

WELCOME
TO Adda247

*"There is
nothing
impossible to
they who will
try."*

GATE 2024



प्रचण्ड Batch

PRODUCTION

METAL CUTTING

LEC-3

Mechanical Engineering



GATE 2024



GATE

प्रत्न Batch

MECHANICAL ENGINEERING



MON/ TUE/ WED- 9PM

THEORY OF MACHINE (TOM)



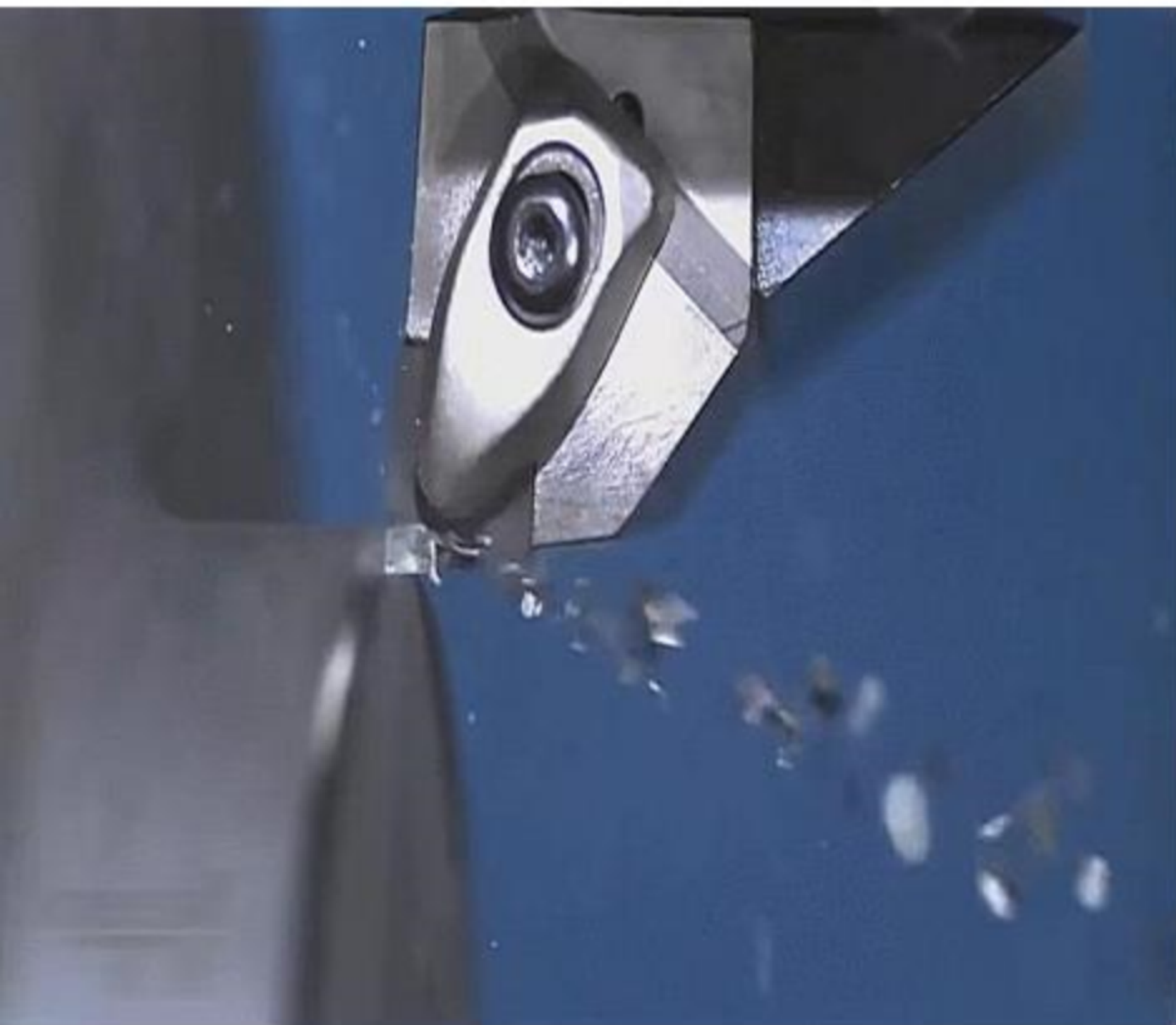
THUR/ FRI/ SAT- 6PM

PRODUCTION ENGINEERING

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METAL CUTTING





1. Introduction to Metal cutting
2. Machining operation
3. Turning operation And analysis
4. Orthogonal Machining Analysis



