



# Proper Selection for Perforated Products

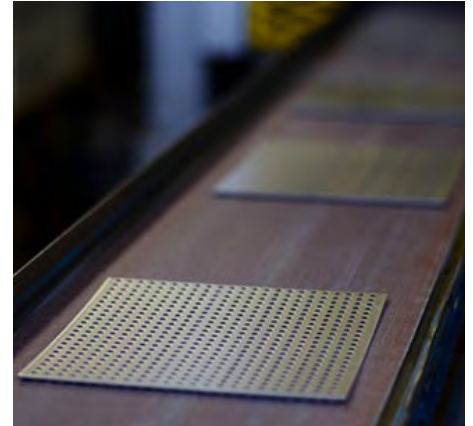


## Introduction

Perforating, the process of creating holes in metals, plastics, paper and composites, is a process that offers a staggering number of options. Holes vary in shape and size, materials can be very thin to quite thick, and the variety of materials that can be perforated include most formable metals and just about any material that can be cut by shearing action.

Add to these choices a seemingly endless selection of pattern orientations and a wide range of available material widths and lengths including material supplied in coil form, making the right choice for your application can be daunting.

At Metalex we are here to help. Whether you are an experienced consumer of perforated products or are new to the process, we can help you make the best possible choice for your particular application.



## The Process

Simply stated, perforating is the process of making holes in material, usually metal, using a mechanical means to penetrate, or “punch” through the material, leaving behind a hole of particular size and shape. Various factors affect cost, and can even affect the feasibility of perforating as an economical means of manufacturing a particular product for your application. There are two basic manufacturing methods:

**Sectional:** This process utilizes a CNC-controlled press to punch a section of the entire part at a time. This method is necessary when the perforated areas are irregular in shape, such as when perforating within a circle while maintaining a solid margin around the perimeter.

It can also be a very economical way to keep tooling costs at a minimum, especially when a custom hole size/shape and/or pattern orientation is required, particularly when low volume production is required. Typically, hole sizes up to 3” can be punched. Only sheets can be produced from this process.

**All-Across:** This is a high-volume process. Very specialized high-speed presses perforate the entire width of the material with each stroke, and incrementally advance the material using a CNC-controlled feed system. There are a wide variety of hole sizes and patterns available.

Most available patterns are round holes on 60-degree staggered centers, but square, square-end and round-end slots and some decorative designs are also available. Custom patterns can be built to your specifications when large production volumes are needed. Hole sizes up to 1” diameter can be punched. Both sheets and coils can be produced from this process.

**Non-Perforating Methods:** Laser cutting is also a Metalex option. While typically this process is much slower than perforating, there are applications where laser cutting is the appropriate option.

At Metalex we will advise the best process to meet your cost and quality requirements.

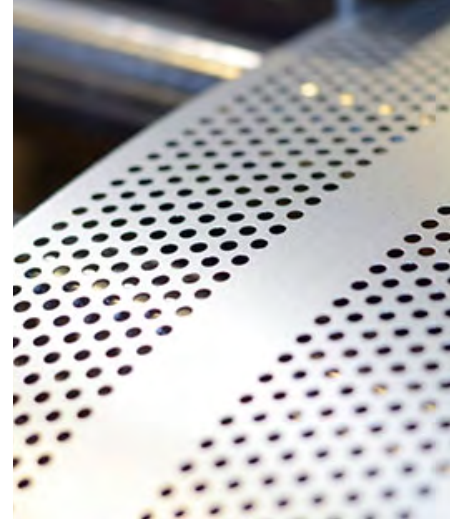
# Cost Considerations

## Your Application

Generally, it's pretty simple. You want the lowest-cost product that will fully meet your application requirements. That means evaluating the raw material and selecting the lightest gage that will provide the required strength and rigidity, and selecting the raw material type that provides the characteristics needed for the application.

Additionally, the simpler it is for us to manufacture, the lower the cost will be, so your quality requirements should be reviewed carefully so that the tolerances you specify will safely meet your requirements without exceeding them needlessly. For example, a part length tolerance of +/- .015" may require twice the cost to finish shear than a tolerance of +/- 1/16".

We'll break down the cost-drivers so you can easily focus on those that apply to your application.



