**Document Title**

**Draw Die Material Selections and Grain Size** used in determining the suitability and selection of the most adaptable raw material to be used in draw forming

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Raw Material Selections for Draw Applications

Grain size is extremely important in determining formability. According to the ASTM grain size scale, a value of 00 indicates the coarsest grains and the softest materials, 13 the finest grains and the hardest materials. For blanking and punching, a grain size of 10 to 11 can be appropriate. In draw applications, too fine of a grain can be resistant to deformation. A grain size range from 7 to 9 should suffice for most applications and metals. Keep in mind that the grain becomes coarse and lacks uniformity below 8 and can be responsible for “orange peel” on the side walls of the part. The temper and grain size can be adjusted at the mill for the best results and performance.

**Commercial Quality Steel (CQ)**
Used for low strain drawing applications such as shallow containers or embossments.

**Drawing Quality Steel (DQ)**
Used for moderate drawing applications

**Drawing Quality-Aluminum Killed Steel (DQ-AK)**
Used for severe drawing applications.

**Interstitial Free Steel (IF)**
Used in extreme applications or multiple severe draws.

The primary difference between grades is the grain shape and impurity removal. The grain shape is generally round in CQ steel and becomes flatter in the DQ, DQ-AK and IF. This allows for better slippage during the drawing process.

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**Raw Material Selections for Draw Applications**

Stainless steel type 305 or 305S is usually preferred for deep draw applications. It’s tendency to work harden during drawing is a lot less than other types of stainless steels. The grain size should be 8 to 9.

Nickel alloys may require a finer grain than stainless steel. A grain size of 9 to 10 would be recommended.

Keep in mind that the specification on the part print relative to temper refers to the finished part and not the raw strip. This means, depending upon the application and depth or severity of the draw, it may be advisable to start with a softer or lower temper material and allow for a degree of work hardening. In any case, it is suggested to confer with your raw material supplier as to the material and its specifications.