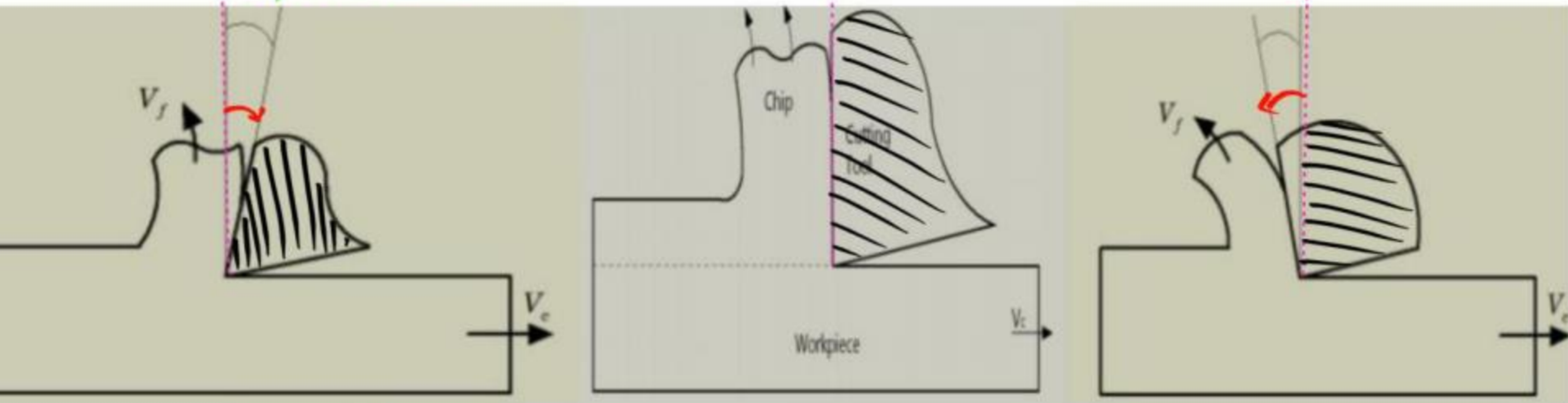
today's
topic

1. Machine Tool And Cutting Tool

2. SPCT AND MPCT

3. System of Description of Tool Geometry

Discussion on Rake Angle
Reference Plane



* $\alpha = +ve$

* $\alpha = 0$

* $\alpha = -ve$



* $\alpha \rightarrow +ve$



* $\alpha \rightarrow \text{Zero}$



* $\alpha \rightarrow -ve$

* HCS Tool \rightarrow 7 to 10 m/min

* HSS Tool \rightarrow 30 m/min

* Carbide Tool \rightarrow 150 m/min

* Ceramic Tool \rightarrow 600 m/min

\Downarrow
Brittle Tool

\Downarrow
Powder Metallurgy Technique

zero Rake Angle



* Increase Tool Strength

* Turning of Brass And Cast Iron with the help of zero Rake Angle.

* Thread cutting operation is done with zero Rake Angle.



* Thread cutting operation



Slowest operation



Lathe machine



Thread cutting



with the help of

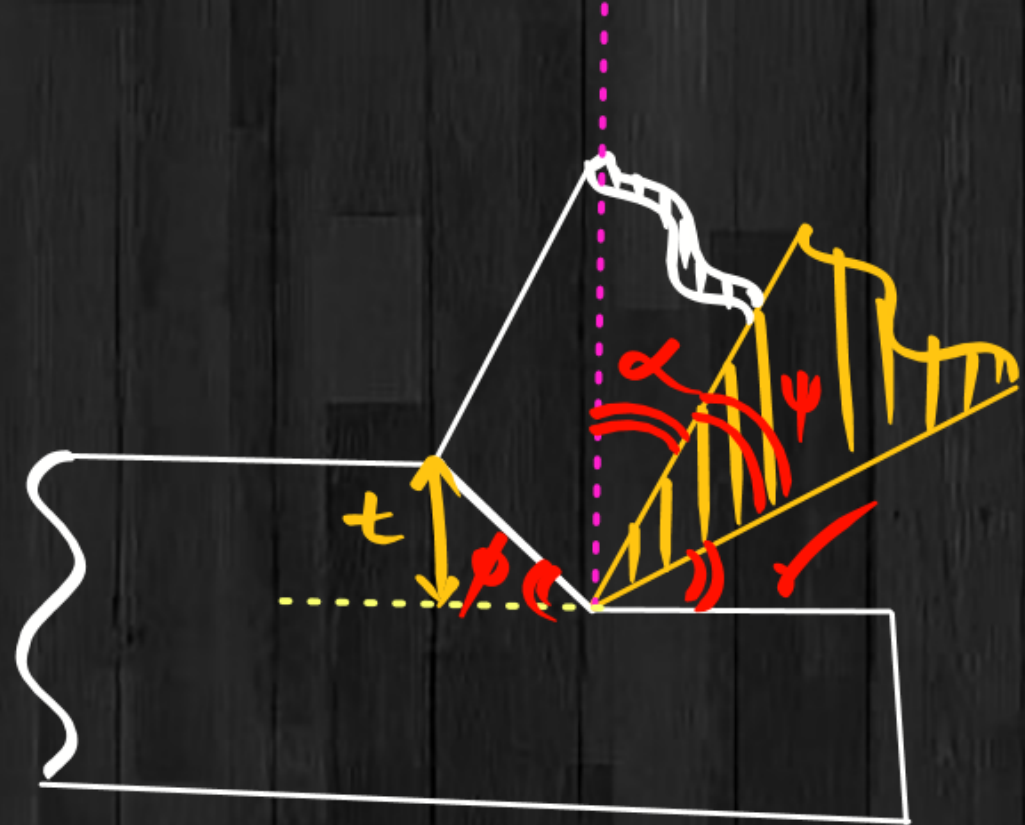
"Lead Screw"

