Chapter 11
Threaded Fasteners

TOPICS

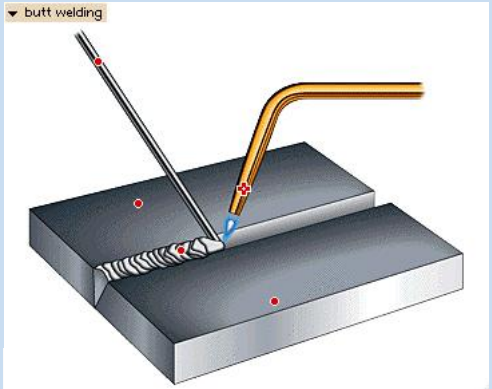
- Introduction
- Thread terminology
- Thread drawing and dimensioning
- Threaded fastener

Introduction

FASTENING TYPE

1. Permanent

Welding



Gluing

Riveting

FASTENING TYPE

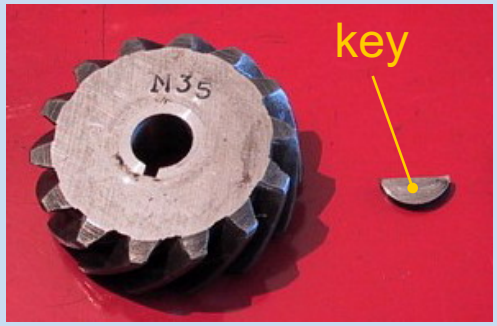
2. Temporary

2.1 ***Threaded fastener***

- bolts
- studs
- screws

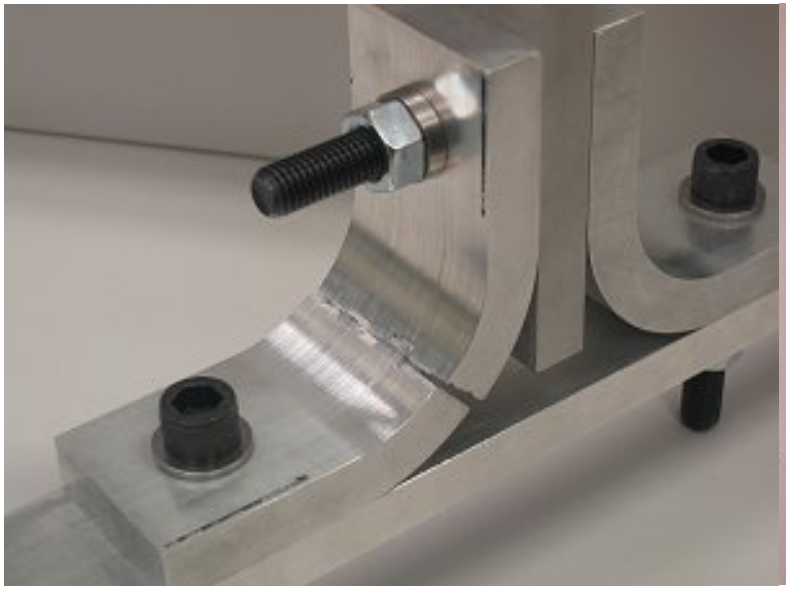
2.2 ***Non-threaded fastener***

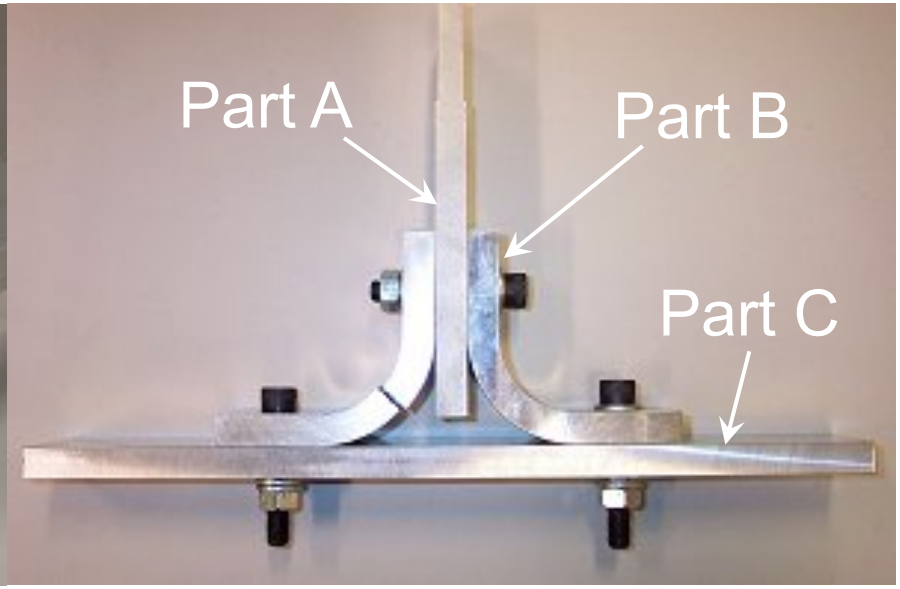
- keys
- pin



THREAD APPLICATION

1. To hold parts together.
2. To move part(s) relative to others.



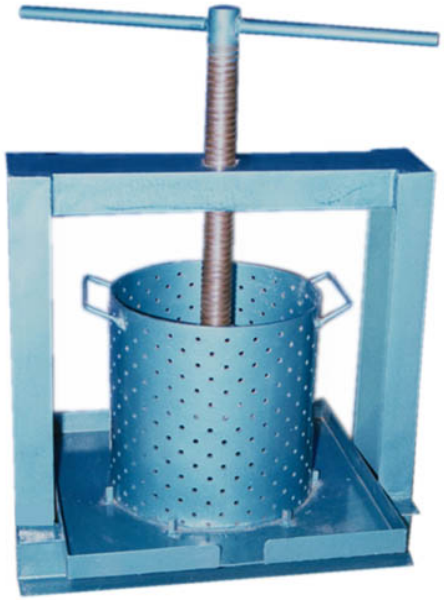


THREAD APPLICATION

1. To hold parts together.

2. To move part(s) relative to others.

Wood working vise

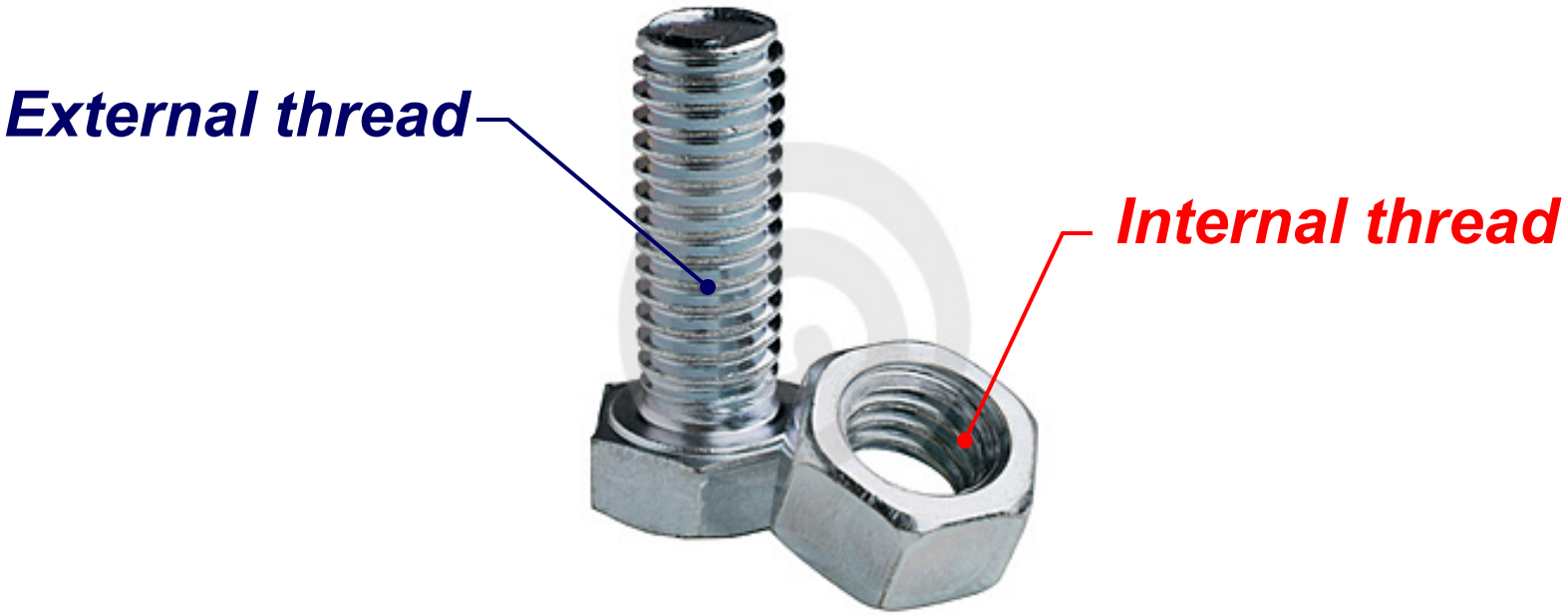


Palm fruit pressing machine

Thread Terminology

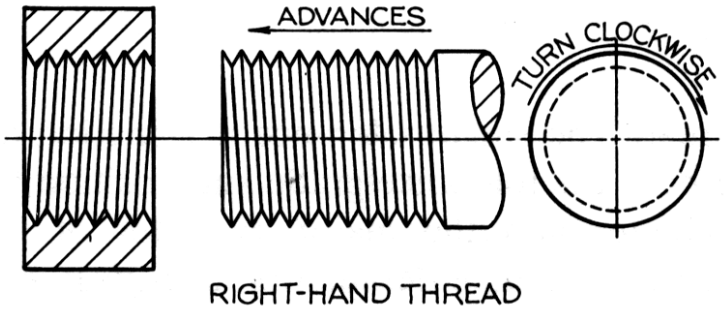
THREAD TERMINOLOGY

External (male) thread	A thread cut on the ***outside*** of a cylindrical body.
Internal (female) thread	A thread cut on the ***inside*** of a cylindrical body.

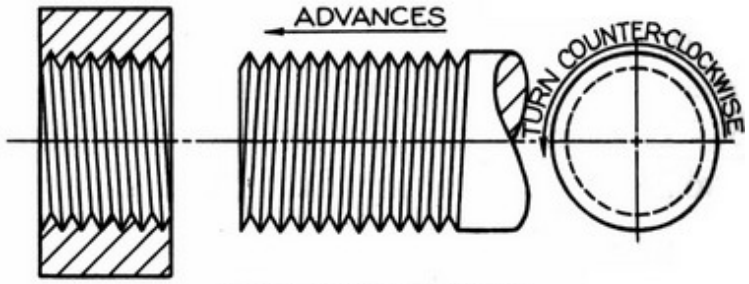


THREAD TERMINOLOGY

Right-hand thread	Thread that will ***assemble*** when turned ***clockwise***.
Left-hand thread	Thread that will ***assemble*** when turned ***counter-clockwise***.



