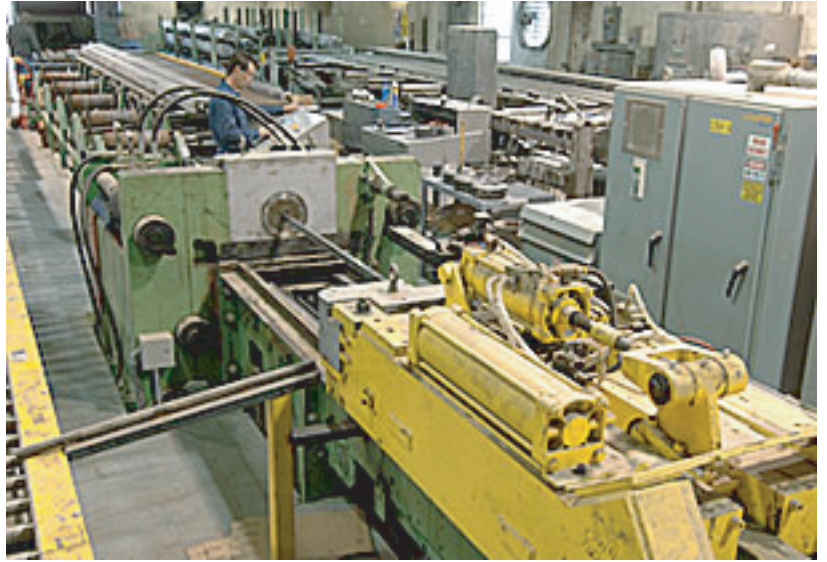


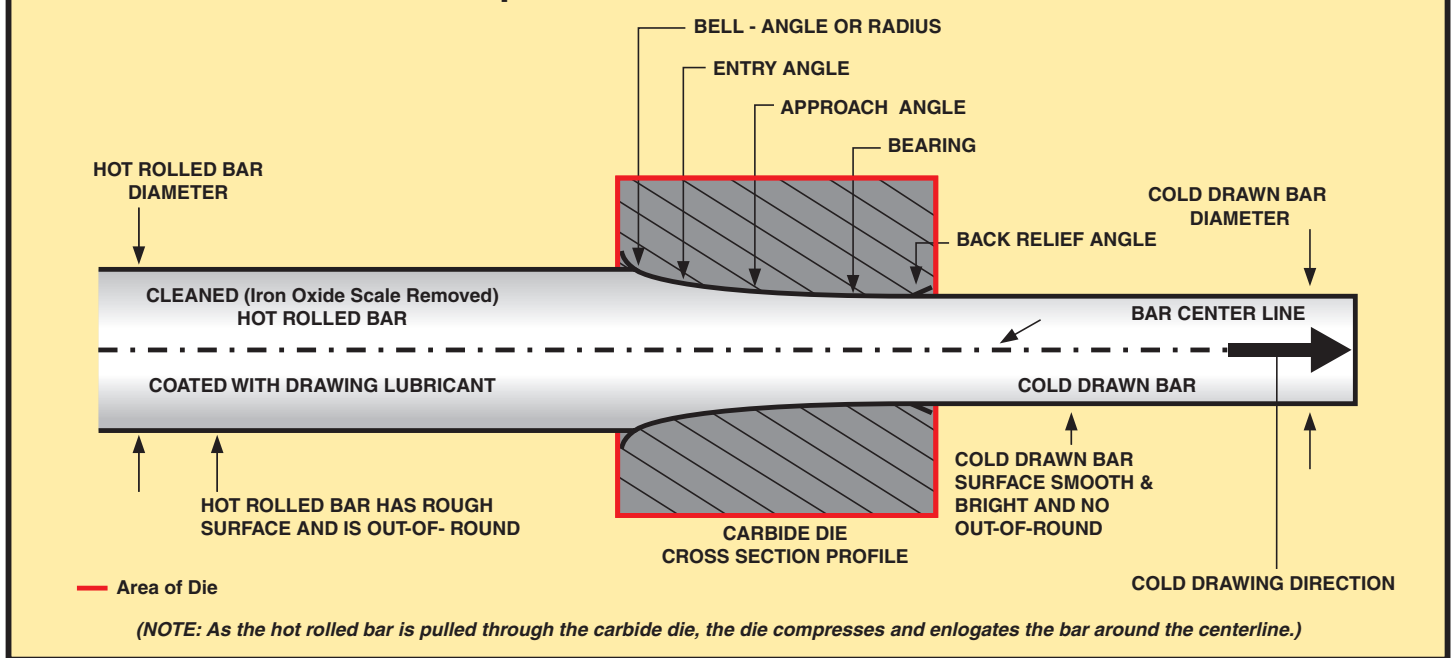
The Cold Drawing Process for Bars and Coils



