



Wuhan University of Technology

《Blasting Engineering》
EXCELLENT COURSE

Chapter 6 Presplit and Smooth Blasting

**Main
Content :**

6.1 Presplitting Blasting

6.2 Smooth Blasting

6.3 Application Condition of Presplitting and Smooth Blasting (Omitted)

6.4 Practices of Presplitting and Smooth Blasting (Omitted)

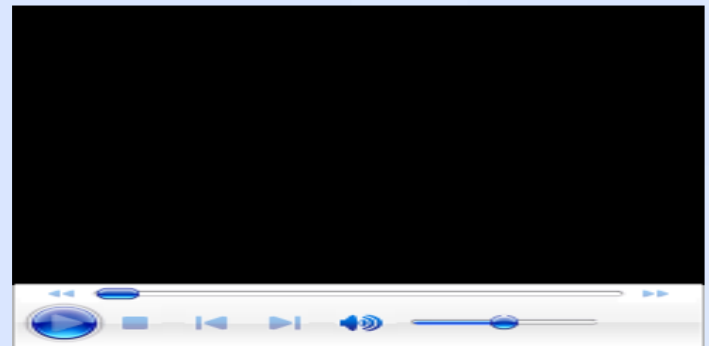
6.5 Introduction of New Direction Fracture Blasting Technology

6.1 Presplitting Blasting

There are two same important questions faced by the blasting and excavation in limited area:

- ① Using the most effective methods to fragment well the rock and throwing it if necessary in fixed area to reach the certain engineering purposes;
- ② Reducing the damages to surrounding rock and mostly keep their strength and stability, meanwhile, screening off the surroundings to some extent from ground vibration in main round.

VIDEO



Presplitting blasting

The presplitting blasting is drilling dense holes along the contour line, and the cracks at the final contour are created by blasting prior to the drilling of the rest of the holes for the blasting pattern, using decouple charge or low power explosive, which screens off damages from the main round to surroundings.

Mechanical Condition of Creating Presplit Crack

- ① The radial pressure of explosion to holewall lower than the dynamic limited compression strength, which not crushing the holewall:

$$\sigma_p < \sigma_{Dp}$$

- ② The accompanying tangential tensile stress lower than the dynamic limited tensile strength, which not create random crack at holewall:

$$\sigma_t < \sigma_{Dt}$$

- ③ The resultant tensile stress on line of holes centers higher than the dynamic limited tensile strength, then creating the cracks:

