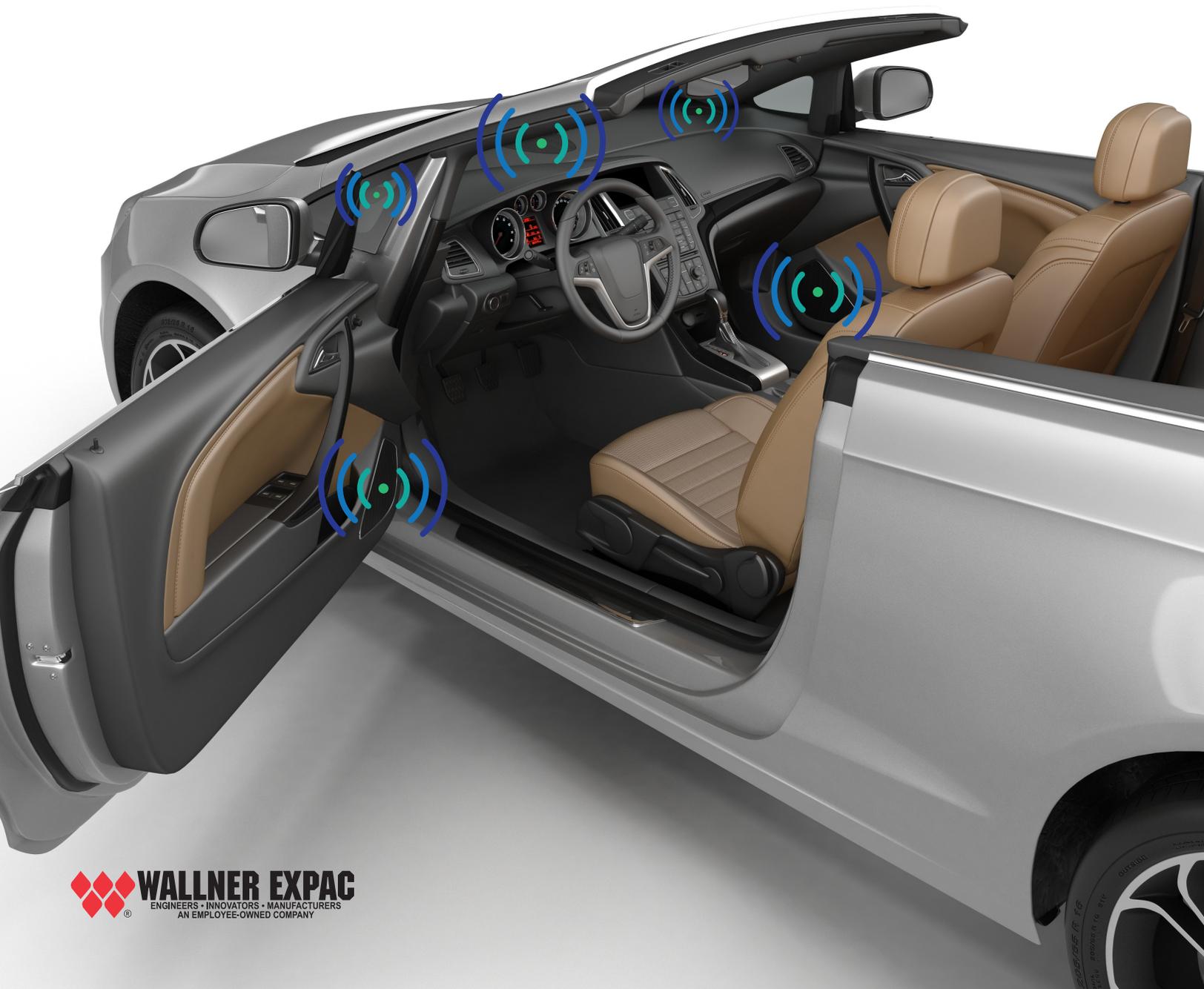


SAFEGUARDING YOUR SOUND

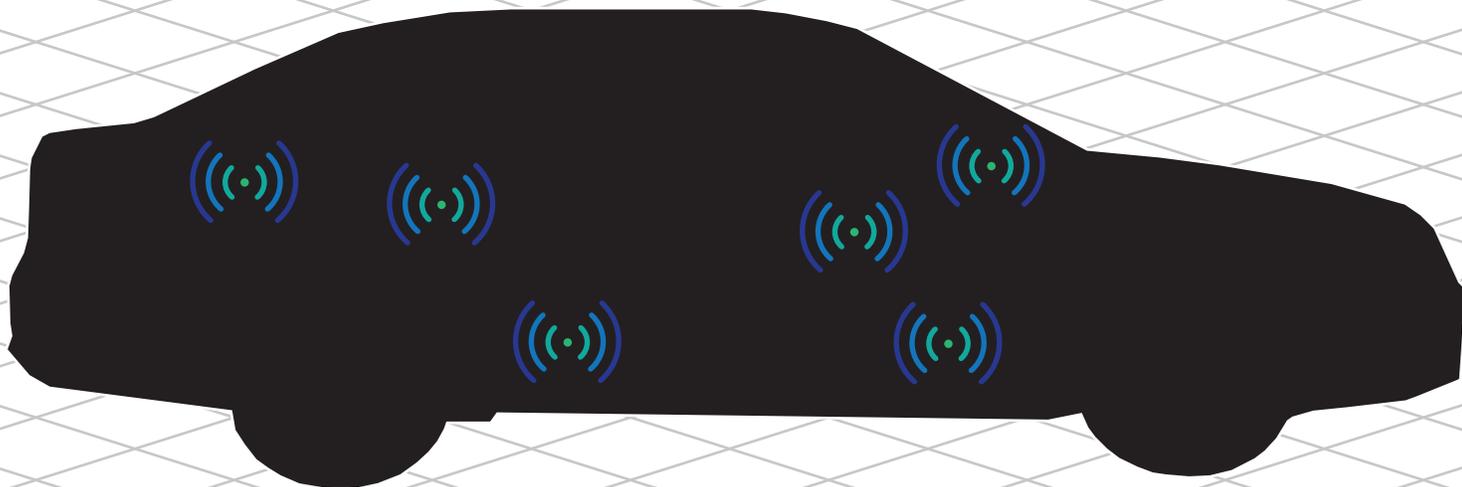
Why Expanded Metal
is a Sound Choice for Your
Vehicle's Speaker Grille Covers



Today's car audio is an important part of a vehicle. It is usually integrated with GPS navigation, satellite radio, Bluetooth streaming, voice commands, Wi-Fi, and more. But all of these would be useless without a good speaker system.

Protecting the most vulnerable elements of the speaker—the cone and dust cap which are typically made from a thin paper with premium models using aluminum, titanium, or silk will ensure years of use and enjoyment.

Covering them is the best- and in many cases the easiest solution. Commonly known as grilles or screens, they are made from different materials. This report will discuss the four most common types of speaker grills: Perforated metal, plastic, expanded metal, and fabric. Although aesthetics is important, how well it protects should be an important consideration and is highly recommended.



WHY USE SPEAKER GRILLE COVERS?

The use of speaker grilles is a choice of aesthetics or necessity- and sometimes both. Some are removable while others are embedded into the speaker housing. Home audio systems typically have a removable fabric screen that can showcase the components whereas automotive speakers must have a grille to ensure they not only look good but also protect the delicate components. A major consideration is how the grille will affect the transmission of sound. There are various types of materials- typically metal, plastic, or fabric with each having its drawbacks and advantages.

SPEAKER GRILLE MATERIALS

Grilles are categorized as Soft Mesh and Hard Mesh. Soft Mesh speaker grilles are made from various fabrics, foam, and other soft materials. It is relatively absorptive and produces fewer reflections, phase issues and resonances than its Hard Mesh counterpart. The drawback is that it is susceptible to tearing and offers little protection to the speaker components.

SOFT MESH

Speaker cloth or speaker fabric is specifically designed to allow for easy sound transmission through the material- specifically frequencies from 20 Hz to 20 kHz. Available in a variety of colors, most of the fabric is made from synthetic materials or threads in an open weave pattern. This results in a very open-spaced fabric and when viewed under magnification, the pattern features square openings. Many of these materials are also

flame retardant and even mildew proof so that moisture can pass, and any heat generated from the driver does not accumulate under the fabric. Most automotive speaker cloth materials are tightly stretched over an expanded metal or perforated frame. They have excellent fade resistance and most can be cleaned with a vacuum brush.

HARD MESH

Hard automotive speaker mesh is primarily made of metals, plastics, and even wood. These meshes can be made by perforating, drilling, extruding, or expanding. They can also be made from woven or welded wires.