(AcME Thread)

29°

☺ * $\alpha + \psi + \gamma = 90^\circ$
 * $\downarrow \alpha + \uparrow \psi + \gamma = \text{constant}$

☺ * Wedge Angle (ψ) \uparrow
 \Downarrow
 Rake Angle (α) \downarrow
 \Downarrow
 Strength of Tool \uparrow



☺ * \uparrow Wedge Angle α Strength of Tool \uparrow
 * \uparrow Wedge Angle α $\frac{1}{\text{Rake Angle}}$ \downarrow

Machine Tool And Cutting Tool

1. Machine Tool

A machine tool is an assembly of several different elements, mechanisms, prime mover as well as CPU/microprocessor.

Which holds both workpiece and cutting tool in an appropriate position and brings the required relative moments between the workpiece and cutting tool.

Cutting Tool

Cutting tool is the one which comes in direct contact of workpiece to deform it plastically .



Conventional cutting Tool

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MACHINE TOOL	CUTTING TOOL
It is an assembly of mechanisms that are clustered to perform certain operations by utilizing electrical , mechanical ,etc energy.	It is service having one or more wedge shape and sharp cutting edges to facilitate shearing during metal cutting.
It provides necessary motions to accomplish <u>cutting action</u> .	It does not provide any motion.
It supports and hold the <u>work-piece</u> and other necessary elements.	It generally hold the <u>Inserts</u> by clamping screw.
It transmits the vibrations to ground , hence foundation is necessary.	As it does not transmit any vibration to ground no foundation is needed.
Machines are difficult to move as they are large in size and heavier.	Cutting tools are easier to move from one place to another. ✓
✓ Cost is higher then cutting tool.	Cheaper than machine tool.
Example:- <u>Lathe machine , Milling machine , etc.</u>	Example:- <u>Single point cutting tool, etc.</u>

#

Cutting Tool



- ① Single Point cutting Tool (SPCT)
- ② Multi Point cutting Tool (MPCT)