$$\sigma_{Rt} > \sigma_{Dt}$$

Mechanism of Creating Presplit Cracks

1) Decoupled charge

A

2) Stress reinforcement on line of holes centers

B

3) Guide hole for each other

C

4) Firing the presplit holes simultaneously

D

Calculation of Charge Amount

Three methods: theoretical arithmetic, empirical formula and empirical value



Empirical formula

Proposed decoupled coefficient

Calculation of charge amount

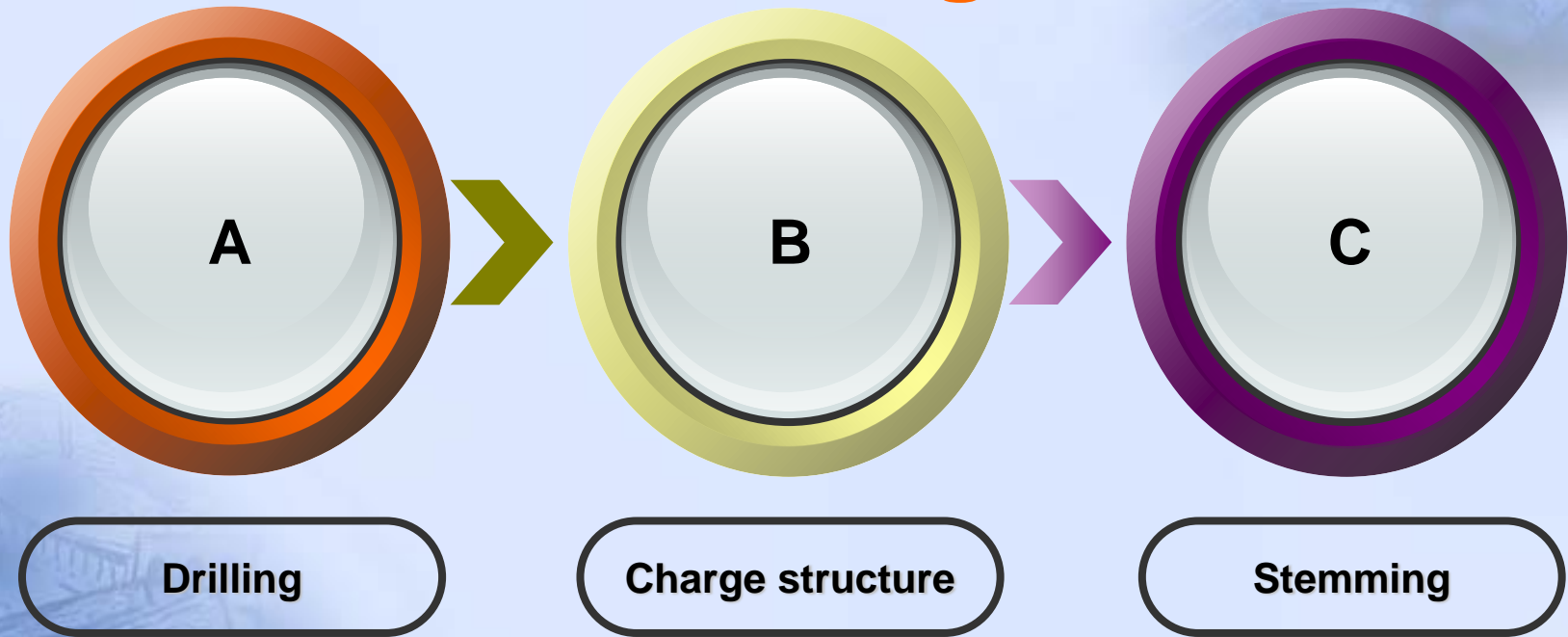
Tunneling blasting: 1.5~4;
Deep hole blasting in open blasting or large cavern : 2~4。

Tunneling blasting — $q' = 0.034[\sigma_{\text{压}}]^{0.6} \cdot [a]^{0.6}$

Deep hole blasting — $q' = 0.042[\sigma_{\text{压}}]^{0.5} \cdot [a]^{0.6}$

where, q is line density, **kg/m**; $\sigma_{\text{压}}$ is limited compression strength , **MPa**;
 a is spacing, **m**。

Construction of presplitting blasting



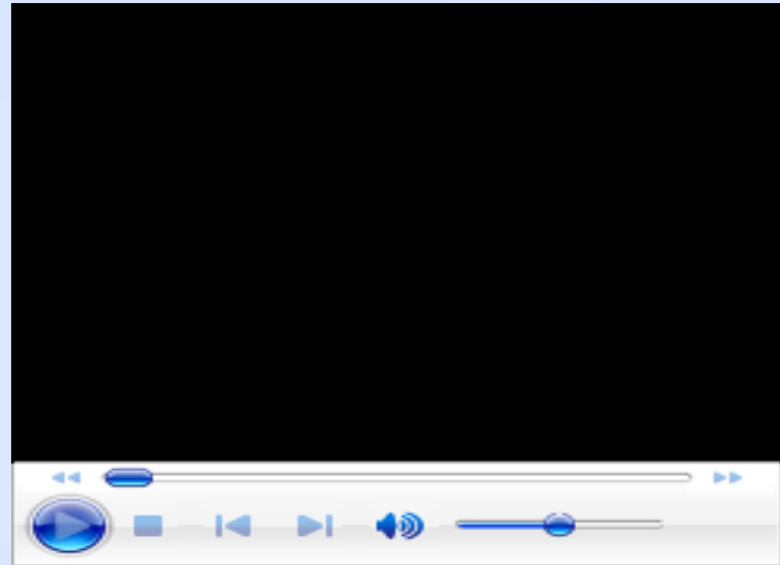
Interval time with 75~110ms prior to the main round when firing the presplit holes and main holes together

6.2 Smooth Blasting

Smooth blasting

- The smooth blasting is drilling dense holes along the contour line with decouple charges or low power explosive, which firing after the main round and forming well contour profile.