Expanded Metal

Made from a single sheet of metal, it is strong and lightweight and is characterized by its diamond-shaped pattern. Special patterns are available. With a low manufacturing cost and many tunable parameters, the size of the openings can be adjusted to achieve optimal sound transmission. It offers an array of open areas and can be painted to match the interior.

Perforated Metal

Perforated metal is easily recognized by its round holes. Other shapes can be made, and holes of varying sizes can create pictures or unique designs. If a pattern is chosen, it should have a little more open area in the center and have a little less open area at the edges. It can be painted or left unfinished and polished.

Plastic Holes

It looks similar look as perforated metal but is manufactured from an injection molding process that uses raw plastic material and a mold. The plastic is first tinted to match the interior, is melted in the injection molding machine, and then injected into the mold where it cools and solidifies into the final part.

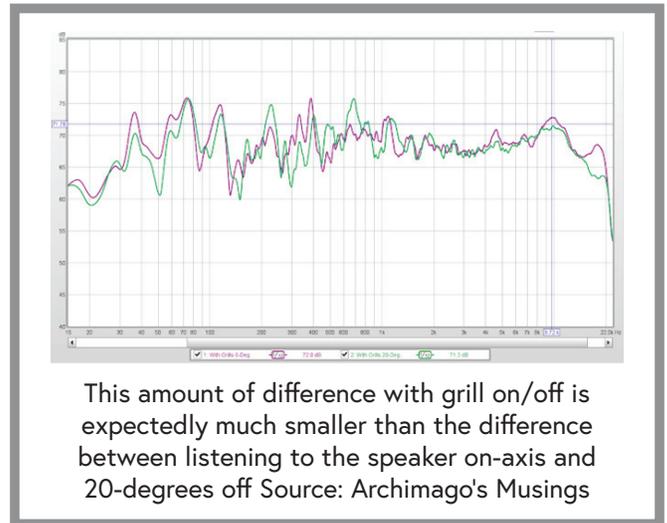


DO SPEAKER GRILLES AFFECT SOUND?

In short, a speaker grille will alter the sound. Specialized speakers such as studio monitors are required to reproduce audio so precisely that anything in the speaker's direction could impede and distort the sound. Lower frequencies from subwoofers tend to produce more movement. High powered subwoofers- such as those used in high-end car audio applications produce lower frequencies resulting in powerful sound waves. This movement may rattle a grille while the speaker's driver is under heavy load and may diminish or distort the low frequency waves.

If a grille lacks precision openings, the sound waves may be become trapped and can reflect back to the cone. These reflections can cause comb-filtering, phase cancellation and strange resonances. Conversely, if the grille is extremely porous- such as a thicker fabric- the sound may be absorbed by the material, reducing the strength of the sound waves.

For automotive use, the difference in sound transmission between having a speaker grille on or off is insignificant and rarely noticeable, so they are nonremovable. In the end, the benefits of using a speaker grille outweigh any minute sound distortion.



PROTECTING YOUR AUTOMOTIVE SPEAKERS WITH AN EXPANDED METAL COVER

Automotive sound systems can rival those of the home. It is not uncommon to have 10 speakers- with luxury vehicles having many more. Speakers located in the lower corner of doors are typically

screened with a plastic grille and can easily be damaged from kicks when exiting the vehicle. Subwoofers located in the trunk can be damaged from unsecured items that slide around while the vehicle is in motion.



Lower car door speakers are susceptible to damage from kicks when exiting a vehicle

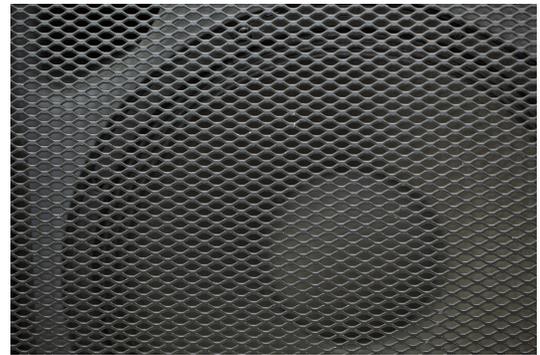
Uses of expanded metal products fall into five principal categories: Enclosure, protection, support, aesthetics, and filtration- all applicable for use as speaker grilles. Because of its single-piece architecture, it has a very high strength-to-weight ratio. It is manufactured from a sheet of metal using a Shear-FormSM process: The sheet is fed under a set of knives and is slit and simultaneously stretched producing its signature diamond-shaped pattern.

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 its production, manufacturing costs are minimal.