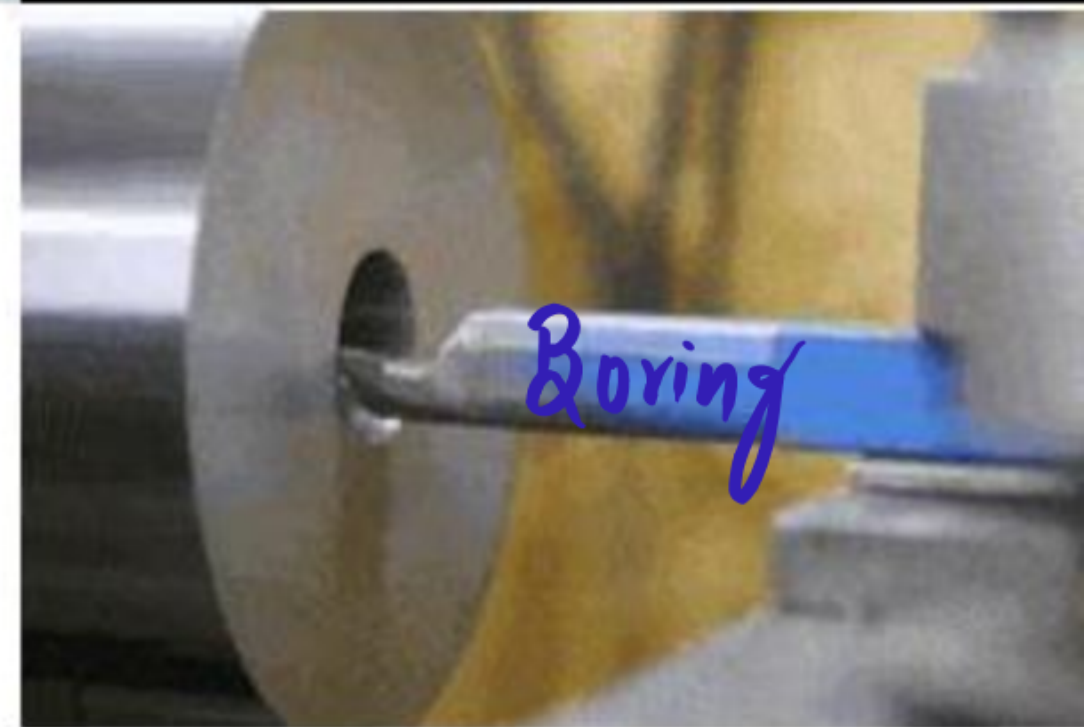
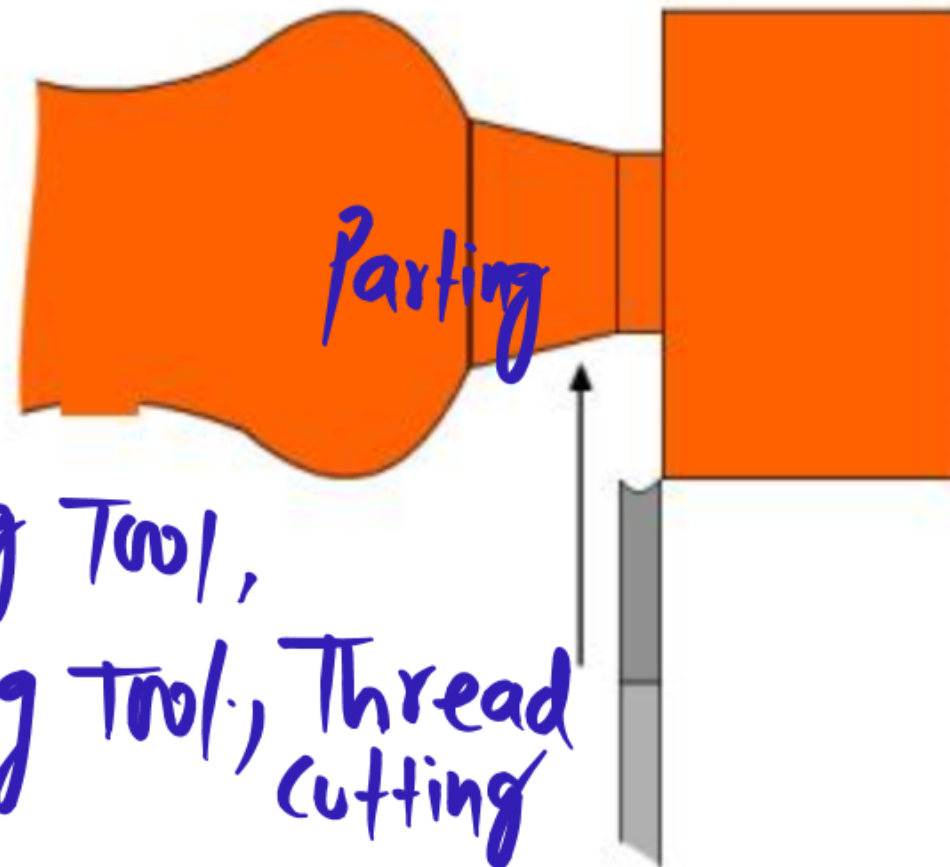
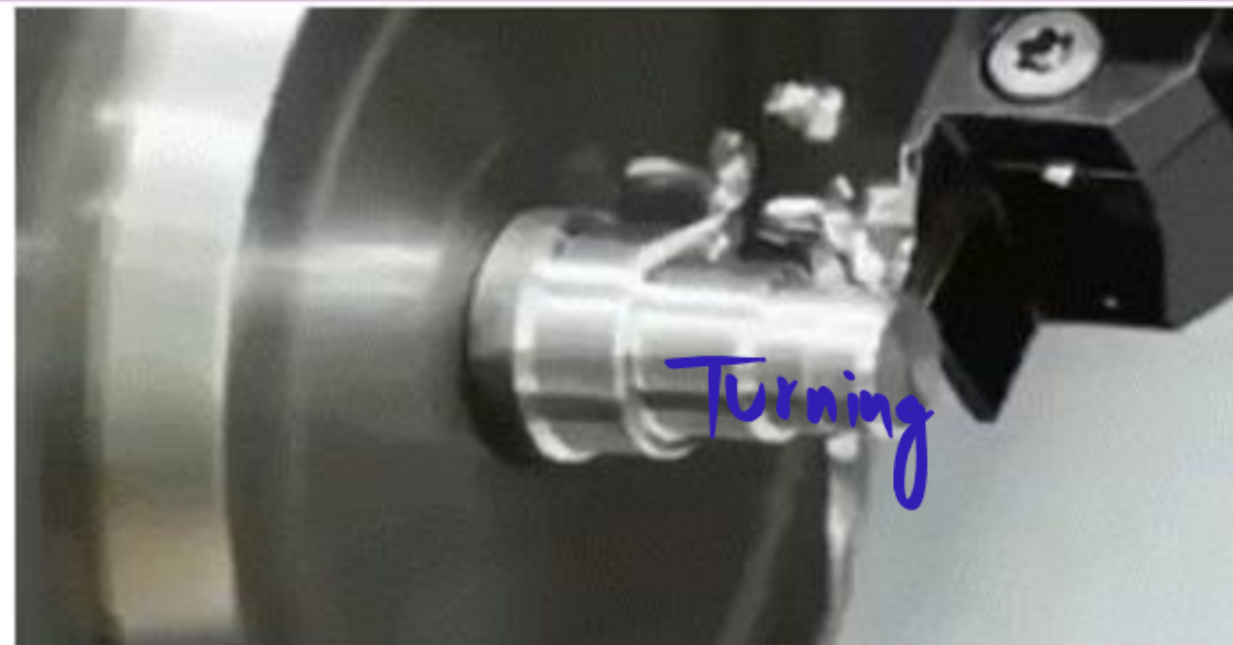
Single point cutting Tool



During machining only one cutting edge come in contact with workpiece.