RIGHT-HAND THREAD



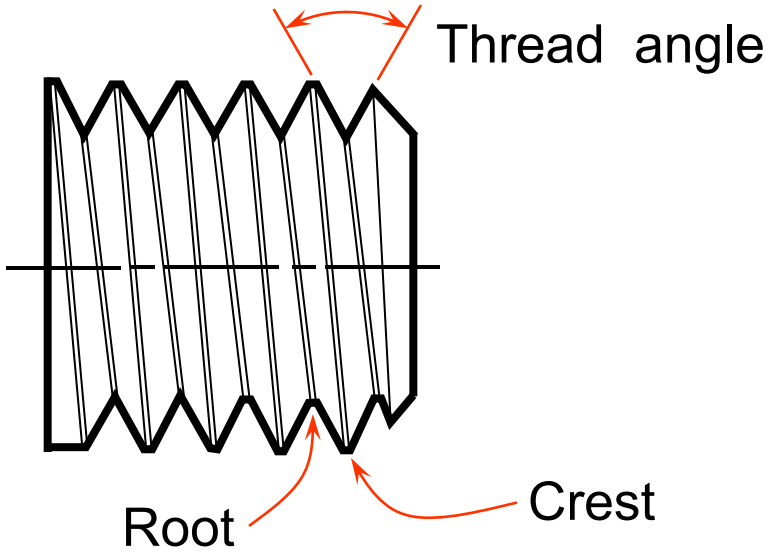
LEFT-HAND THREAD

Turnbuckle use RH and LH thread at each end to double displacement.

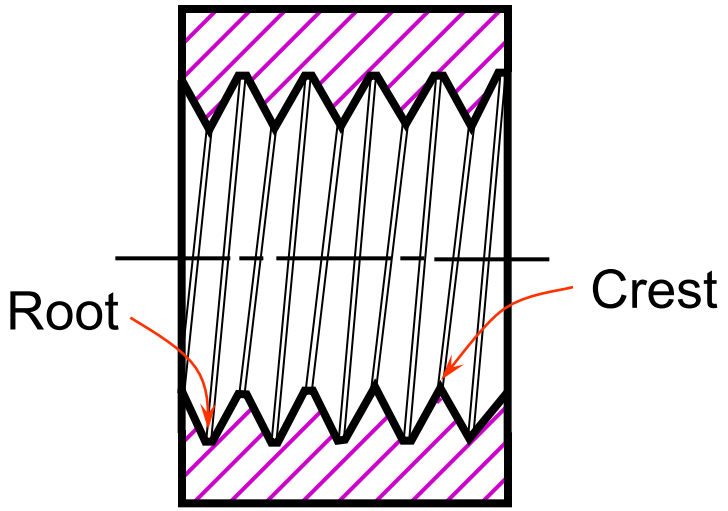
THREAD TERMINOLOGY

Crest	The ***peak edge*** of a thread.
Root	The ***bottom*** of the thread cut into a cylindrical body.
Thread angle	The angle between threads faces.

External Thread



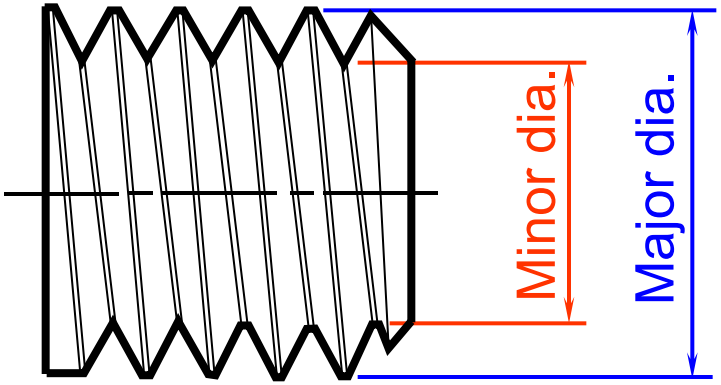
Internal Thread



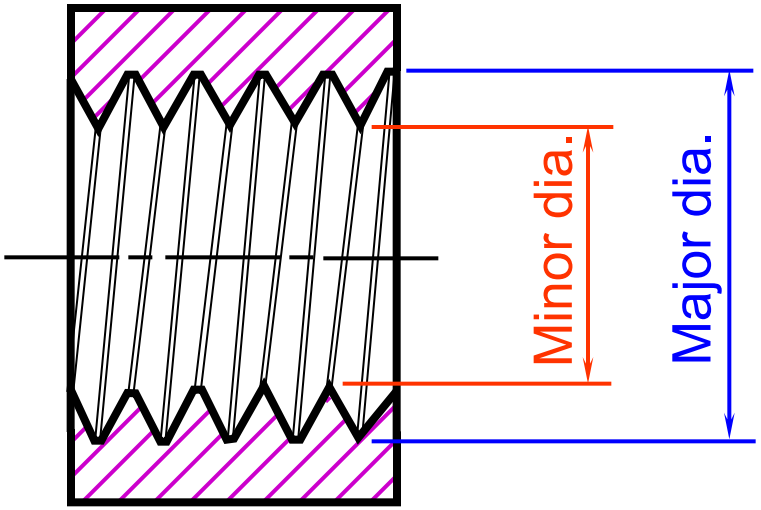
THREAD TERMINOLOGY

Major diameter	The ***largest diameter*** on an internal or external thread.
Minor diameter	The ***smallest diameter*** on an internal or external thread.

External Thread



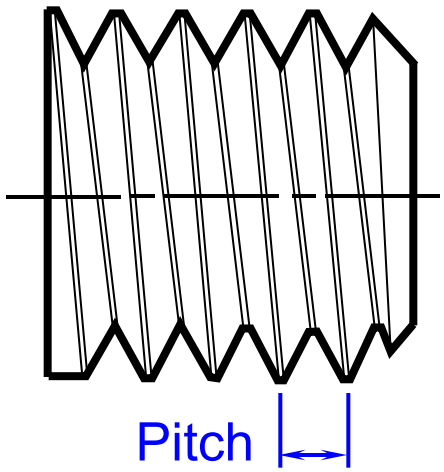
Internal Thread



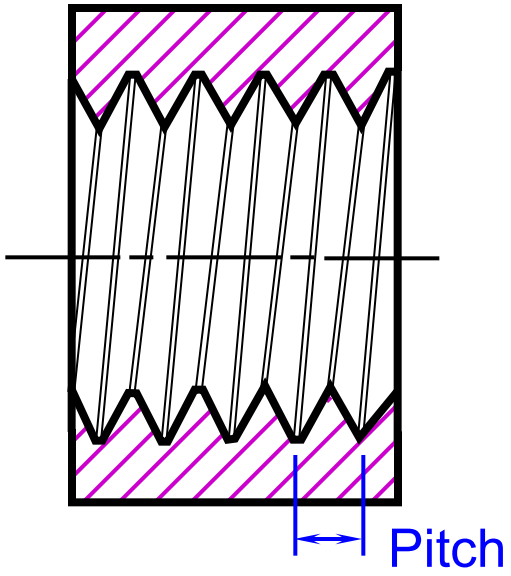
THREAD TERMINOLOGY

Pitch	The distance between crests of threads.
Lead	The distance a screw will advance when turned 360°.

External Thread

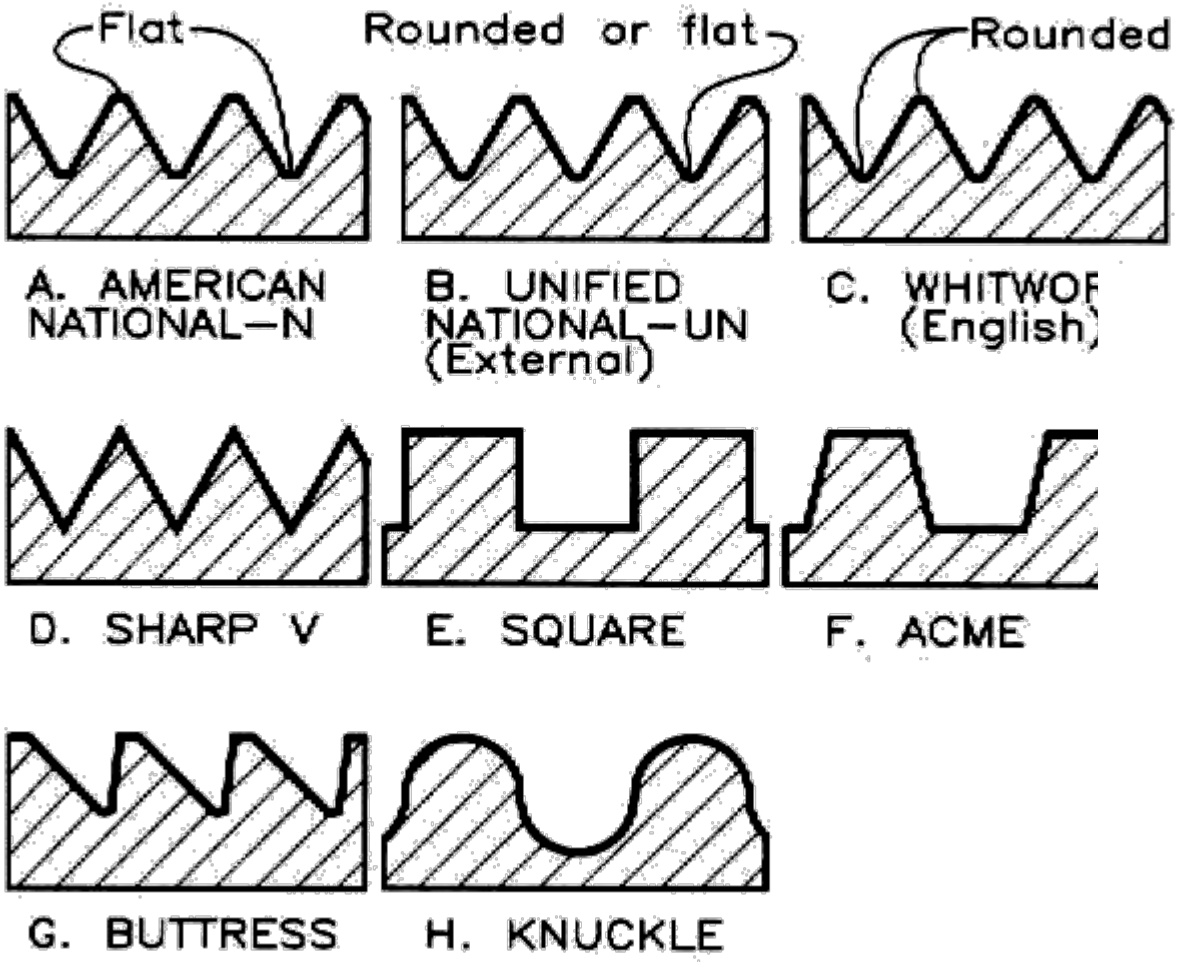


Internal Thread



THREAD TERMINOLOGY

Thread Form	Form is the profile shape of the thread.