VIDEO →



Differences between Presplitting and Smooth Blasting

Presplitting blasting

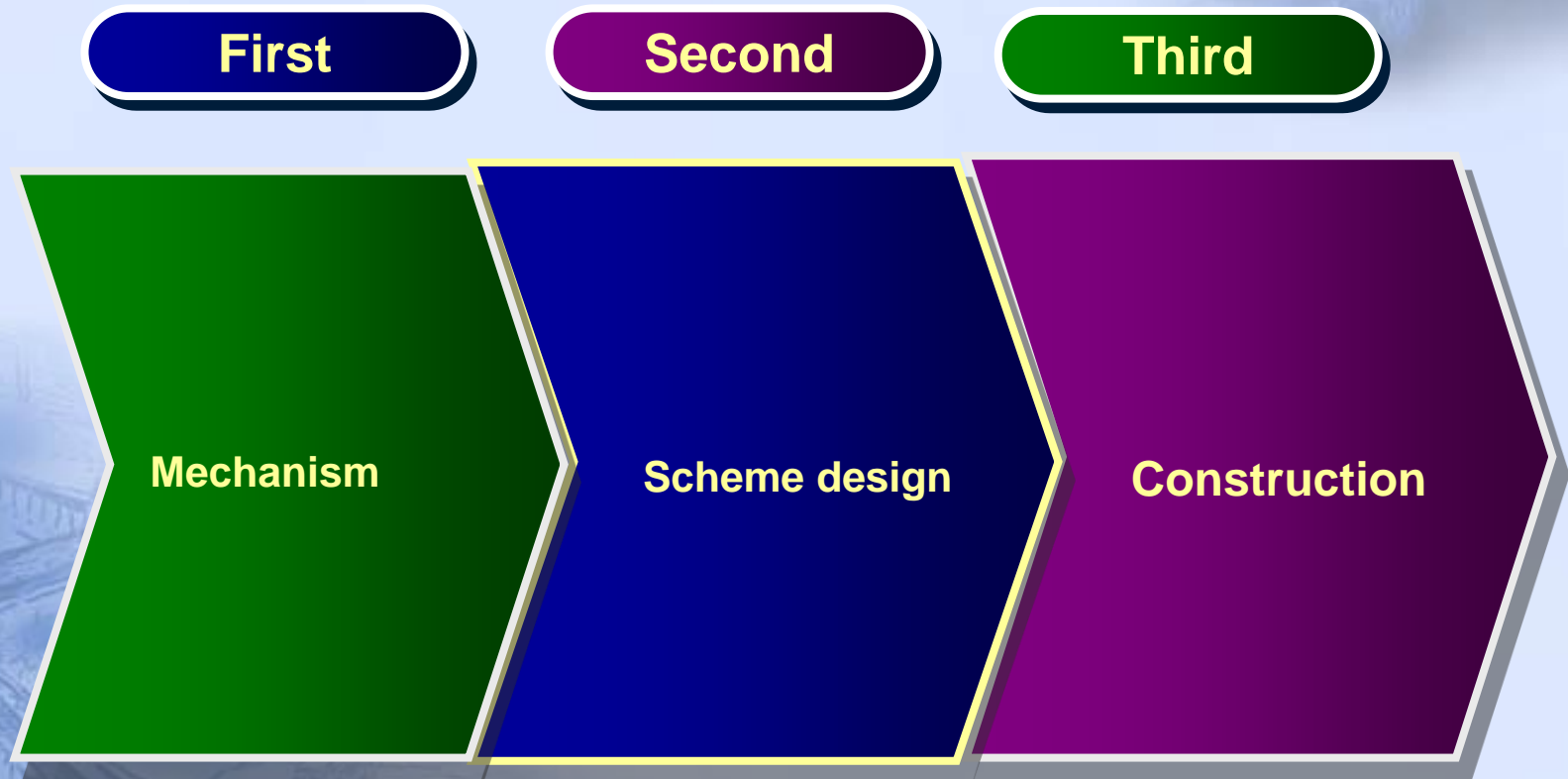
- A** The presplitting blasting firing prior to the main round;
- B** The presplitting blasting has only one free surface, so the constraint of rock is larger.