* Example :->

Turning, Facing, Parting
Shaping, Planing, Boring Tool,
Slotting Tool, Grooving Tool, Thread Cutting

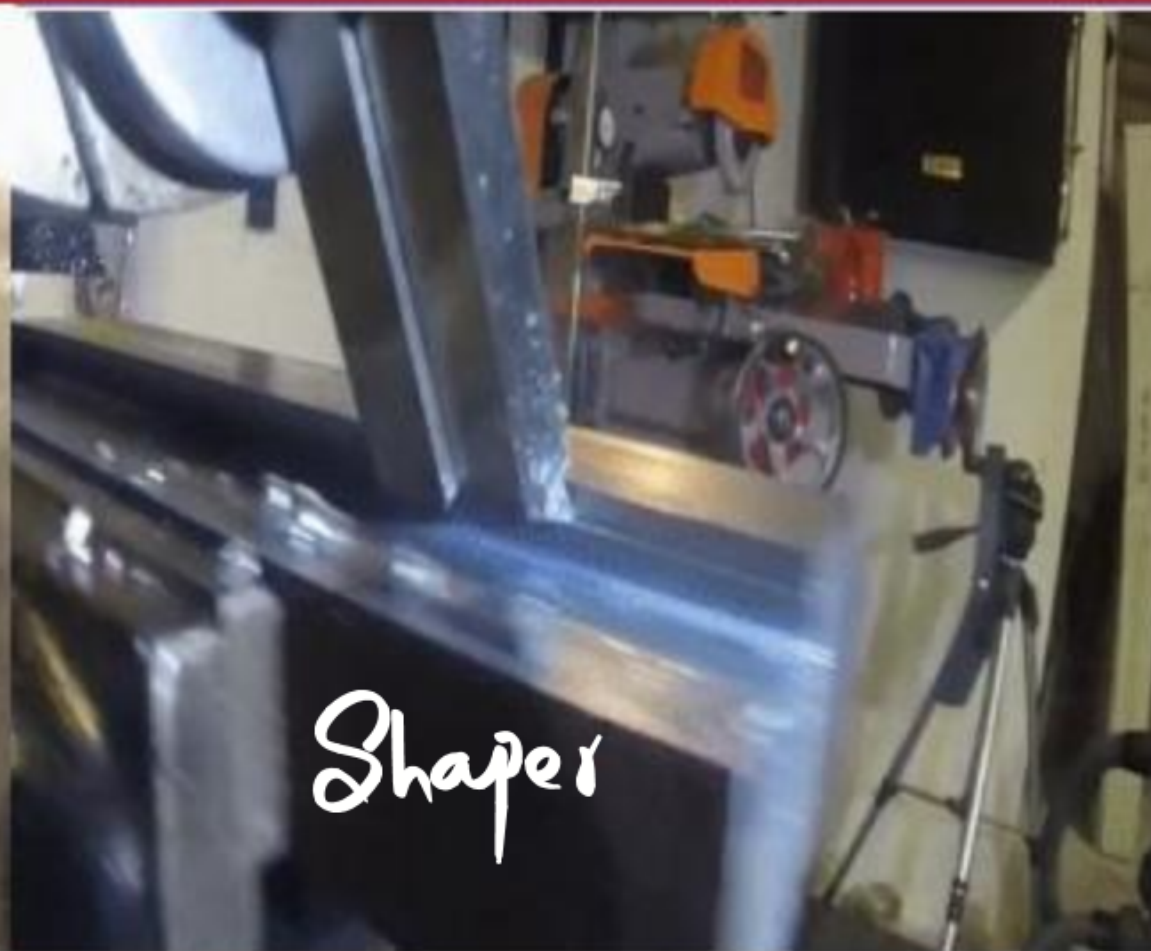


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Thread cutting



Shaper



Grooving

Multipoint cutting Tool



During Machining more than one cutting Edge Come in contact with Workpiece.