Example :

"knuckle thread form"

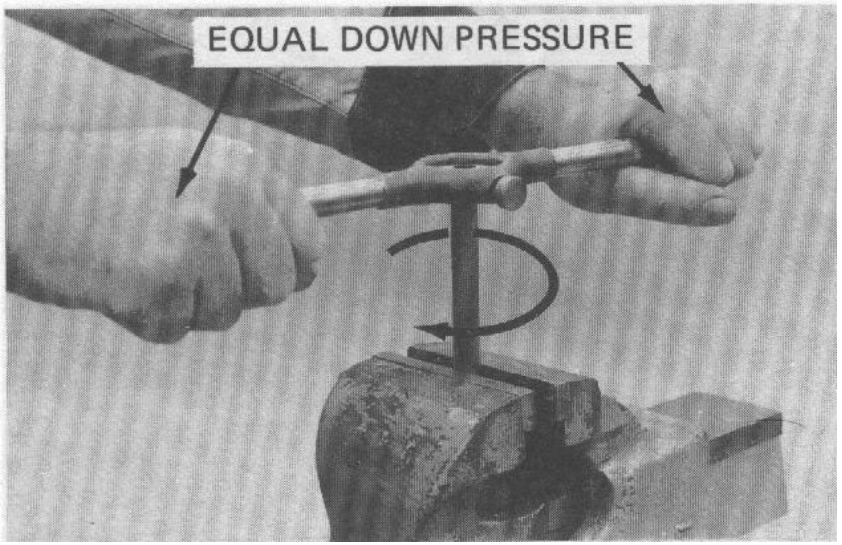
EXTERNAL THREAD CUTTING

Tools

- Threading Die

- Die stock

Operation



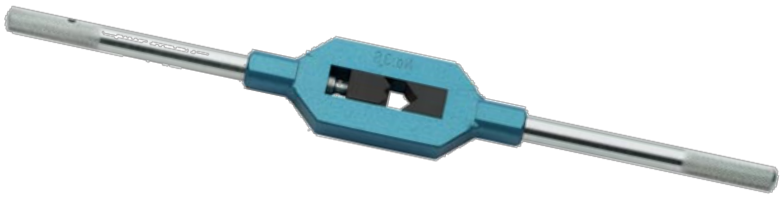
INTERNAL THREAD CUTTING

Tools

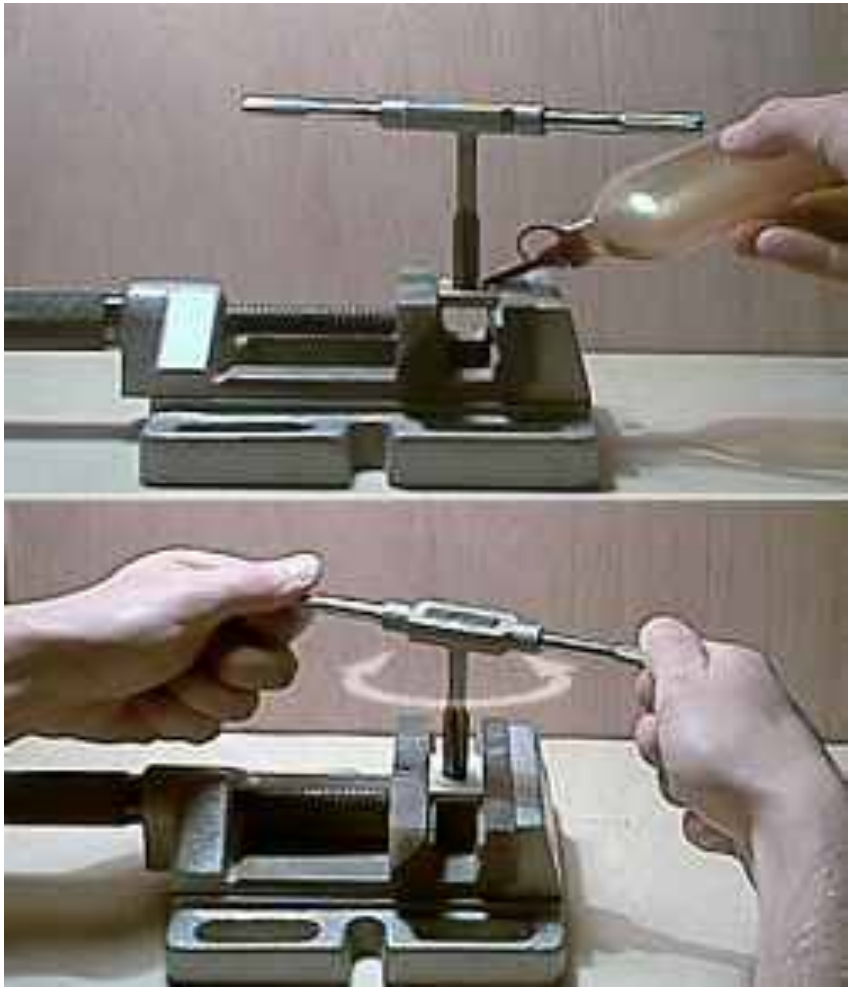
- Twist drill

- Tap

- Tap wrench

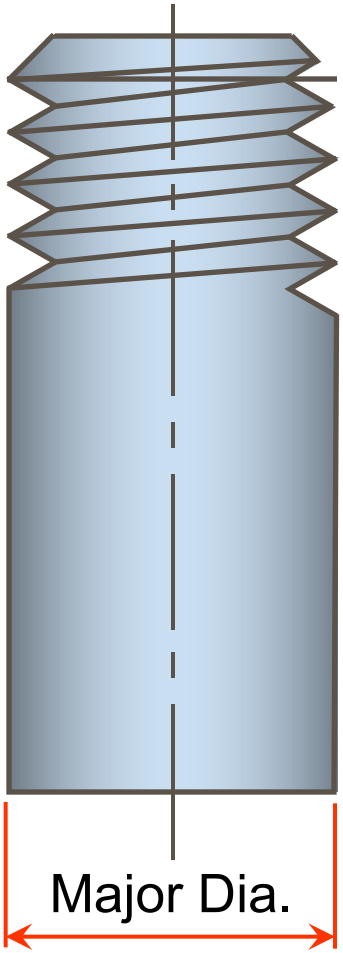


Operation

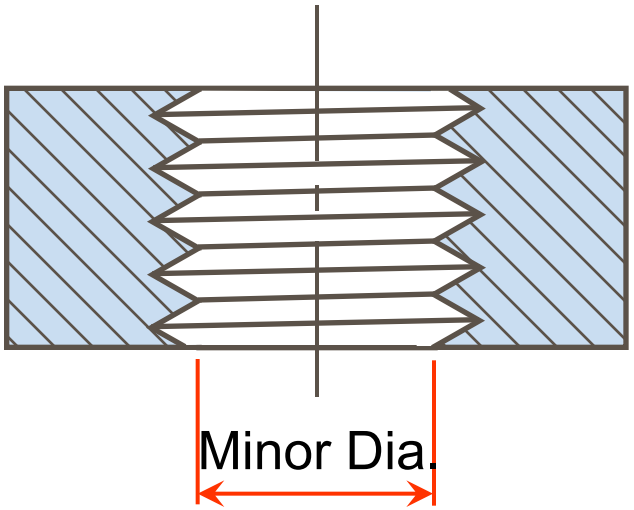


COMPARISON OF THREAD CUTTING

External Thread



Internal Thread



Thread Drawing

THREAD REPRESENTATION

1. ***Detailed*** representation

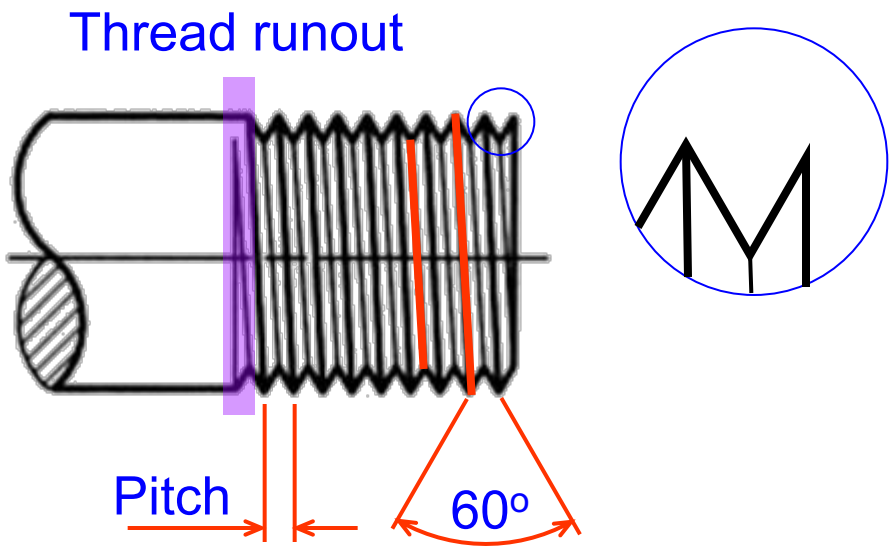
2. ***Schematic*** representation

3. ***Simplified*** representation

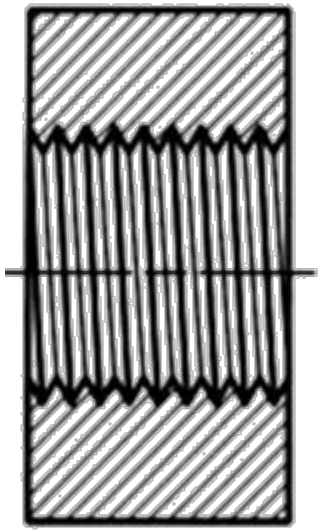
DETAILED REPRESENTATION

- Use ***slanting lines*** to represent crest and root.
- Roots and crest are drawn in ***sharp*** Vs.

External thread



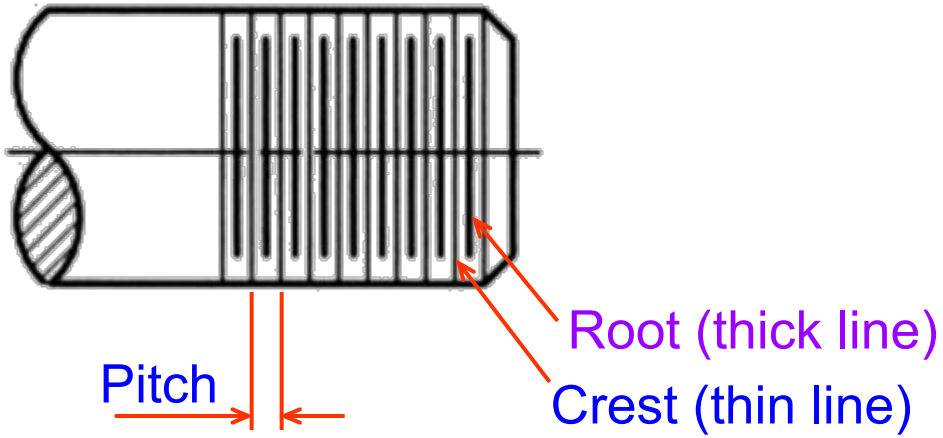
Internal thread



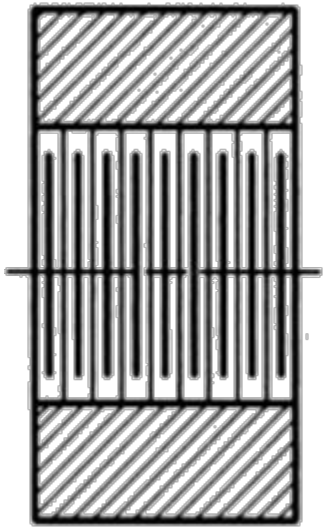
SCHEMATIC REPRESENTATION

- Use alternate ***long*** and ***short*** lines for representing ***crests*** and ***roots*** of the thread, respectively.