**Material:** Listed by ascending cost per pound and most common variety.

- Hot-rolled pickled and cold-rolled carbon steel - Commercial Quality (CS)
- Galvanized Steel (Hot-Dipped Galvanized, Galvannealed and Electro-Galvanized, coated prior to perforating) – Hot-Dipped:G40 - G90; Galvannealed: A30 - A60
- Aluminized – Type 1
- Aluminum – 3003 H14 and 5052 H32
- Prepainted Steel, Galvanized Steel and Aluminum
- Protective Film Coated Stainless and Aluminum (for one-side surface critical applications)
- Stainless steel – 400-series, T304 and T316
- Brass – ½ hard
- Copper – C110
- Special Alloys – Inconel, Copper-Nickel, Titanium, Monel, Corten, Muntz, and many more
- Plastics – PVC, Polypropylene, ABS, Kydex, Mylar, Teflon

**Note:** *There many more types of metals that can be perforated, and many more alloys and coatings available than the most commonly available listed above.*

## HOLE SIZE AND CENTERS

In general, the larger the hole, the faster the production rate. That goes for the center-to-center distance between holes, too. However, this increase in production rate is reduced when either the punch diameter or bar (the solid material between two adjacent holes) approaches the material thickness. The closer the punch diameter or bar is to the material thickness, the slower the production rate, which increases cost. Aim for ratios not exceeding 1:1 for mild steel and aluminum and 2:1 for harder material such as stainless steel. For any given material type and thickness, the larger the hole and greater the centers, the faster the run rate.

## HOLE SHAPE

While many hole sizes and shapes are available, the most economical to produce are round holes.

## PERFORATION PATTERNS

The most common, generally strongest, and most economical round hole pattern is the 60-degree stagger. Straight and diagonal (45-degree) patterns are less common, but available in many common hole sizes. Square and slot perforations are straight, side stagger and end stagger configurations. Decorative patterns are unique designs. Metalex is continually adding new patterns. Please visit our website for the most current pattern list.

## OPEN AREA

Related to hole size and centers (above) the larger the hole for a given center-to-center dimension and the closer the center-to-center distance the greater the amount of metal is removed, resulting in a higher percentage of open area (POA). For example, a 1/8" round hole on 3/16" 60-degree staggered centers has a POA of 40%. The same hole size in a 1/4" 60-degree stagger has a POA of 22.7%. Higher open areas can increase cost as the hole size and bars approach the material thickness, reducing the run rate.

## HOLES PER SQUARE INCH

HPSI is a measurement of how many holes per square inch are created by a specific perforated pattern. Related to open area, the closer the holes of a given hole size are to each other the greater the HPSI. Generally, higher HPSI values result in lower run rates.

## MARGINS

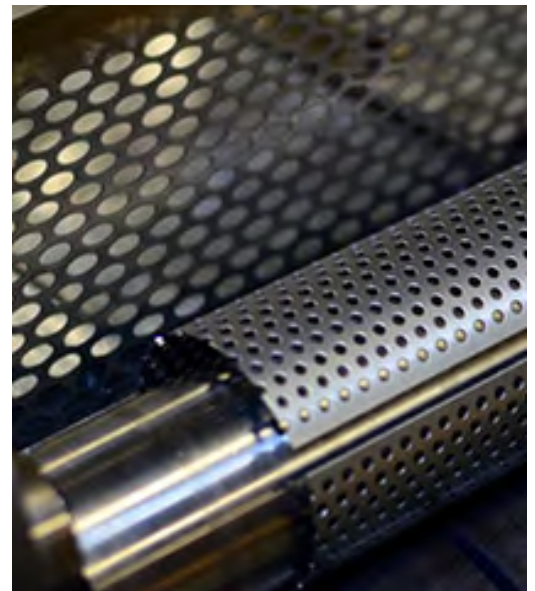
Solid, non-perforated borders along the part perimeter, and blank areas within the perforated area add value, but may also adversely affect flatness and require secondary shearing to hold overall part size and margin tolerances. Solid areas adjacent to perforated areas may result in excessive and uneven stress and strain within the sheet. Corrective leveling, a secondary process we employ, reduces these stresses to improve the sheet flatness. Results depend on several factors, including material type, high open area, high HPSI, sheet size and uneven margins. Margins generally increase cost.

