeter fencing provides better protection. The tops can be left with random shears to prohibit someone from attempting to climb over the top and looks better than chain link fencing.

Protection from nature is another consideration. Typically screened with chicken wire, exterior vents provide birds and rodents access to the safety of attics and crawl spaces. A determined rodent can gnaw through and invade the space. Once breached, pigeons and rodents quickly create mess of feathers, droppings, and nesting materials. Allowed to accumulate, this can require the expense of removing the animals, cleaning, and repairs to any damage.

A relatively new reason for affixing expanded metal to rooftop solar panel arrays is for compliance with homeowner association covenants. HOAs cannot restrict homeowners from adding solar panels; however, they can mandate that the panels meet architectural requirements: "[The] Area between roof and panels shall be skirted and painted in a color that matches the roof color."

This justification serves two purposes: Aesthetics and the safety of all community residents. HOAs claim that the space between the panels and the roof is unsightly. Panels without skirting provide a safe haven for birds and rodents from predators and extreme weather conditions. Left un-skirted, leaves, nesting birds, and windblown debris can accumulate, becoming a visual blight. Rats and squirrels will gnaw on wires and scratch at panels. For condominiums or townhomes, this is extremely dangerous. The accumulation of debris– if allowed to come in contact with the frayed wires– may ignite which can quickly grow and spread to multiple units.

To effectively protect from animals and comply with local regulations, expanded metal offers remarkable strength and versatility. With no joints or welds that can separate, openings can be modified to allow for needed ventilation. With the availability of different patterns and colors, it can seamlessly complement existing architectural elements.



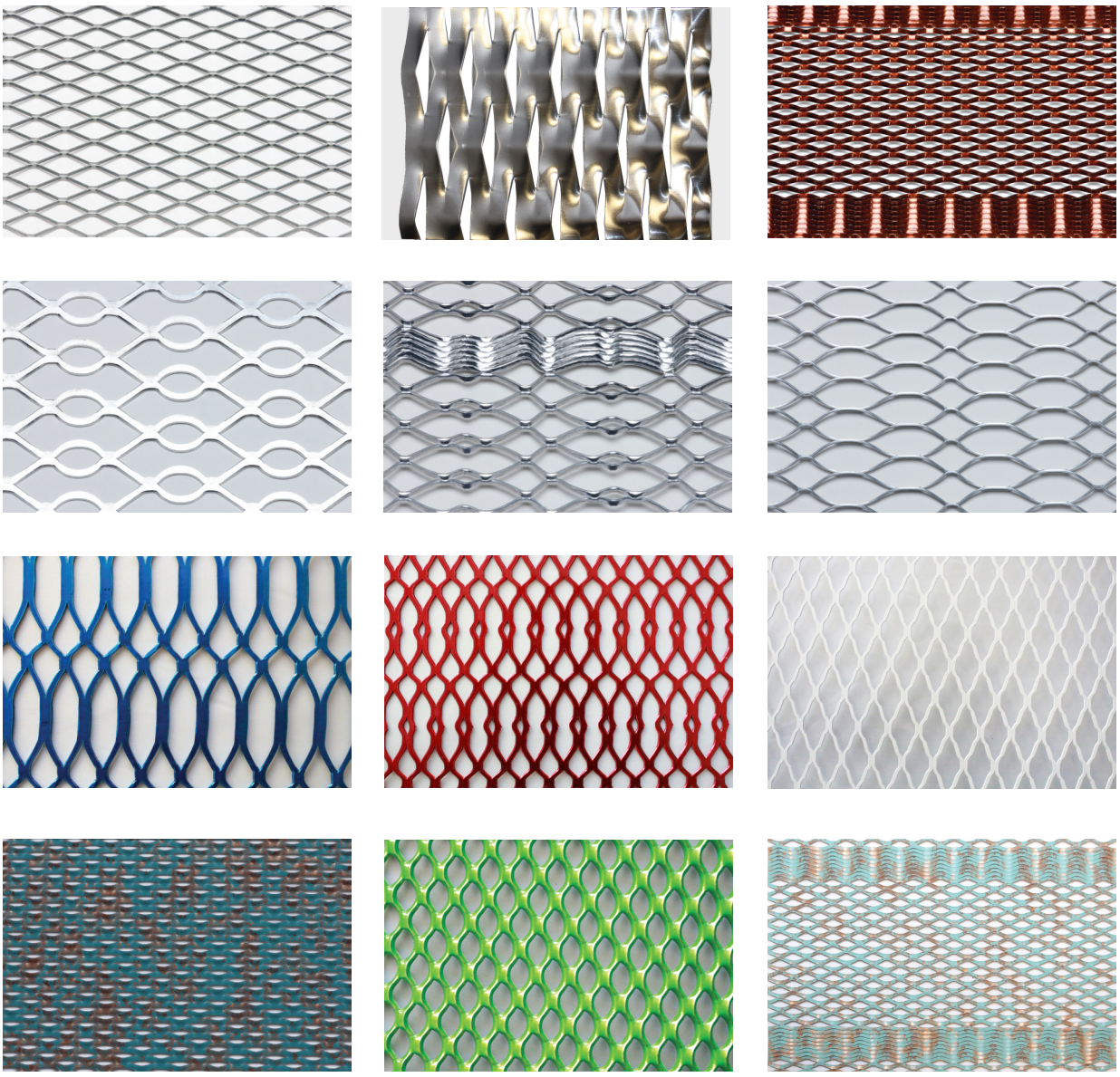
Engineering rendering of protective expanded metal skirting or solar panels

