The necessary characteristics of a punching tool

- Good wear resistance, high compression resistance, high impact resistance and toughness, and high fatigue strength.

Punching tool materials must be selected to suit the punching conditions, such as the production quantity, workpieces, and lubrication.

Characteristics of tool steel

- D2 has excellent wear resistance and good toughness, which leads to reduced deformation.
- SKH40 is the type of tool steel most often used.
- SKH40 has excellent wear resistance and toughness.
- D2 has excellent toughness and superior wear resistance, compression resistance, rigidity, and heat resistance. However, toughness is poor, and if this material is used incorrectly, its full performance cannot be achieved.

Shape of punches and dies

- The length of R(\(Y\))
  - Length of punch R(\(Y\))
    \[ Y = \sqrt{4P} \]
  - Length of pilot punch R(\(Y\))
    \[ Y = \sqrt{4P} \]
- When P = 8, \(Y\) is always 8 mm.
- When P > 8, \(Y\) is determined by the equation:
  \[ Y = \sqrt{\frac{P}{8}} \]
  Example 1: Finding \(Y\) for SPAS10—60—P6.0
  \[ X = \sqrt{\frac{P}{8}} - 6.6/2 = 4.5 \]
  \[ Y = \sqrt{\frac{4P}{8} - 6.6/2} = 4.5 \]
- Example 2: Finding \(Y\) for SPT5—20—P4.5
  \[ Y = \sqrt{\frac{P}{8} - 6.6/2} = 4.5 \]