External thread



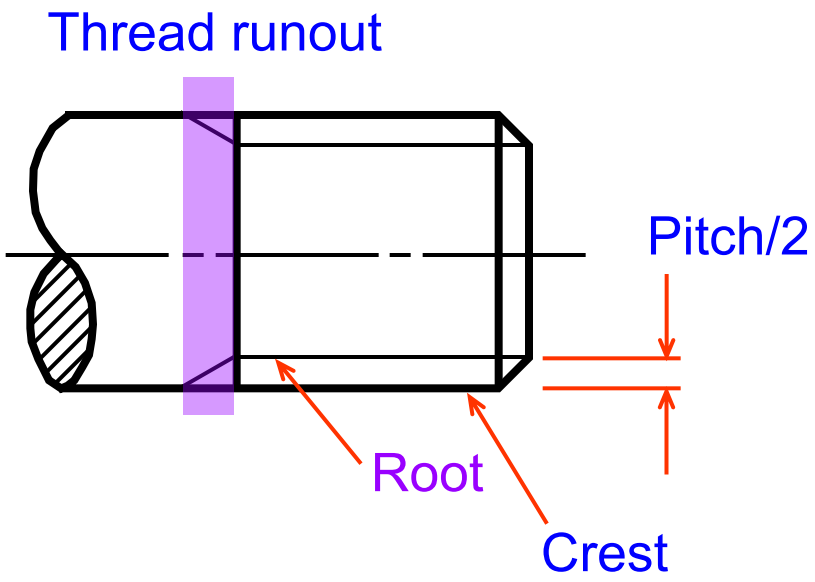
Internal thread



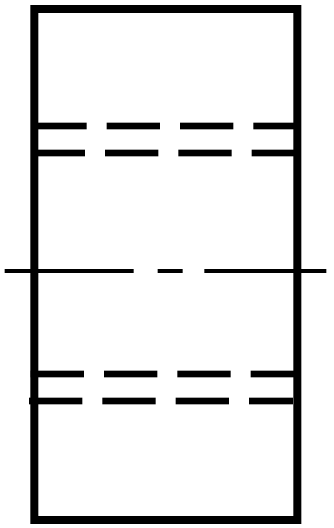
SIMPLIFIED REPRESENTATION

- Use ***thick continuous lines*** for representing ***crest*** and ***thin continuous lines*** for representing ***root*** of the thread, respectively.

External thread



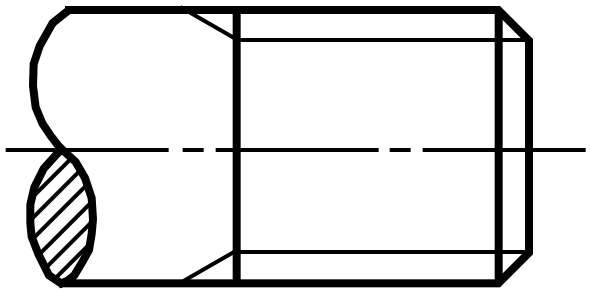
Internal thread



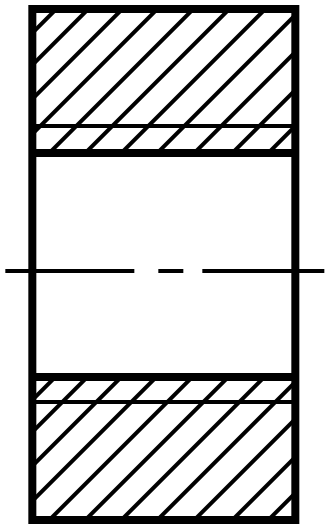
SIMPLIFIED REPRESENTATION

- Use ***thick continuous lines*** for representing ***crest*** and ***thin continuous lines*** for representing ***root*** of the thread, respectively.

External thread

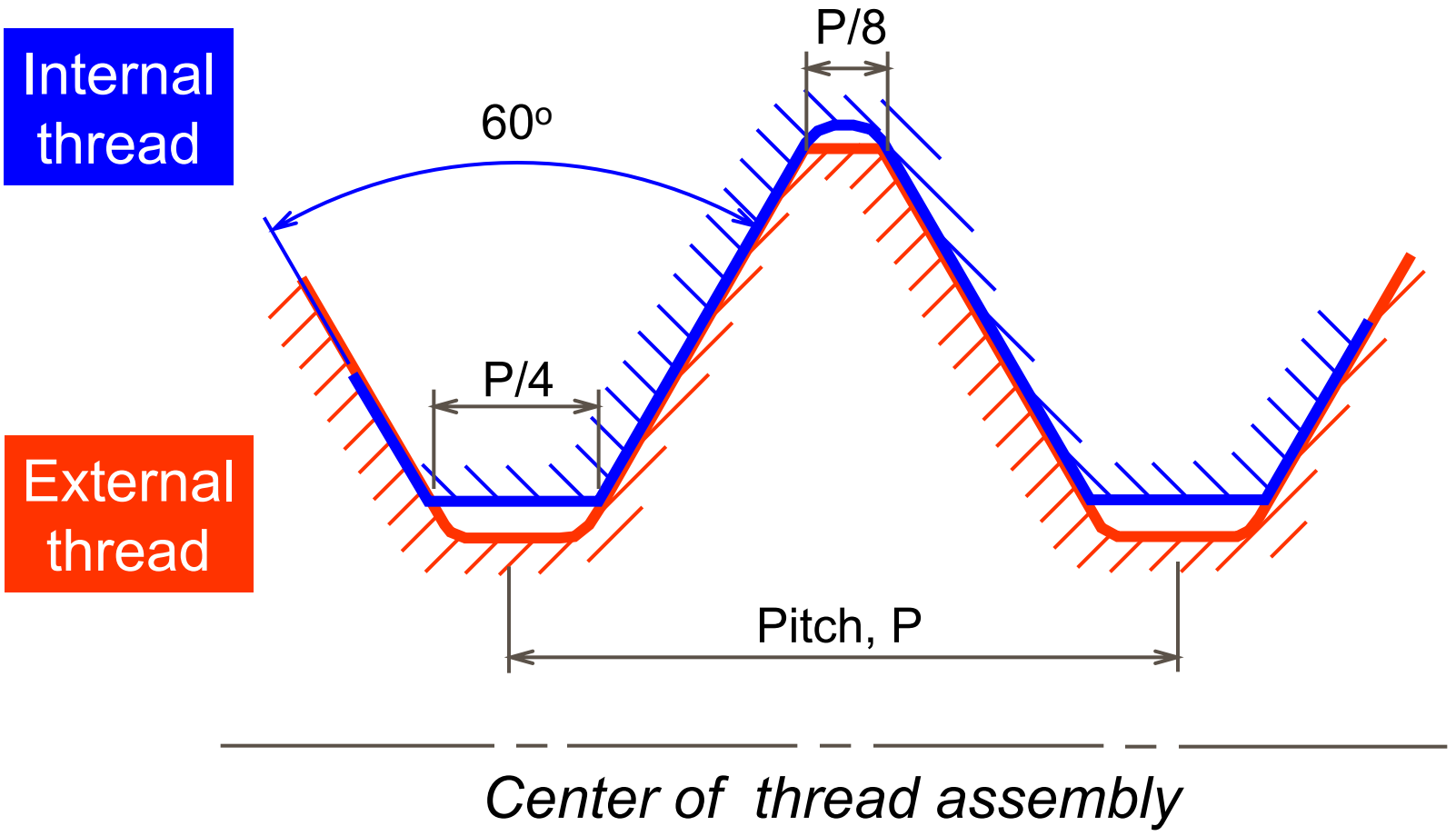


Internal thread



Sectional view

ISO (METRIC) THREAD



Thread assemble occurs if and only if both (internal & external) thread have an equal ***nominal size*** *(or diameter)* and ***pitch***.

METRIC COARSE THREAD

[Table 9.1]

Nominal size	**Major diameter**	**Pitch**	Minor diameter	Tap drill size
M6	6.00	1.00	4.92	5.00
M8	8.00	1.25	6.65	6.75
M10	10.00	1.50	8.38	8.50
M12	12.00	1.75	10.11	10.00

Metric thread

Minor diameter ≈ Tap drill size

In thread ***drawing***, the following relationship is used.

Minor diameter = ***Major*** diameter – Pitch

METRIC FINE THREAD

[Table 9.2]

Nominal size	**Major diameter**	**Pitch**	Minor diameter	Tap drill size
M8	8.00	0.75	7.188	7.25
		1.00	6.917	7.00
M10	10.00	0.75	9.188	9.25
		1.00	8.917	9.00
		1.25	8.647	8.75

Minor diameter ≈ Tap drill size

In thread ***drawing***, the following relationship is used.

Minor diameter = ***Major*** diameter – Pitch

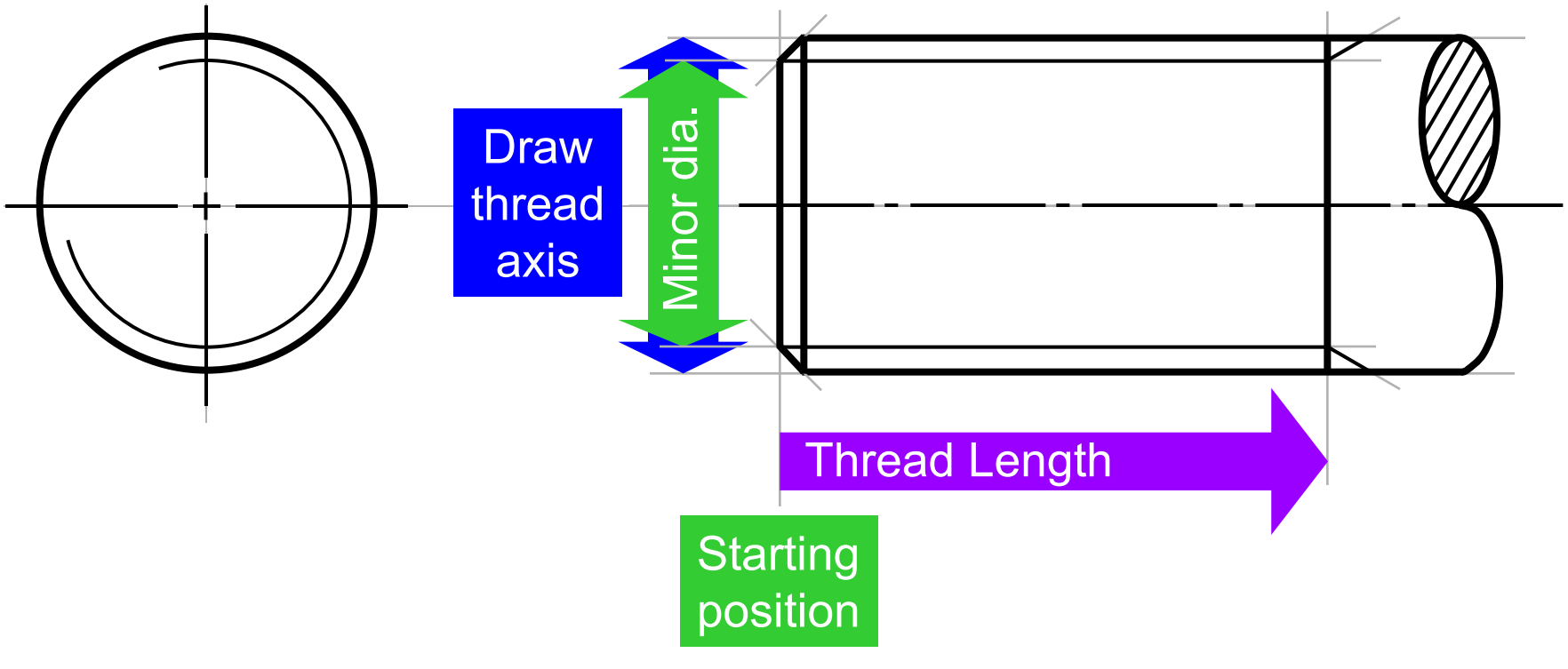
DRAWING STEPS OF EXTERNAL THREAD

Draw an arc that represents a root.