FINAL THOUGHTS:
The Versatility of Expanded Metal

Ultimately, the design of a structure must be functional. Expanded metal is a distinctive material that can be utilized for almost any design. Welded or woven wire is limited to either a square or rectangle pattern. Not limited to a diamond-shaped pattern, expanded metal can be formed into many attractive designs that can complement existing architectural elements such as gutter guards, chimney caps, building façades, and skylight screens. Additional uses include outdoor furniture, living walls, fire screens, and lighting shades. It can also be painted–or even powder coated during the manufacturing process to maximize its longevity.

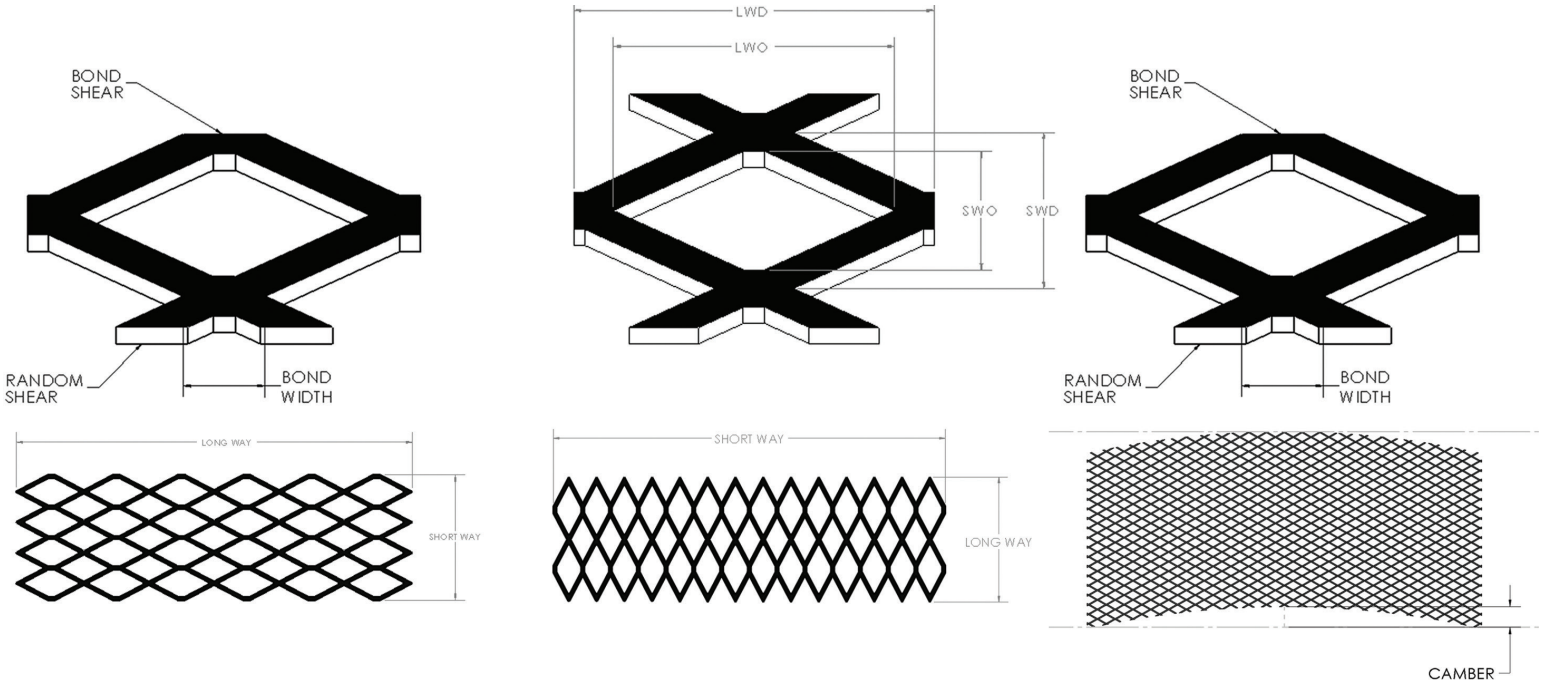
Architectural enhancements will continue to be an important and beneficial option for new home and building construction. Engineered for strength and safety, expanded metal is the leading choice to protect, safeguard, and enhance.

