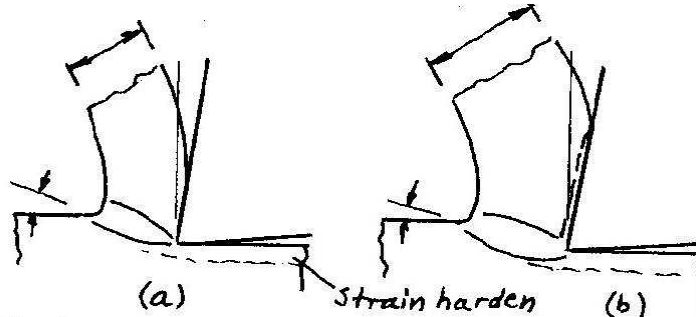


## Solutions of ME 355 Home Work No. 3

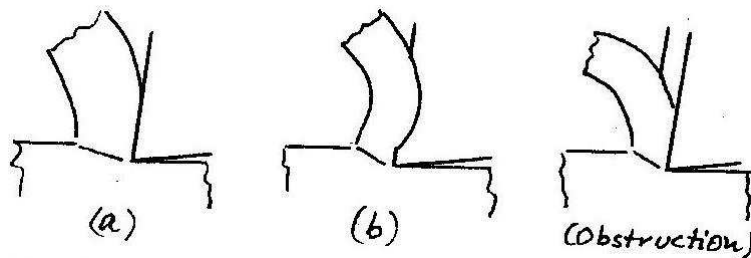
### 1. 16A-3



*Essentials:*

- (a) Widening of shear zone
- (b) Secondary shear zone; shear angle decreases; chip thickness increases

### 2. 16A-4



*Essentials:*

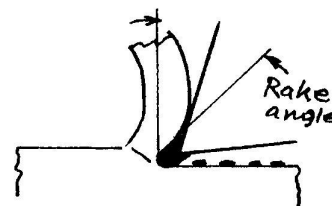
Tighter chip curvature in (b)

### 3. 16A-7

- (a) Lubrication and reduction of wear
- (b) (1) As a lubricant, a fluid ① reduces rake-face friction, thus increases the shear angle and reduces cutting force and energy; ② reduces flank friction; ③ improves surface finish; ④ delays the onset of BUE formation (*accept any two*).  
(2) It reduces wear by ① minimizing adhesion and ② reducing the frictional force.

### 4. 16B-2

- (a) A BUE forms when sticking friction prevails on the rake face and cutting energy is minimized by the formation of a dead-metal zone attached to the tool edge
- (b) Advantages: ① highly positive effective rake angle, hence low cutting force and power; ② protection of the tool edge

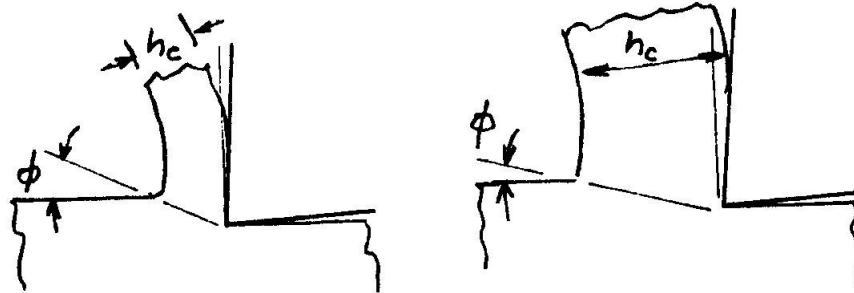


- (c) Disadvantages: ①cut surface is rough and has fragments of unstable BUE attached; ② break-away of BUE may set up vibrations, impairing surface finish; ③the part is not produced to the preset dimensions (*Accept any two*).
- (d) Avoid BUE: reduce cutting speed to move into low-speed, lubricated regime, or increase cutting speed to develop a secondary shear zone. (*Both answers needed.*)

## 5. 16B-8

- (a) Clogging occurs when chips do not break properly and/or are not removed at a sufficient rate
- (b) In cutting ductile materials, tighter chip curl may or may not break the chip. Chip breakers may help, but it may also be necessary to cause the chip to hit an obstruction (e.g., the side of the tool). This can be done by changing the tool geometry. If long, continuous chip is unavoidable, it may be necessary to use mechanical winding devices.
- (c) In cutting less-ductile materials, chip breakers should be effective. The broken chip can be relatively readily removed---if necessary, with the aid of the cutting fluid and/or air blast.

## 6. 16B-14



*Essentials:*

- (b) Shear angle high, chip thin.
- (c) Shear angle low, chip thick. ect.