Ex: →

- * Grinding Tool
- * Drilling Tool
- * Milling Tool
- * Hack Saw
- * Broaching



Drilling Tool



Grinding Tool



Hack Saw



Broaching

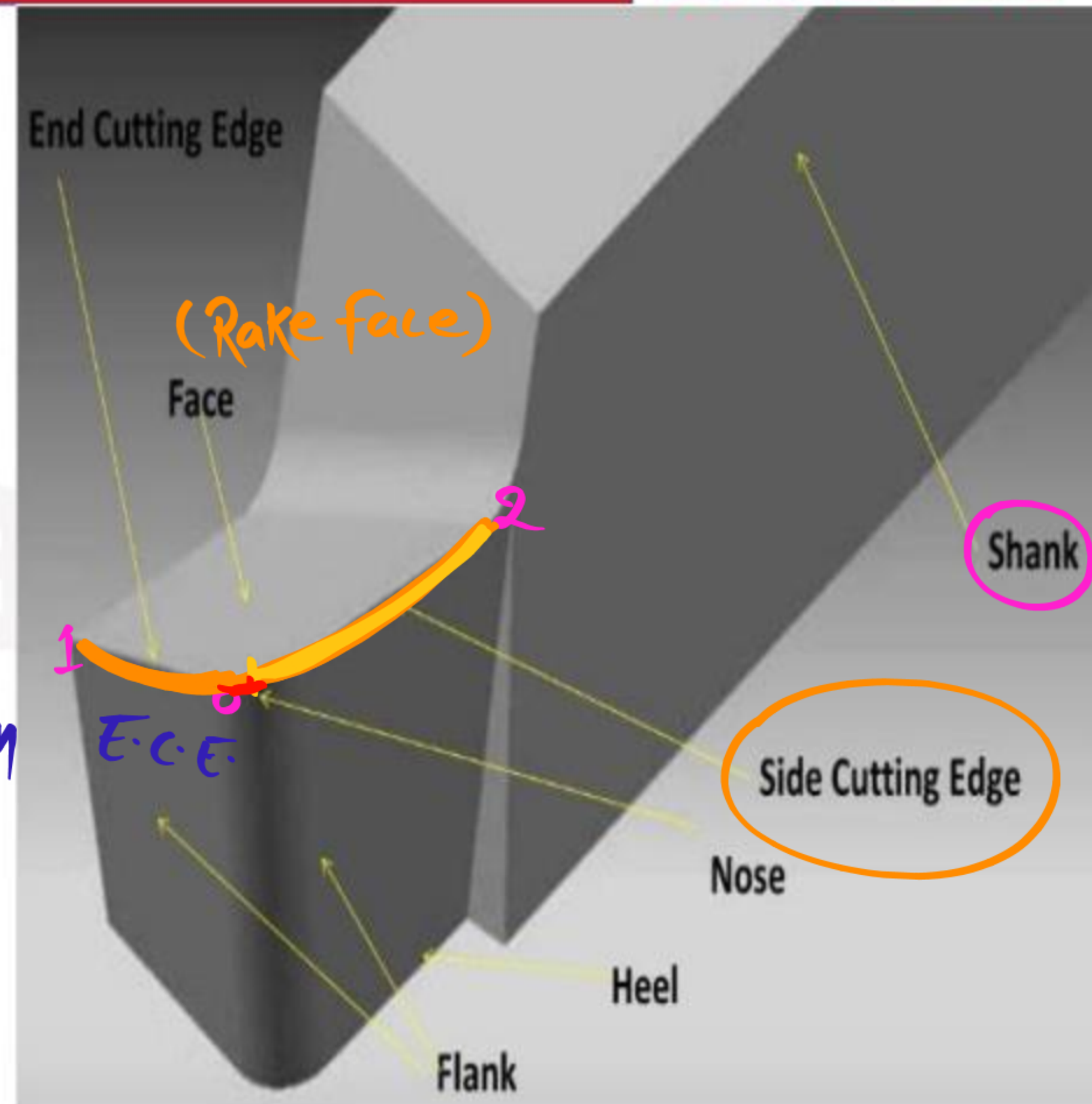
System of Description of Tool Geometry

1. Machine Reference System OR (ASA)

2. Tool Reference System OR (ORS)

3. Work Reference System

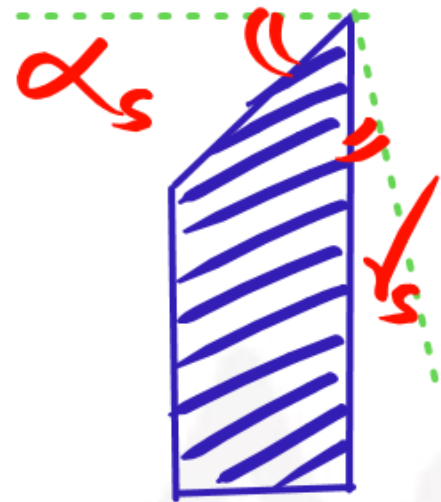
* ASA → American Standard Association System
* ORS → Orthogonal Rake System



* 0-2 \Rightarrow Side cutting / Major cutting / Principle cutting
Edge / Edge / Edge

* 0-1 \Rightarrow End cutting / Minor cutting / Auxillary cutting
Edge / Edge / Edge