Draw a circle that represents a crest.

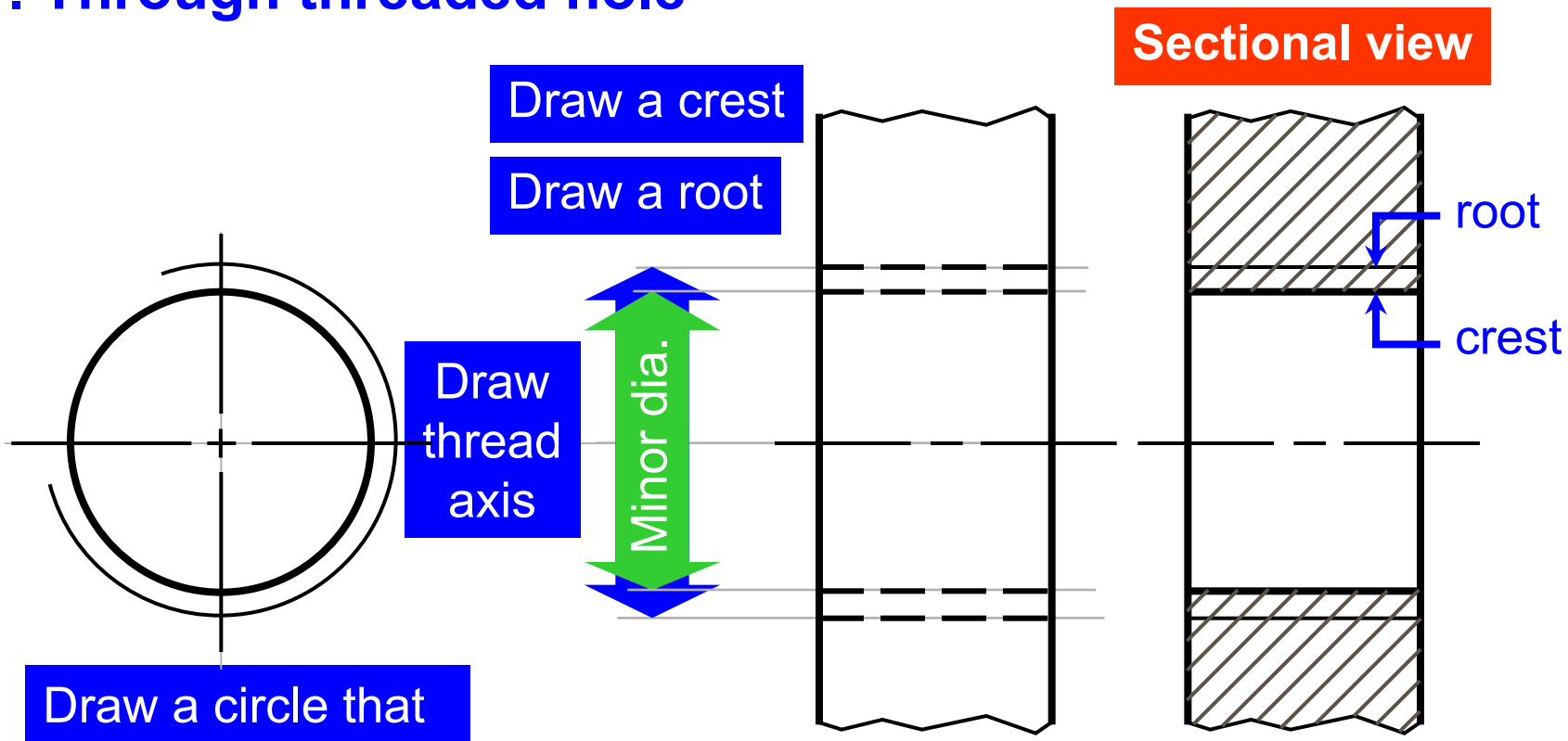
Draw 45° Chamfer

Draw line making 30° with thread axis



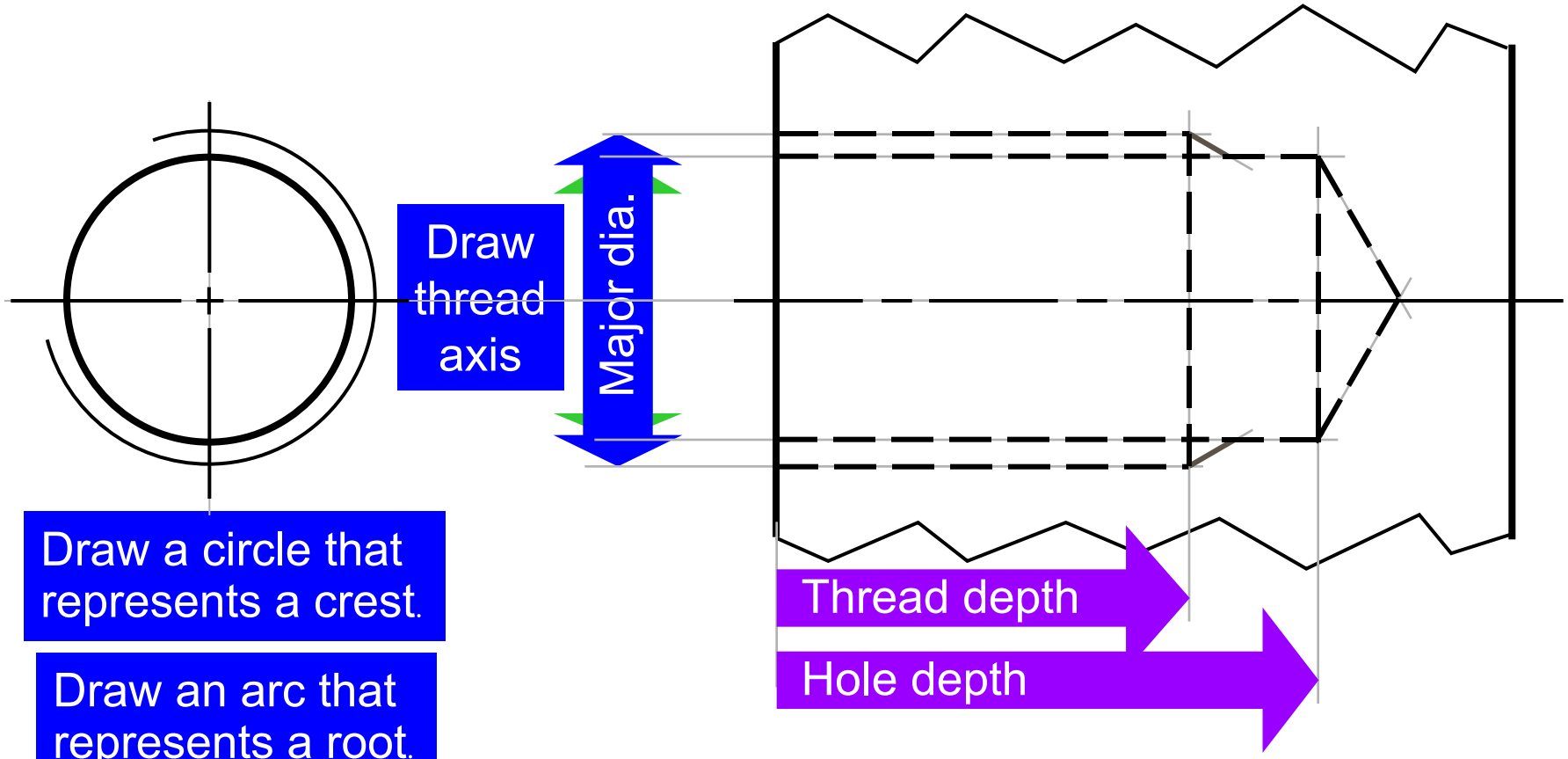
DRAWING STEPS OF THREADED HOLE

1. Through threaded hole



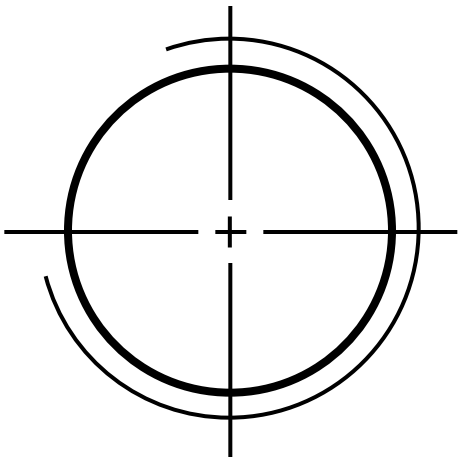
DRAWING STEPS OF THREADED HOLE

2. Blinded threaded hole

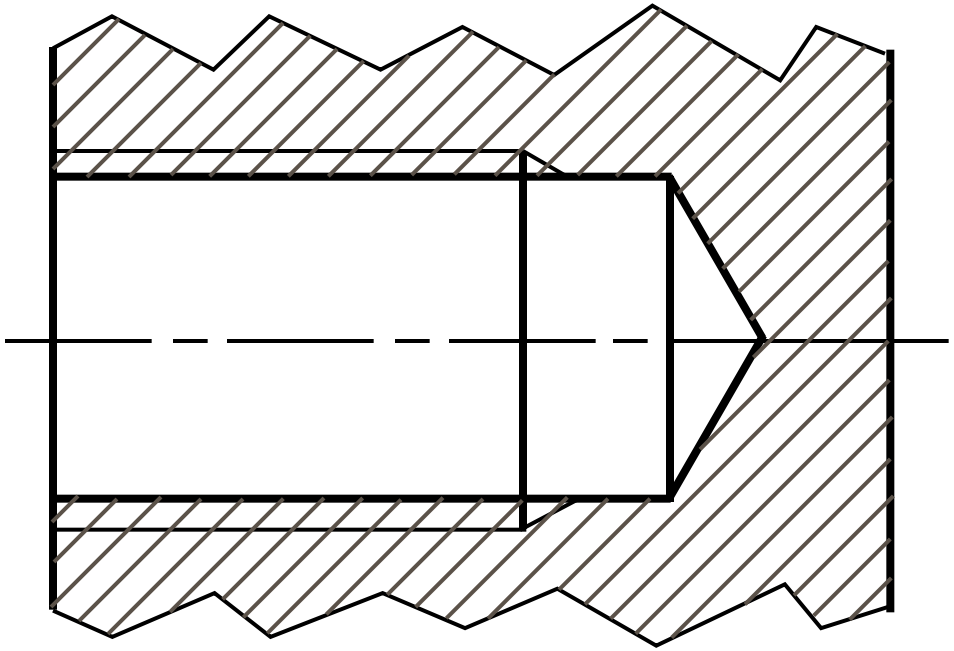


