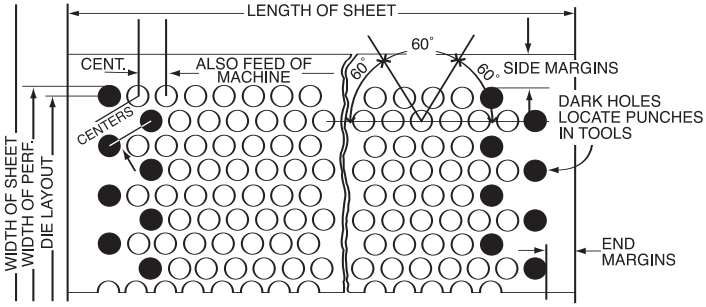
HOLES PATTERNS
Round Holes

Round holes ranging from under .020″ to over 6″ account for 80% of the production of the perforating industry. This shape is the most versatile in its application and provides a wide range of open areas as well as a handsome appearance. Round holes are produced with greater efficiency and less expense than any other hole shape. The dies and punches that make round holes are the most cost efficient to build and maintain.

The 60° Staggered Round Hole Pattern

The 60° staggered formation is the most popular hole arrangement because of its inherent strength and the wide range of open areas it provides. The diagram below illustrates the essential die design and perforating practices for producing 1/4″ round holes on 3/8″ centers in a 60° staggered formation. The basic perforating die layout includes two rows of punches, arranged as the illustration shows, in an open staggered pattern. The actual punches in the die are indicated by the solid black holes. The feed of the press is from right to left.



The Step-and-a-Half Punching Process

Notice first that the arrangement of the punches is more open than the hole pattern produced in the perforating process. The finished hole pattern is produced by feeding the sheet through the press in increments equal to the required center distance. The wide spacing of the punches is necessary to give sufficient strength to the die and to provide adequate punching force to each punch. Notice that the pattern at the beginning and at the end of the sheet is not complete. This is the result of the open spacing of the punches and is explained later under the heading, **End Margins.**

The fact that the arrangement of the punches in the die and the holes in the perforated pattern are different indicates that two different staggered hole patterns can be produced from the same die.

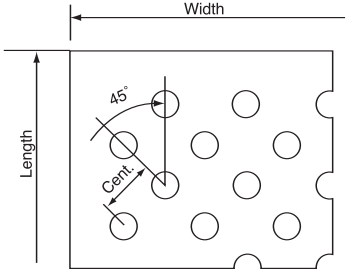
The Closed Hole Pattern: To produce a hole pattern on 3/8˝ centers as illustrated, the material is fed through the press in increments equal to the center distance of 3/8˝. This results in the "closed pattern" for this particular die.

The Open Pattern: The open pattern from the same die arrangement results when the feed is increased to produce a hole pattern with the actual center distance of the punch arrangement.

A straight line hole pattern is also possible from this die if one of the rows of punches is removed or "idled."

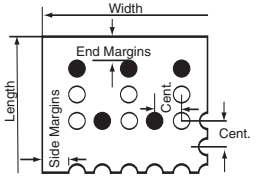
The 45° Staggered Round Hole Pattern

This pattern is a standard IPA option. Although it is stronger than straight row patterns, it is not as strong, nor is it as versatile in providing compact hole spacing and high open areas as the 60˚ pattern.

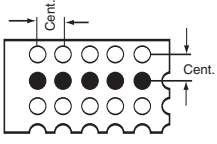


The Straight Line Pattern

The straight line patterns can be produced by an open punch arrangement with a stepped punching procedure or with a closed punch arrangement; both methods are illustrated below. The stepped procedure produces an unfinished end pattern while the closed punch arrangement produces a finished end pattern. A straight line pattern of holes is weaker than a staggered arrangement and has a tendency to stretch the material to a greater degree.



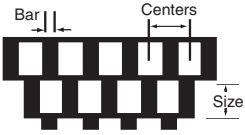
Open Punch Arrangement



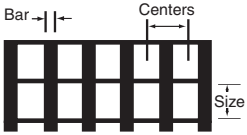
Closed Punch Arrangement

Square Holes

Square holes are principally used for grills and machine guards offering a maximum of open area to permit good visibility and through-put while providing the necessary protection or decorative cover. Available in both straight line and staggered patterns, the straight line pattern is standard for square holes. Both variations are weaker than the round hole patterns. The sharp corners on square hole tooling make it more subject to wear and vulnerable to the stresses of the punching process, increasing tooling costs and reducing production rates. Square hole patterns are generally more expensive than the equivalent round hole pattern.



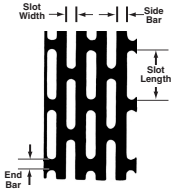
SQUARE PERFORATIONS
STAGGERED



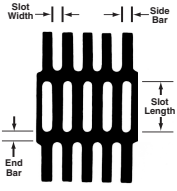
SQUARE PERFORATIONS
STRAIGHT LINES

Slots

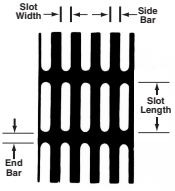
Slots in the Side Staggered, End Staggered and Straight Line arrangements illustrated below are also IPA standards. They are particularly well suited to sorting and grading of solid objects. Typical applications include the sizing of ball bearings or the separation of fingerlings at fish hatcheries. In both applications a single dimension of the object determines the size. The elongated slot increases the through-put in such applications.



SLOTS
SIDE STAGGER



SLOTS
END STAGGER



SLOTS
STRAIGHT STAGGER

Flow of Material

If the sieving process requires a specified arrangement of holes, the direction of flow must be clearly stated.