Examples of architectural uses for expanded metal



Examples of expanded metal patterns and finishes

EXPANDED METAL TERMINOLOGY



LWD
"Long Way of Diamond/Design" dimension

SWD
"Short Way of Diamond/Design" dimension

LWO
"Long Way of Opening" dimension
Used to indicate clear opening in the long direction

SWO
"Short Way of Opening" dimension
Used to indicate clear opening in the short direction

STRAND THICKNESS
Equal to the thickness of the sheet metal being used

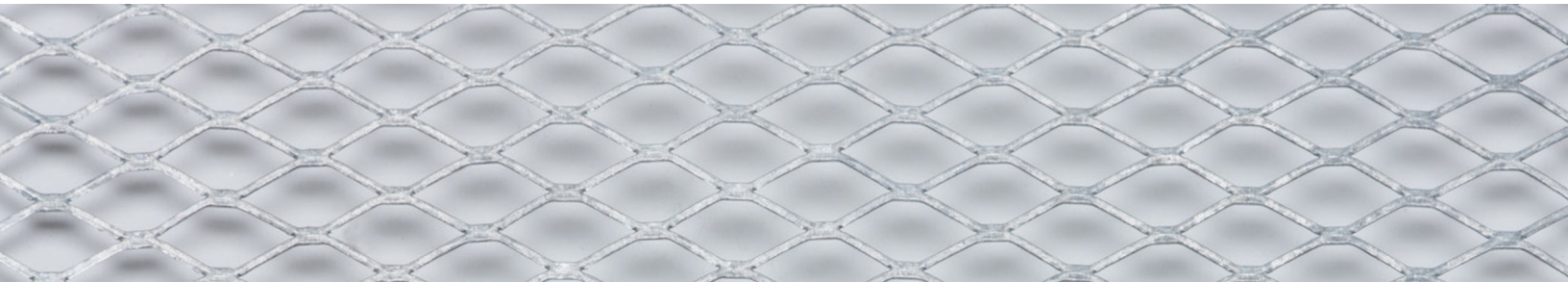
STRAND WIDTH
The amount of metal fed under the dies to produce one strand

BOND SHEARED
Where two strands intersect
Eliminates prongs or jagged edges

BOND WIDTH
The width of two intersecting strands

RANDOM SHEAR
Shearing that leaves prongs or jagged edges

CAMBER
The maximum distance between the edge of the expanded metal and the straight edge



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ABOUT WALLNER EXPAC

Wallner Expac is an employee-owned company and North America's largest manufacturer of light gauge expanded metals for filtration– and also manufacturers expanded metal for many industries and uses. Since 1959, it has evolved from a simple shop to a state-of-the-art, world class manufacturing entity with facilities in Georgia, El Paso, and headquarters in Ontario, California.

Wallner Expac is the founder and leader in the manufacturing of expanded metal used in pleated filters. Since its introduction in 1976, these applications replaced the need for welded wire and distinguished Wallner Expac as an industry leader and innovator. Continuing to bring innovative products to market, Wallner Expac introduced X-Mesh®, the industry standard in filter media backing. Awarded U.S. Patent No. 8,696,781 for X-Mesh®, it is available in various specifications to meet individual needs. For more information on Wallner Expac, contact (909) 481-8800 or visit **www.expac.com**.

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