DRAWING STEPS OF THREADED HOLE

2. Blinded threaded hole

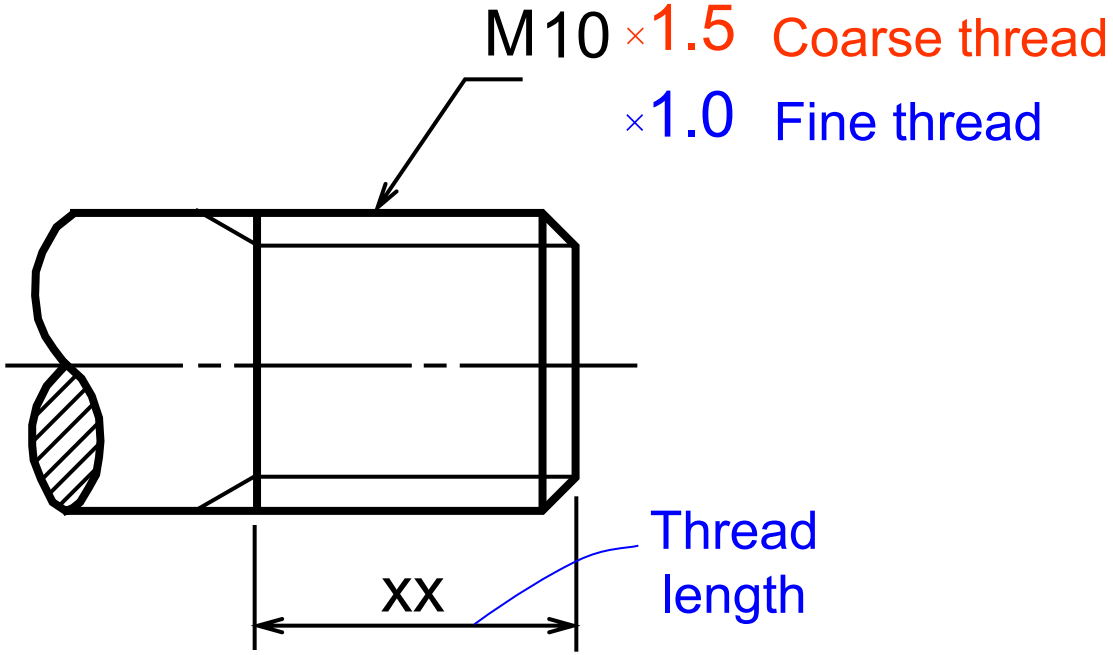


Sectional view



DIMENSIONING EXTERNAL THREAD

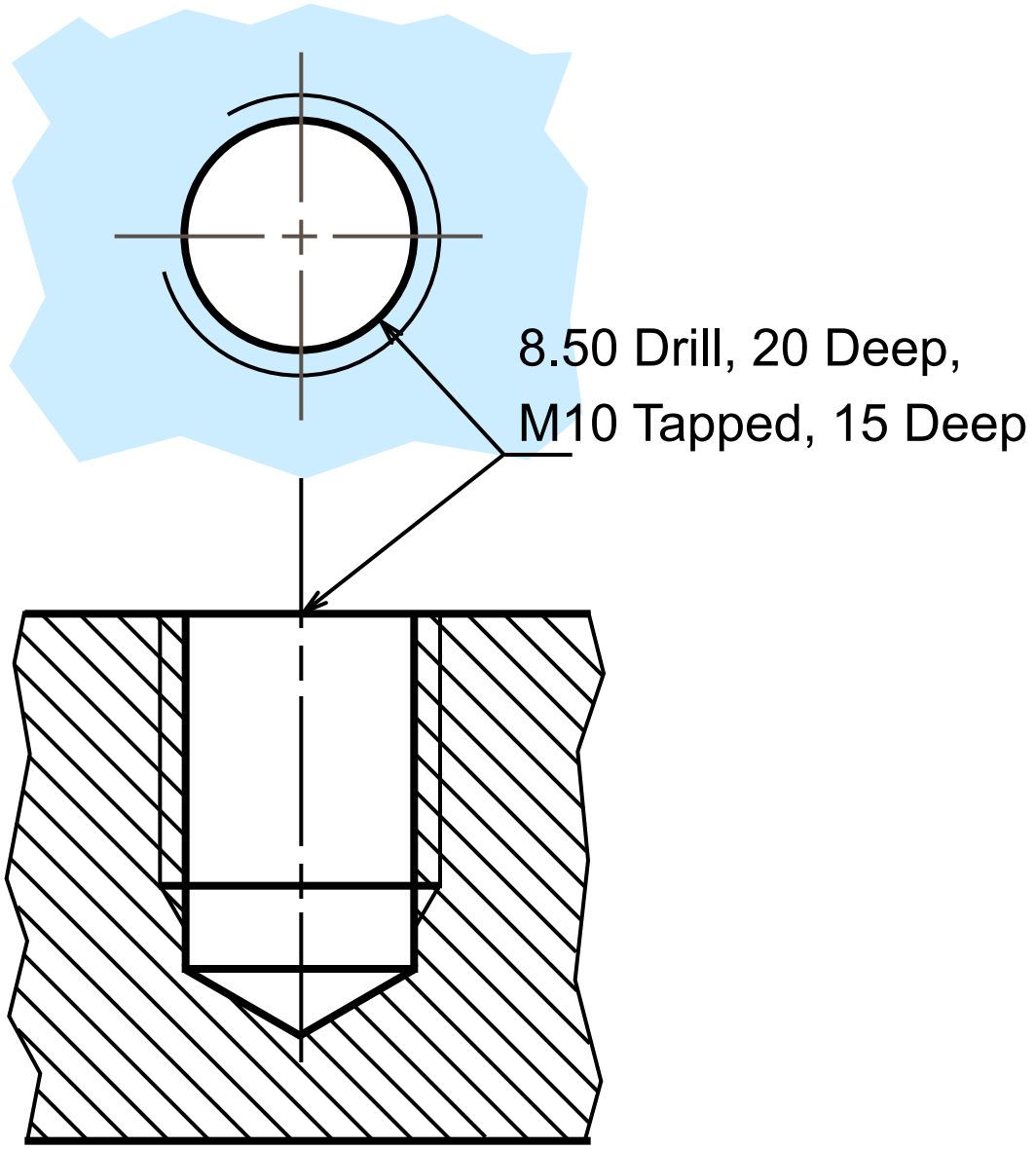
- Use ***local note*** to specify :- ***thread form***, ***nominal size***, ***pitch*** (if it is a fine thread)
- Use ***typical method*** to specify :- ***thread length***.