- **Raw Stock:** Hot rolled steel bar or rod coils are used as raw material. Because the hot rolled products are produced at elevated temperatures (1700 - 2200 Deg. F. i.e. hot rolling), they generally have a rough and scaled surface and may also exhibit variations in section and size.
- **Cleaning:** Abrasive scale (iron oxide) on the surface of the hot rolled rough stock is removed.
- **Coating:** The surface of the bar or coil is coated with a drawing lubricant to aid cold drawing.
- **Pointing:** Several inches of the lead ends of the bar or coil are reduced in size by swaging or extruding so that it can pass freely through the drawing die. Note: This is done because the die opening is always smaller than the original bar or coil section size.
- **Drawing:** In this process, the material being drawn is at room temperature (i.e. Cold-Drawn). The pointed/reduced end of the bar or coil, which is smaller than the die opening, is passed through the die where it enters a gripping device of the drawing machine. The drawing machine pulls or draws the remaining unreduced section of the bar or coil through the die. The die reduces the cross section of the original bar or coil, shapes the profile of the product and increases the length of the original product.
- **Finished Product:** The drawn product, which is referred to as Cold Drawn or Cold Finished, exhibits a bright and/or polished finish, increased mechanical properties, improved machining characteristics and precise and uniform dimensional tolerances.
- **Multi-Pass Drawing:** The cold drawing of complex shapes/profiles may require that each bar/coil be drawn several times in order to produce the desired shape and tolerances. This process is called multi-pass drawing and involves drawing through smaller and smaller die openings. Material is generally annealed between each drawing pass to remove cold work and to increase ductility.
- **Annealing:** This is a thermal treatment generally used to soften the material being drawn, to modify the microstructure, the mechanical properties and the machining characteristics of the steel and/or to remove internal stresses in the product. Depending on the desired characteristics of the finished product, annealing may be used before, during (between passes) or after the cold drawing operation, depending on material requirements.



Example of Carbide Die Cross Section



Customer Benefits of Cold Drawn Bar and Wire vs. Hot Rolled Bar or Rod

Cold Drawn Product Features / Customer Benefits

- **Improved Size and Section / Reduces machining losses**
 - Tighter size & section tolerances
 - Dimensional consistency within each bar
 - Dimensional consistency from bar to bar
- **Improved Surface Finish / Reduces surface machining & improves quality**
 - Cold drawn
 - Ground and polished
 - Surface Improvement (Shaving or turning to produce "Defect Free" surface)
- **Improved Straightness / Facilitates automatic bar feeding**
- **Increased Mechanical Properties / Can reduce the need for hardening**
 - Yield strength
 - Tensile strength
 - Hardness
- **Improve Machinability and Productivity / Enables higher machining feeds & speeds and improved machined finish.**
 - Increased machining rates
 - Longer tool life
 - Improved yield
- **Improved Formability / Improves response to spheroidization Cold Drawn and Annealed**
- **Improved Cost Effectiveness / Optimizes machinability and reduces yield losses Production of Precision Shapes to Precision Tolerances**