Strong and lightweight, expanded metal is ideal for use as automotive speaker grilles. It is also extremely flexible. When subject to impacts, it will bend and may distort, but will not be breached, protecting the delicate speaker components. Its malleability also allows it to easily be formed and cut into different shapes to fit around curves and within the tight spaces of speaker frames and housings.

Aesthetics, or how a speaker grille cover looks in a vehicle is a significant factor. Will the speaker grille cover match the panels or be designed to draw attention to it? Finishes such as paint or powder coat can be applied- or even feature a brushed metal finish. Furthermore, expanded metal micromeshes are not limited to a diamond shape. A variety of patterns with adjustable hole sizes are available- combined with different finishes, to accomplish the desired effect.

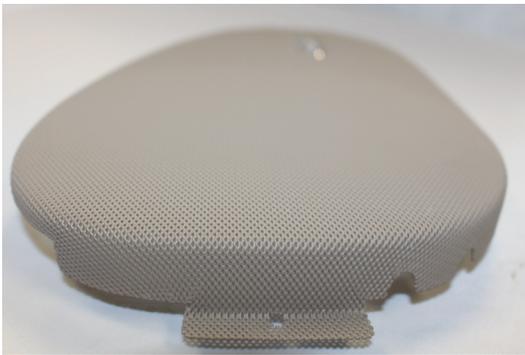
But the most important consideration is the grille's effect on acoustics. Balancing protection with



Expanded metal speaker grille covers protect fragile components

acoustics can be a fine line. All expanded metal's specifications such as strand width, strand pitch, open area percentage, and more can be calibrated to ensure optimal sound transmission. Expanded metal micromeshes, which are the best choice for automotive speaker grilles can have openings as small as 0.038". There are many possible configurations, so an acoustical engineer is encouraged to collaborate with the expanded metal manufacturer to meet predetermined targets.

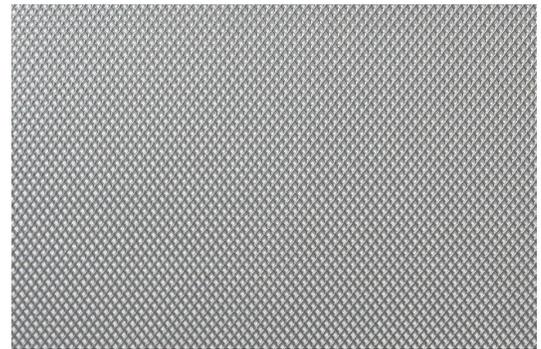
- ◆ Can be painted, powder coated, or even machined for a brushed metal look.
- ◆ Can be formed and cut to fit housings/frames.
- ◆ Long manufacturing runs can help prevent inventory shortages.
- ◆ Tunable parameters can optimize sound transmission and provide effective protection.
- ◆ Can be covered with fabric to act as a frame.



Expanded metal is flexible and strong- ideal to be formed and cut for frames, housings, and mounts

Key Points: Expanded Metal Advantages

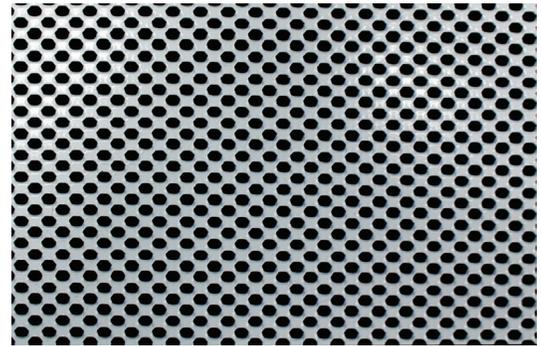
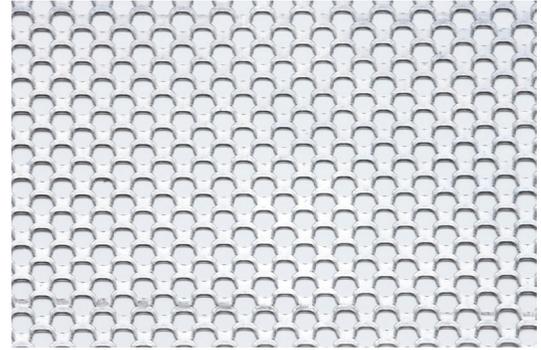
- ◆ A strong and lightweight grille.
- ◆ Cost savings: The manufacturing process of slitting and stretching produces more finished product from the raw material.
- ◆ It's manufacturing process yields little to no waste.
- ◆ No additional processes or components are needed.
- ◆ Aesthetics that can enhance visual appearance with an array of patterns.
- ◆ Features a diamond-shaped pattern, decorative patterns are available.