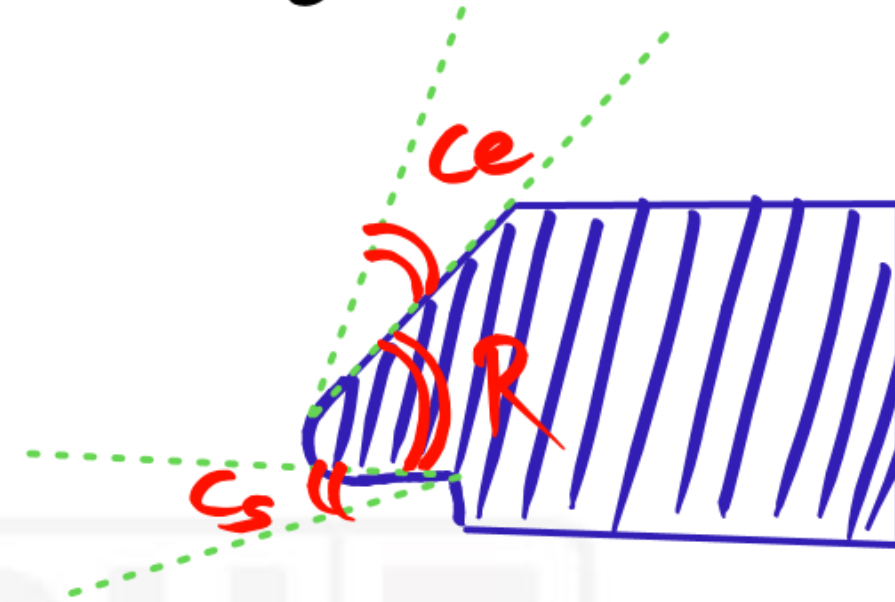
① \perp to Base or Parallel to width



* $\alpha_s \rightarrow$ Side Rake Angle

* $\gamma_s \rightarrow$ Side Relief or Clearance Angle

② Parallel to Base

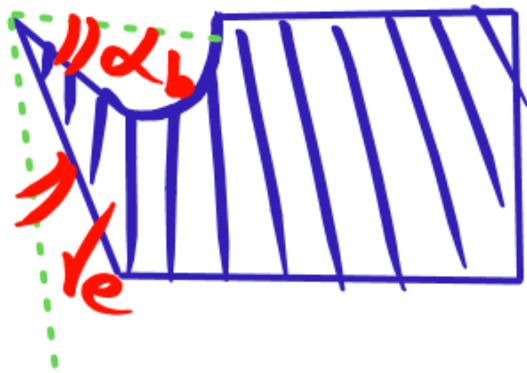


* $C_e \rightarrow$ End cutting Edge Angle

* $C_s \rightarrow$ Side cutting Edge Angle

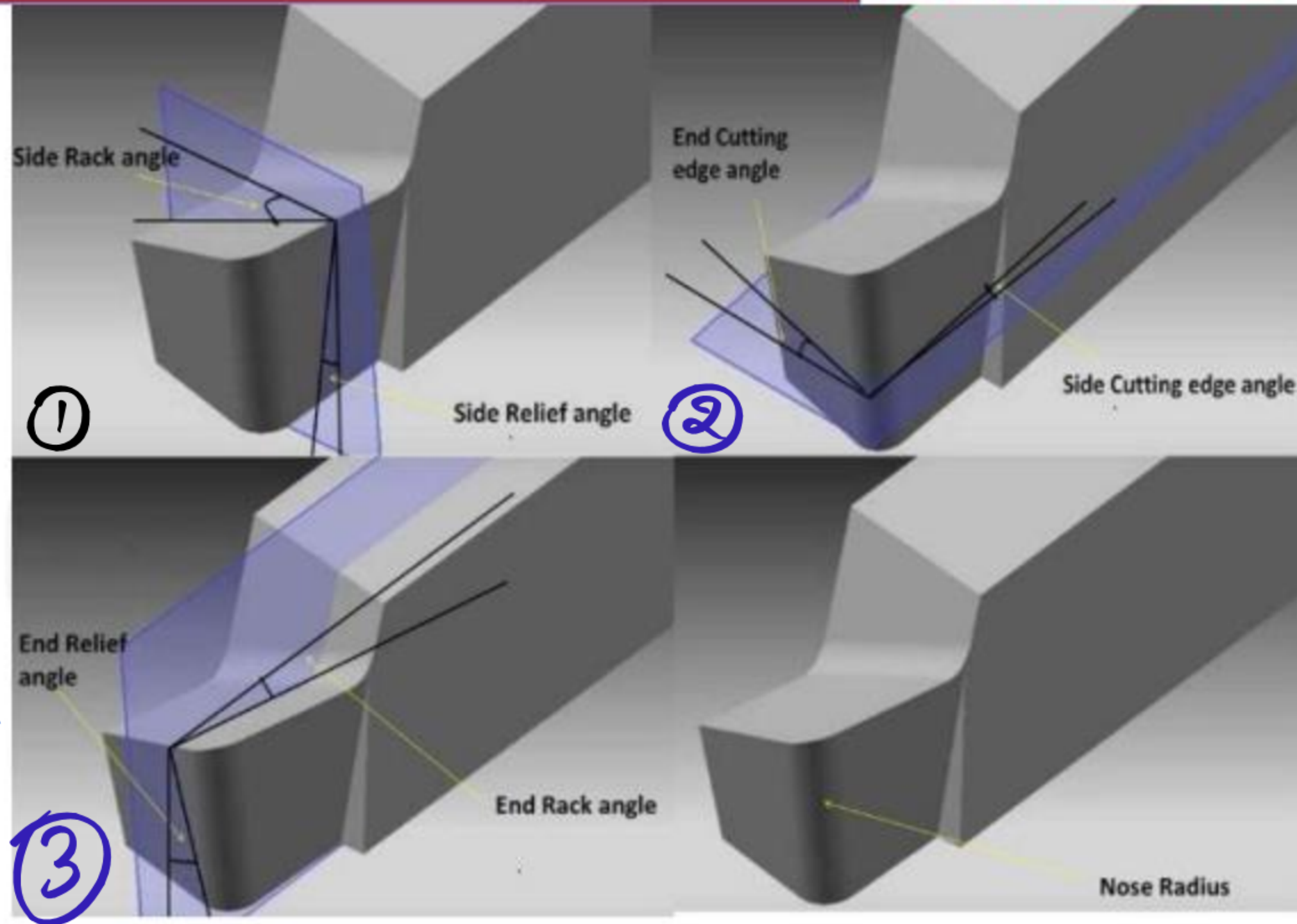