Smooth blasting

- A** The smooth blasting initiated after the main blast;
- B** The smooth blasting has two free surface, so less constraint.

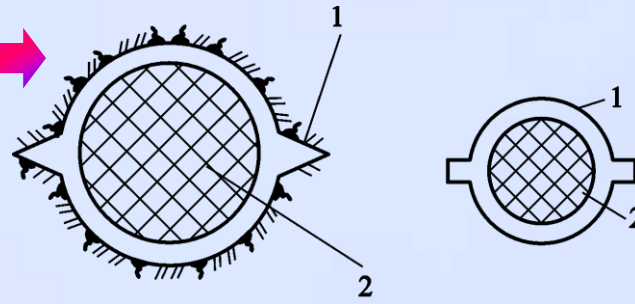
Differentiating.

Other Related of Smooth Blasting

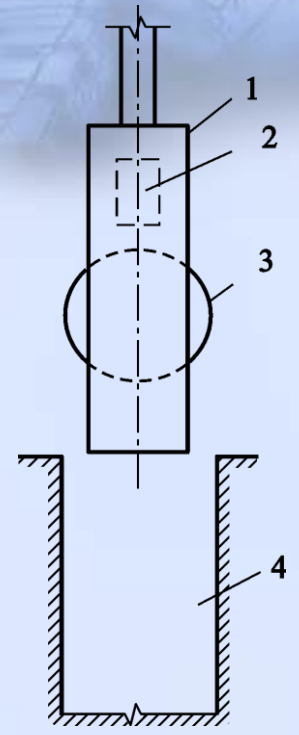
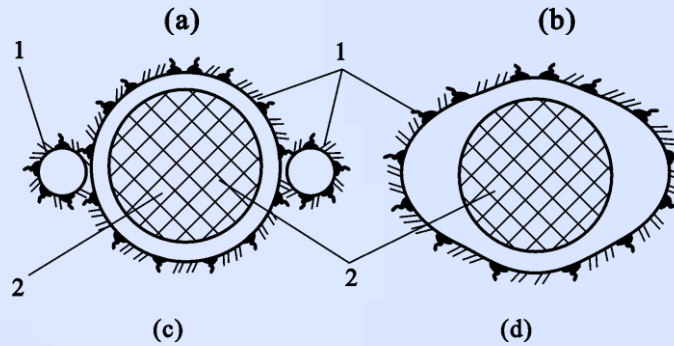


6.5 Directional Fracture Blasting

1) Notched-hole blasting



2) Shaped charge blasting



Notched hole and special-shaped drilling hole

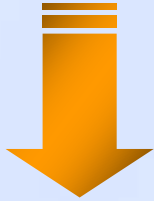
3) Slotted charge blasting

- (a) Notched hole
- (b) Notched hole
- (c) Guide hole
- (d) Special-shaped hole
- 1 Holewall
- 2 — Charge inner hole