Thicker micromesh expanded metals provide adequate speaker protection without severely impacting sound, and can be painted to match the automotive interior

FINAL THOUGHTS

Many people wonder if they want- or even need to use a speaker grille. It is an important element of the speaker and is often discarded for the sake of aesthetics. Some speakers- such as those found in show cars are intended to showcase the driver and cone. Other automotive speakers- such as those found in the doors need a protective grille because of their susceptibility to damage from kicks and bumps. Soft mesh grilles are designed to complement the environment while hard mesh grilles protect the delicate components. Aesthetics or protection? Protection or aesthetics? In the end, a speaker grille serves one- and possibly two purposes: To enhance *and* protect. Unless the application deems otherwise, protection should almost always trump aesthetics and using a speaker grille manufactured from expanded metal will provide both.



Some decorative expanded metal patterns can look very similar to perforated metal



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. After extensive design and development, in 2019 Wallner Expac introduced MicroForm[®]- its line of precision engineered micromeshes for application such as speaker grilles, the support structure for the electrically active materials inside batteries, lightning strike protection, microfiltration, and more.

For more information on Wallner Expac, contact (909) 481-8800 or visit www.expac.com.

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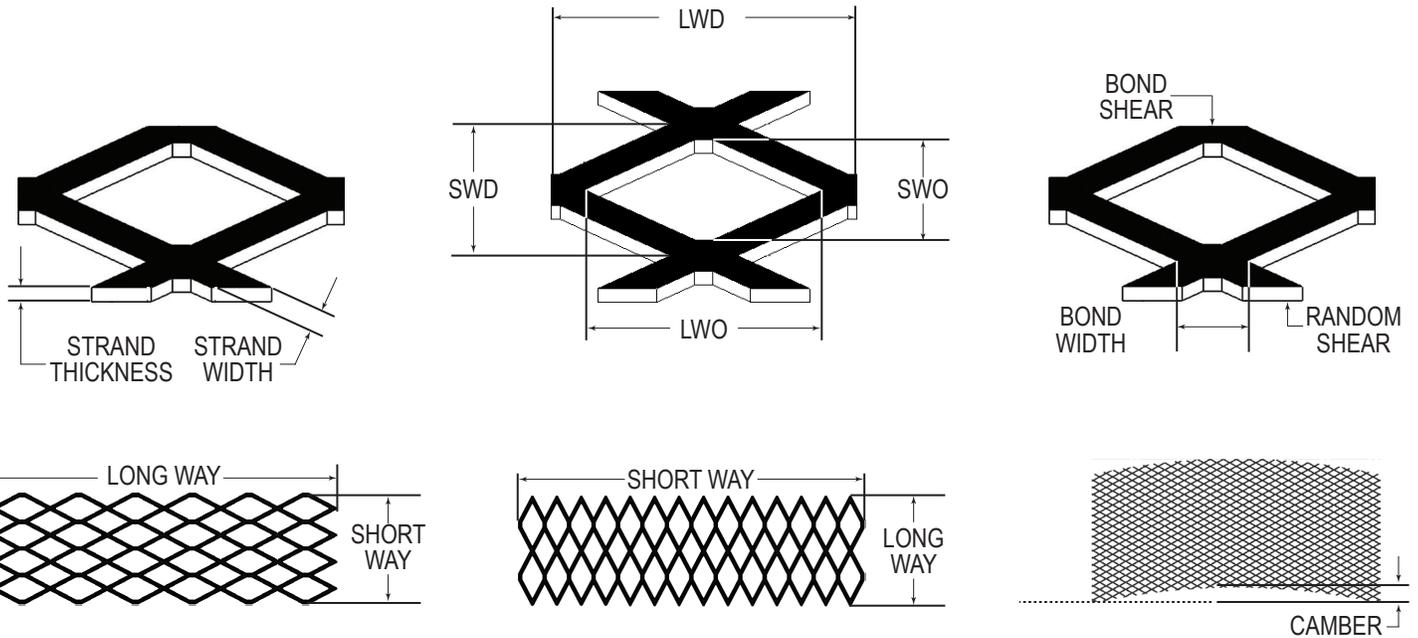
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EXPANDED METAL TERMINOLOGY



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