* $R \rightarrow$ Nose Radius

③ \perp to Base OR Parallel to Length



* $\alpha_b \rightarrow$ Back Rake Angle

* $\gamma_e \rightarrow$ End Relief or clearance Angle



Tool Signature



Complete Description of Tool Geometry



* 7 parameters of Tool

→ 6 → Angle

→ 1 → Nose Radius

+

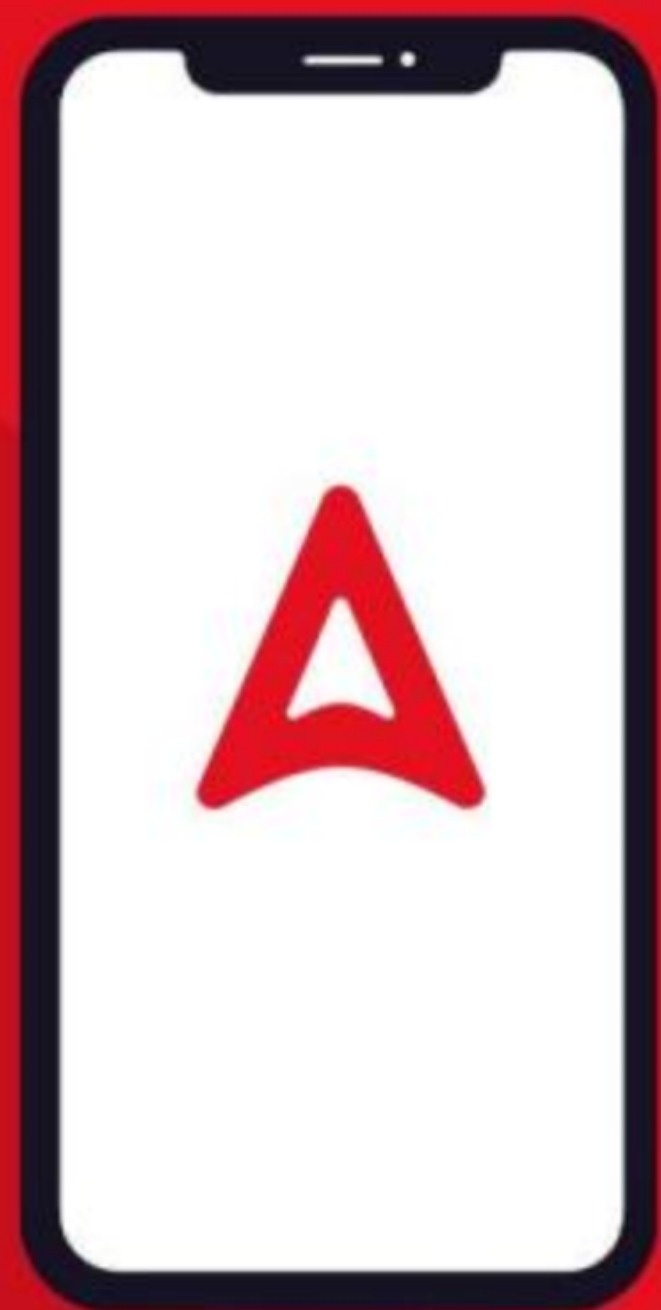


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