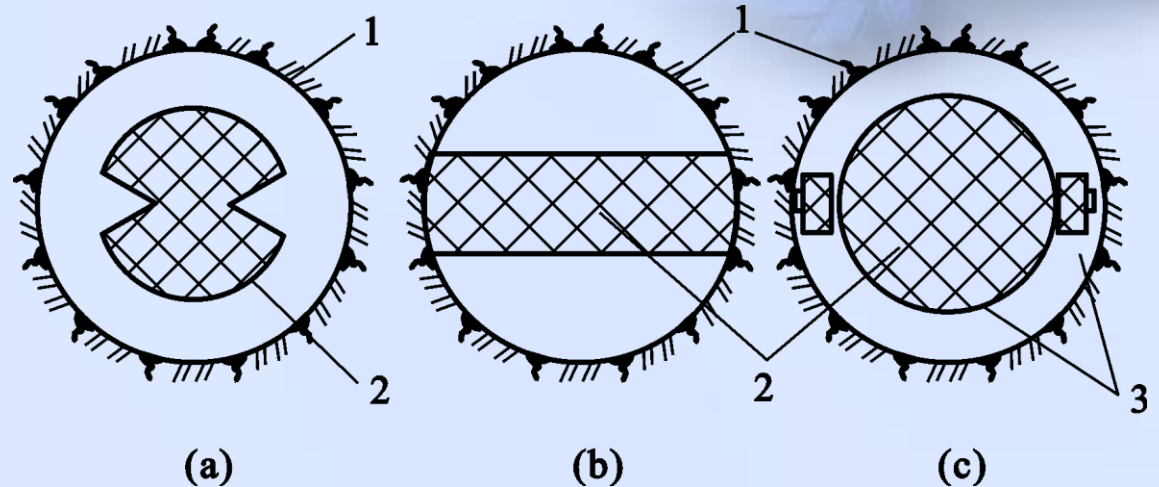
Pneumatic Down-the-hole
 1 Round head; 2 Pneuma
 3 Diamond saw blade ; 4

Directional Fracture Blasting (2)

1) Notched-hole blasting



2) Shaped charge blasting



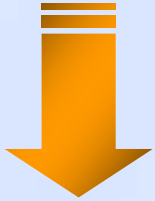
3) Slotted charge blasting

Shaped charge and special-shaped charge

(a) Shaped charge (b) Rectangle charge (c) High hardness medium
1—holewall 2—charge inner hole 3—high hardness medium

Directional Fracture Blasting (3)

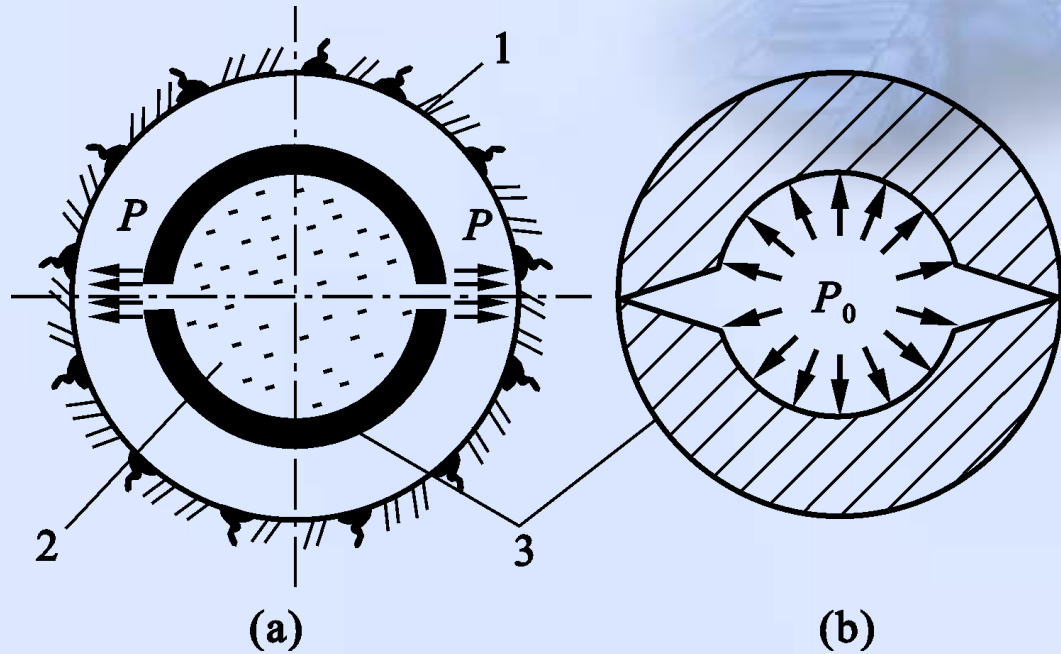
1) Notched-hole blasting



2) Shaped charge blasting



3) Slotted charge blasting



Slotted charge method

(a) Slotted charge (b) Charging tube with inner grooved
1—holewall 2—charging in grooved tube 3—grooved tube



Thank You !

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