## FINISHED END PATTERN

Generally necessary when aesthetics are important or total open area must be maximized, finished end patterns (FEP) are possible on patterns that not long ago were impractical with high-speed all-across perforating. At Metalex we have the most modern CNC-controlled device available integrated into our presses. Because we are able to provide you an FEP state-of-the-art press speeds, the cost of adding this feature is nominal.

## SHEET SIZE

We can perforate up to 60" wide and 144" long in standard sizes, with up to 240" long sheets available. We can also manufacture material into coil form, in finished weights up to 10K lbs. Sheets longer than 144" require special handling and packaging at added cost.



## SPECIAL FINISHES

Most materials are available in special finishes, such as “brite” or polished. It is usually advisable to add a protective film to the material before perforating to protect the special finish.

## VALUE-ADDED

At Metalex we offer a wide selection of secondary processes that add value to your product:

**Leveling** – Leveling is the restoration of the material to its original state before the perforating process. As mentioned previously in the “Margins” section above, various factors in the perforating process affect the flatness of the product. Not every product requires leveling, but once we know your application we can advise if leveling is recommended.

**Shearing** – Shearing is done to achieve an overall part size and squareness within your required tolerance if the desired tolerance cannot be attained as produced at the perforating press. We can work with you to determine if secondary shearing is a requirement.

**Forming and Corner Notching**– We can add the forming of flanges, channels, corrugations to provide you a semi-finished or finished part.

**Mounting Holes** – can be added to you part in an array of shapes and sizes.

**Slitting** – We can slit your material to custom widths in line with the perforating process.

## OUTSIDE PROCESSING

Value added secondary processes performed by our manufacturing partners:

- Painting
- Anodizing
- Degreasing
- Thermal Flattening
- Annealing

## QUALITY CONSIDERATIONS

We all know that more stringent the quality requirements drive up costs. At Metalex, we focus on making sure we understand your requirements fully so we do not add processes that unnecessarily add cost. At the same time we maintain advanced process capabilities so that when you need to hold exceptional tolerances, we can meet the challenge. Our standard tolerances are world class, but when you have an exceptional need regarding the following quality characteristics, let’s discuss:

**Burr** – Either along the cut edges or at the perforations. Standard is no more than 10% of material thickness.

**Surface Critical** – The finished surface will be exposed, and minor scratches and scuffs are a concern.

**Flatness** – Flatness is a function of many factors. But when your application is flatness critical, we can work with you to meet the specific requirement.

**Squareness** – If you are using the part we supply without further shearing, the squareness of the part may be critical.

**Quantity** – Do you need exact quantity?

**Special Packaging** – We can customize packaging and labeling.

## About Metalex

Metalex, powered by UPG, was founded in 1962 in Libertyville, IL by two local entrepreneurs. With diverse and complementary expertise in salesmanship and engineering, they grew their company with one machine in a small factory on the east edge of town. In 1979, Metalex moved into a facility on the site of a former horse farm in south Libertyville.

Metalex continued to grow and added to the original building in 1983, increasing total square footage to 150,000 and equipment totaling 23 expanding lines, a full machine shop and a secondary processing department that includes shearing, stamping and plasma cutting. In 2005, Metalex acquired Arcor, a manufacturer of perforated metal and a variety of metal tubes primarily for the fluid filtration industry.

In 2011, Metalex acquired Morton Manufacturing, the leading manufacturer of anti-slip walking surfaces for railcars, specifically for original equipment manufacturers (OEMs). The company also supplies distributors, OEMs and aftermarket customers in the agricultural, heavy equipment and general industrial space.

Morton has been providing customers with consistently superior products and excellent customer service since 1903 from the 200,000-square-foot facility, also located in Libertyville. Morton's Open Grip®, Deck Span® and Tread Grip® proprietary product designs provide non-slip surfaces that meet or exceed federal specifications for slip resistance.

In 2014, Metalex and Morton merged under the Metalex name. Two years later, in 2016, Metalex opened a facility in San Luis Potosi, Mexico. In 2019, Metalex was acquired by UPG Enterprises LLC, a strategic operator of metals and logistics companies across North America.



Learn more about all of Metalex's products and the processes we use to manufacture them.

[Visit our Resources Page](#)



Have any questions about our products and services?

[Contact Us Today!](#)