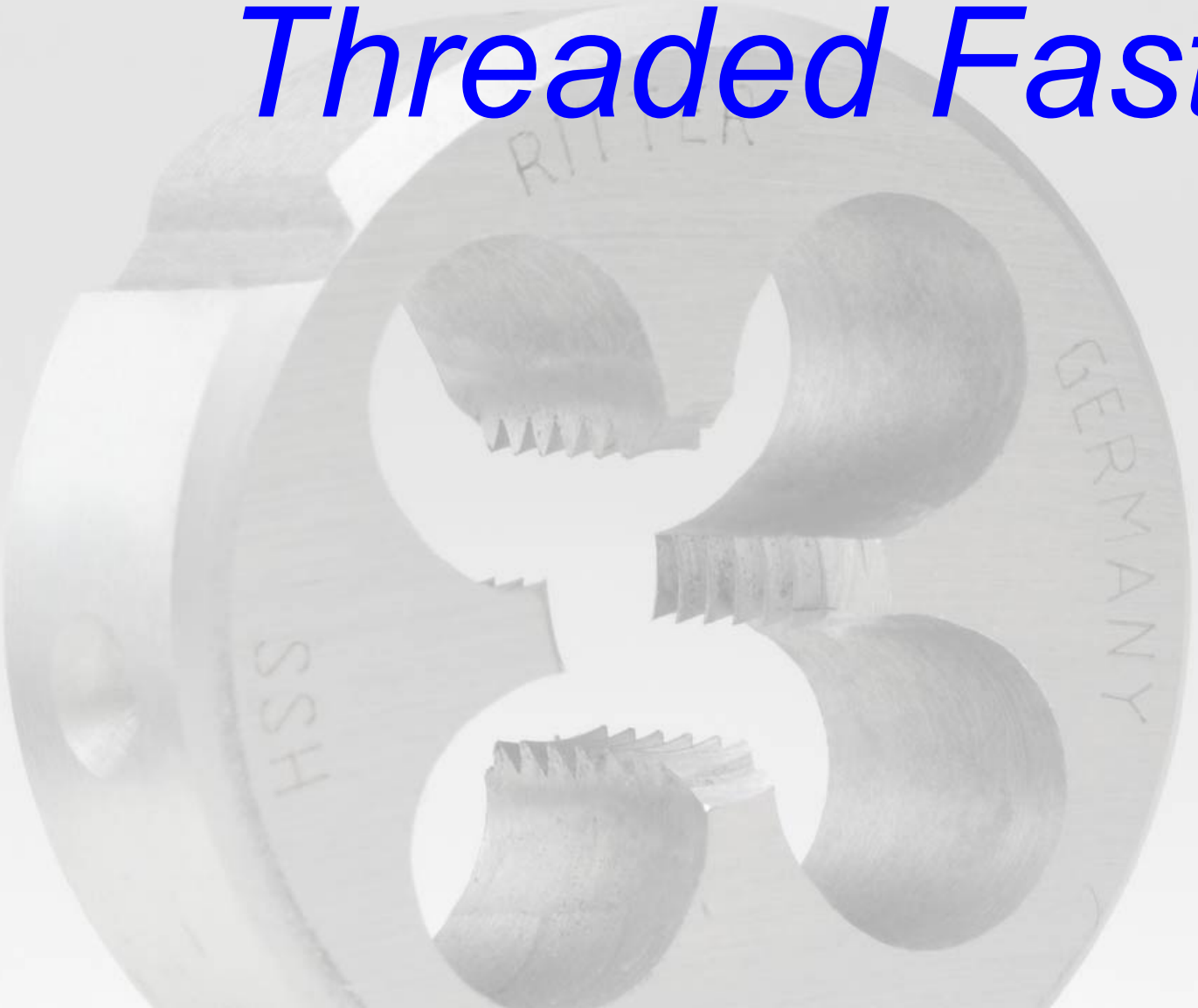
DIMENSIONING THREADED HOLE

Use ***local note*** to specify

1. Tap drill size
2. Drill depth
3. Thread form
4. Nominal size
5. Pitch
6. Thread depth



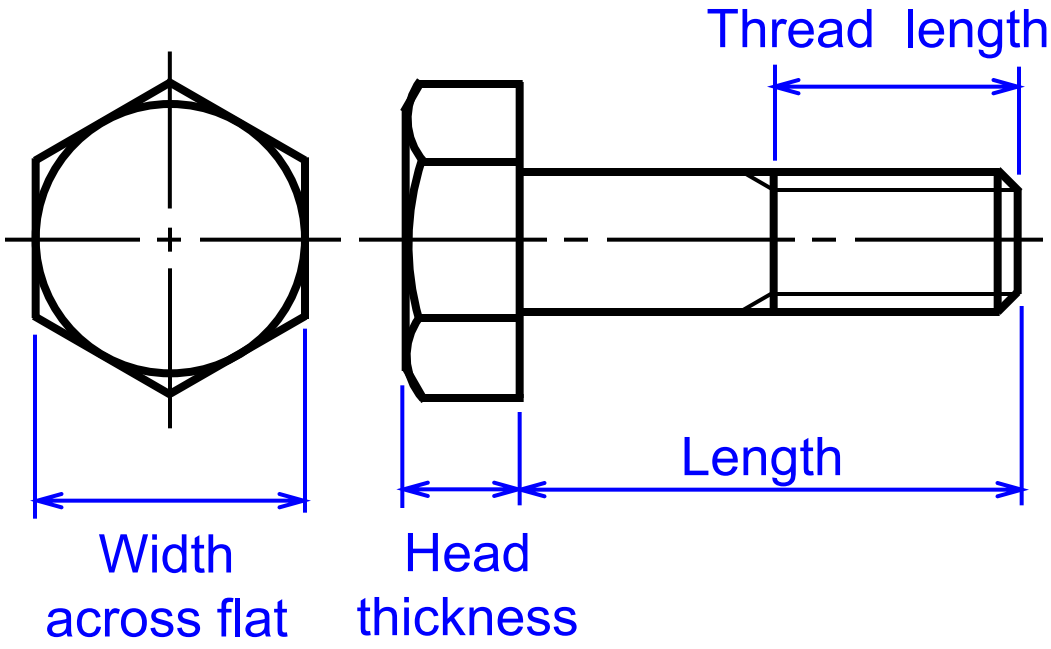
Threaded Fastener



BOLT : Terminology

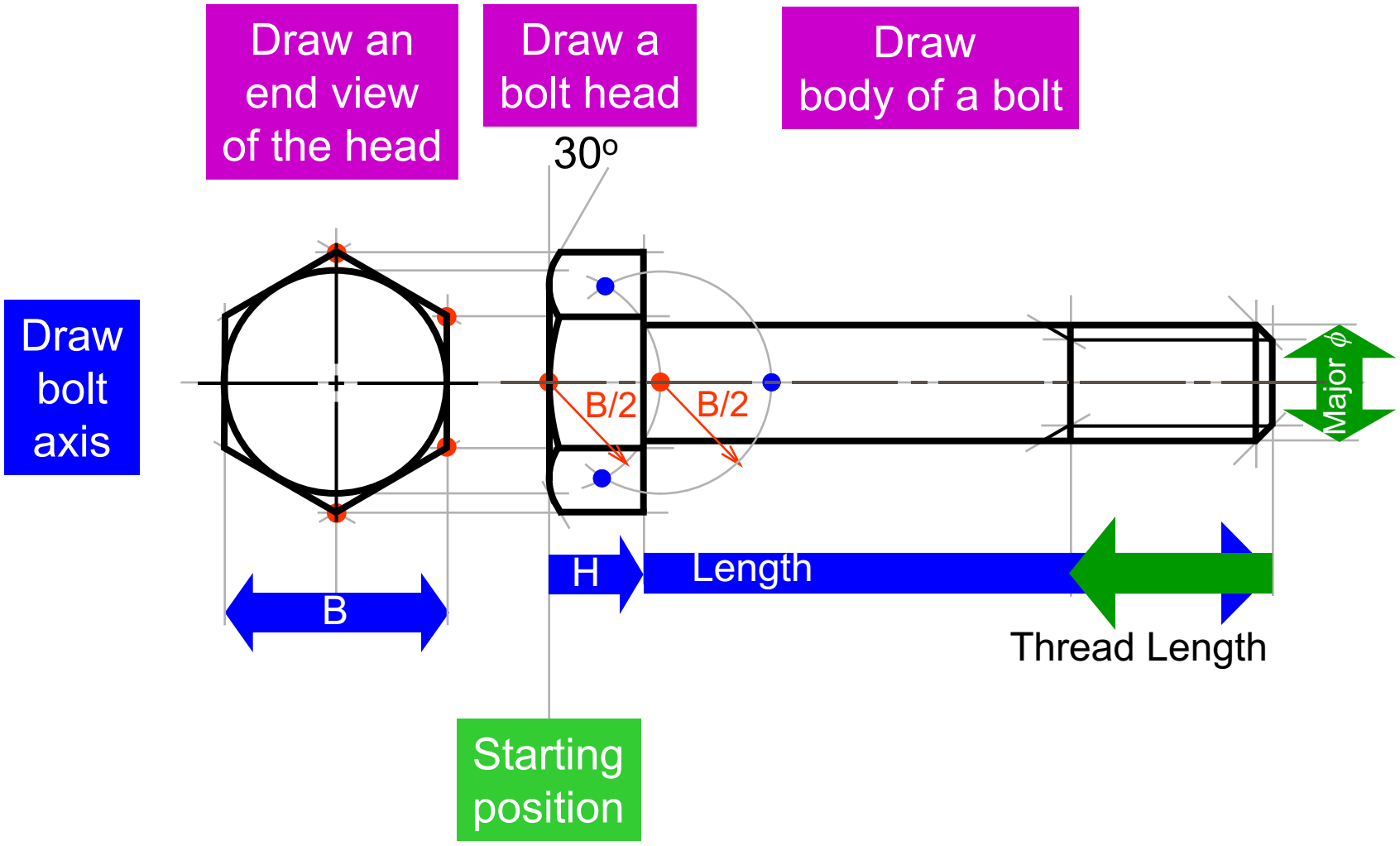
Bolt is a threaded cylinder with a head.

Hexagonal head bolt and nut



Dimensions of bolt's head are listed in table 9.4.

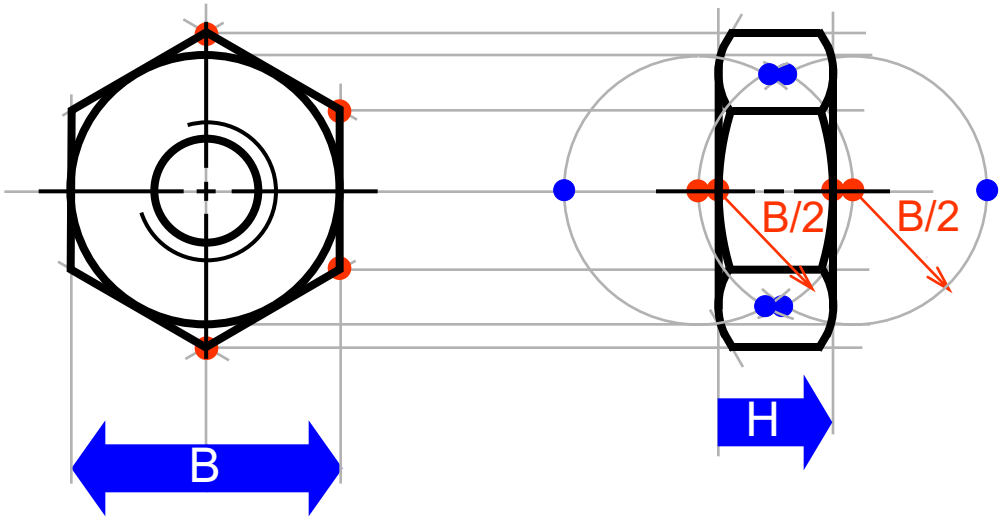
BOLT : Drawing steps



NUT : Drawing steps

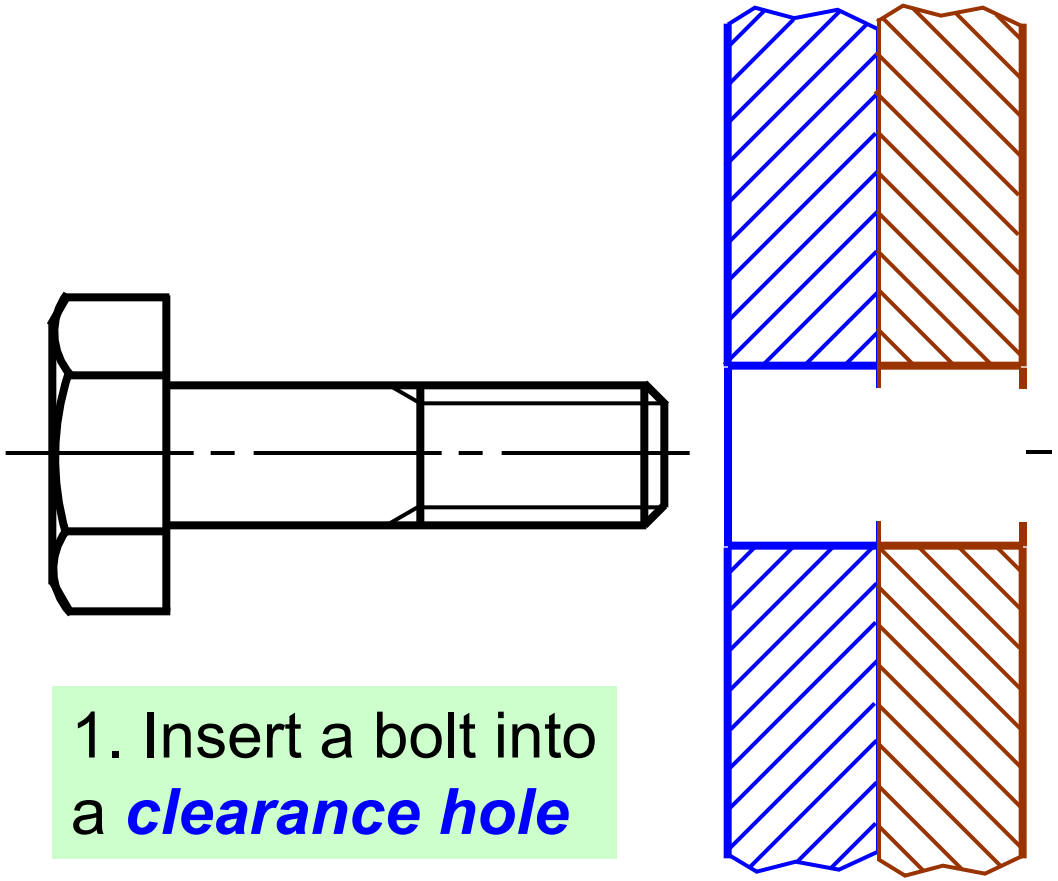
Dimensions of the nut are given in Table 9.14.

Draw an end view of the nut



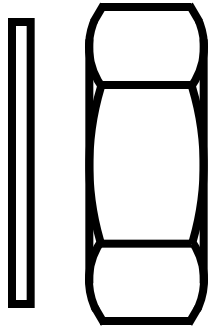
Dash lines represent a threaded hole are omitted for clarity.

BOLT : Application



1. Insert a bolt into a ***clearance hole***

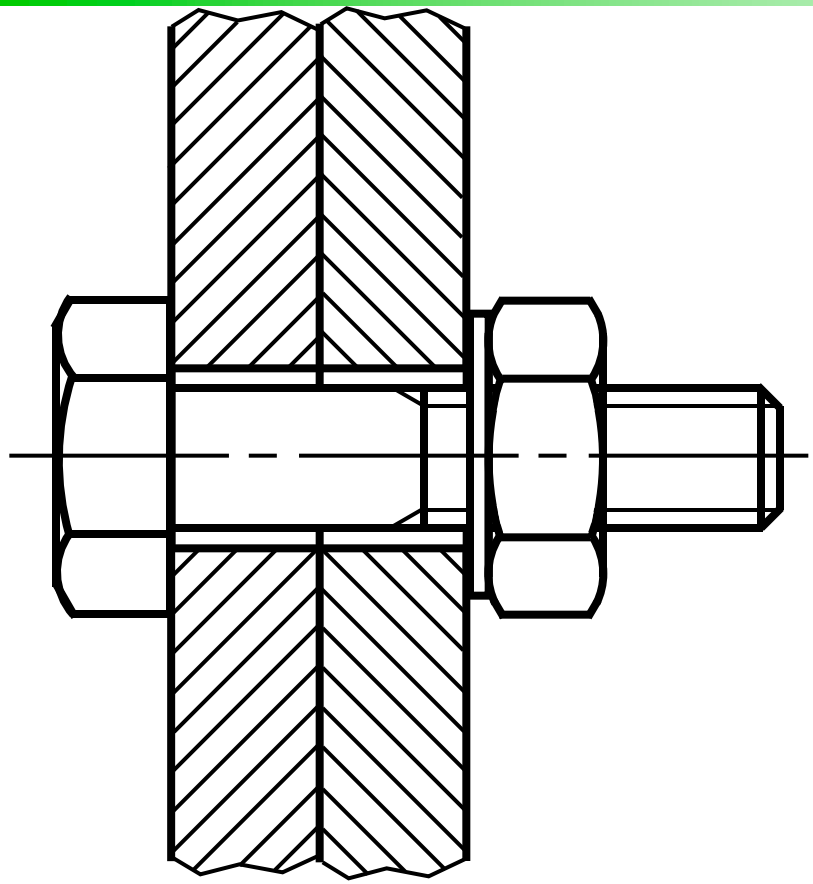
2. Insert a ***washer***.



3. Screw a ***nut***.

Let’ s think together…

- What do you think about the following suggestions for design ***improvement***?



(A) Nothing have to be changed.

(B) Use shorter bolt with the same thread length.

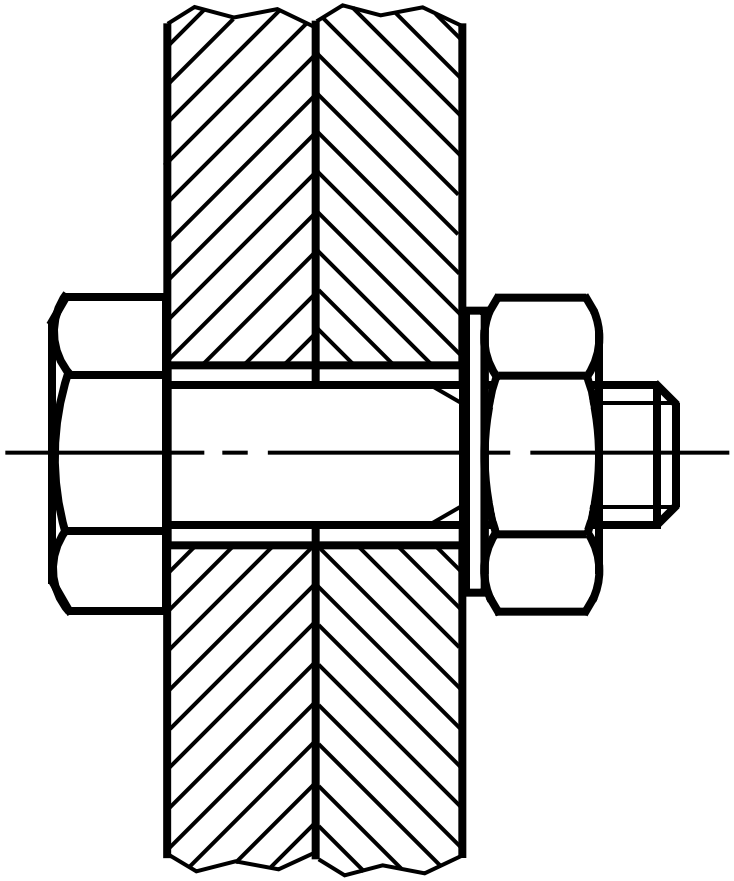
(C) Reduce the thread length.

(D) Add washer or nut.

Correct | Inappropriate | Wrong

Let’ s think together…

- What do you think about the following suggestions for design ***improvement***?



(A) Nothing have to be changed.

(B) Use a bolt of this length but has a longer thread length.

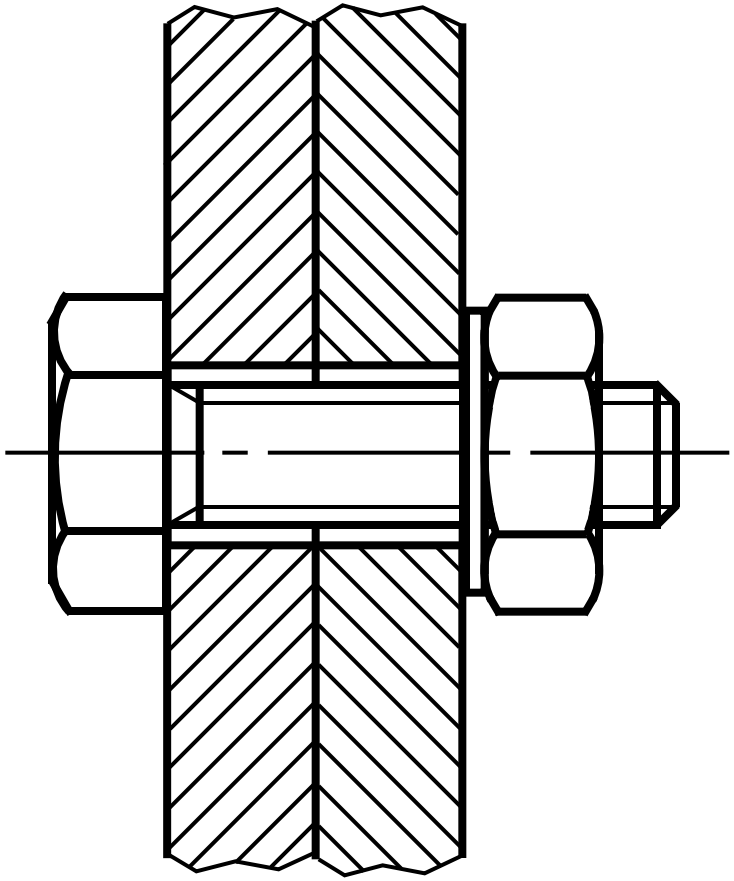
(C) Use a longer bolt with the same thread length.

(D) Add washer.

Correct | Inappropriate | Wrong

Let’ s think together…

- What do you think about the following suggestions for design ***improvement*** ?



(A) Nothing have to be changed.

(B) Use a bolt of this length but has a shorter thread length.

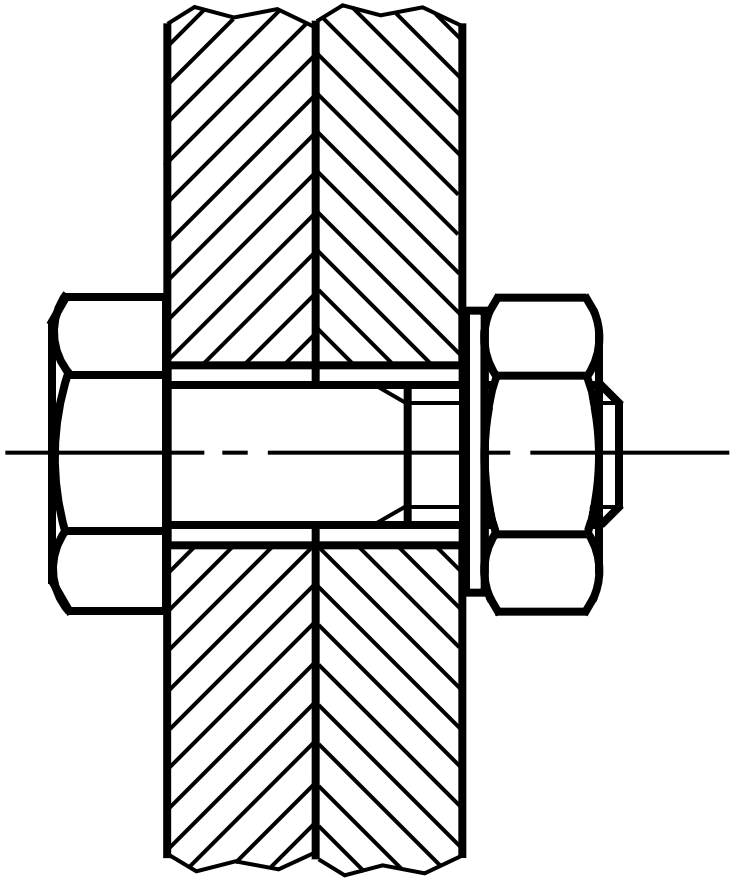
(C) Use a longer bolt with the same thread length.

(D) Add washer.

Correct | Inappropriate | Wrong

Let’ s think together…

- What do you think about the following suggestions for design ***improvement***?



(A) Use a bolt of this length but has a shorter thread length.

(B) Use a longer bolt with the same thread length.

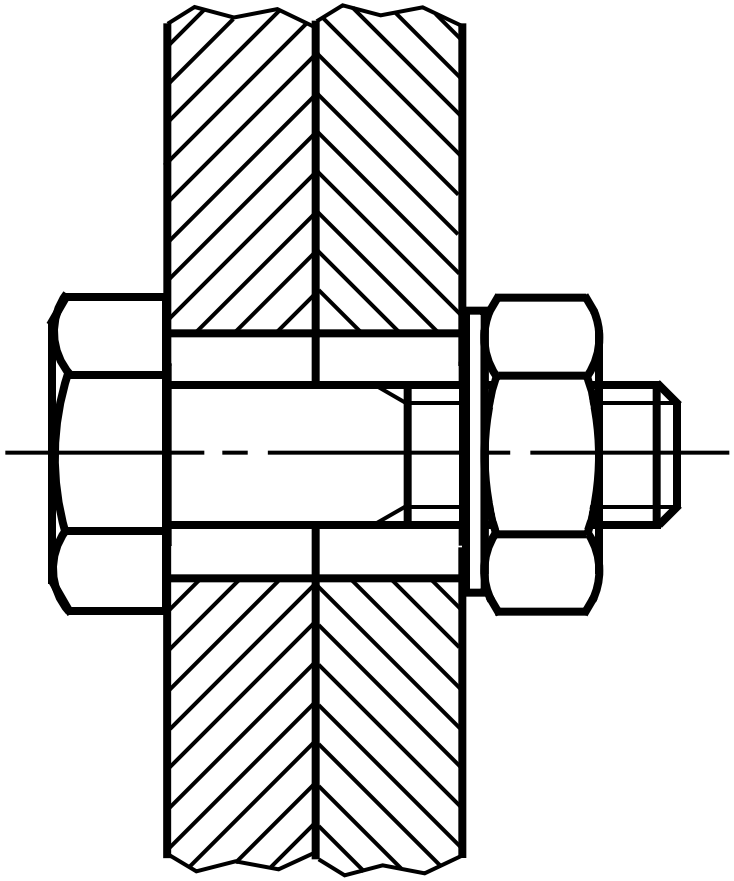
(C) Use a longer bolt by increasing a thread length

(D) Remove washer.

Correct | Inappropriate | Wrong

Let’ s think together…

- What do you think about the following suggestions for design ***improvement*** ?



(A) Increase the bolt diameter.

(B) Use washer with larger outside diameter.

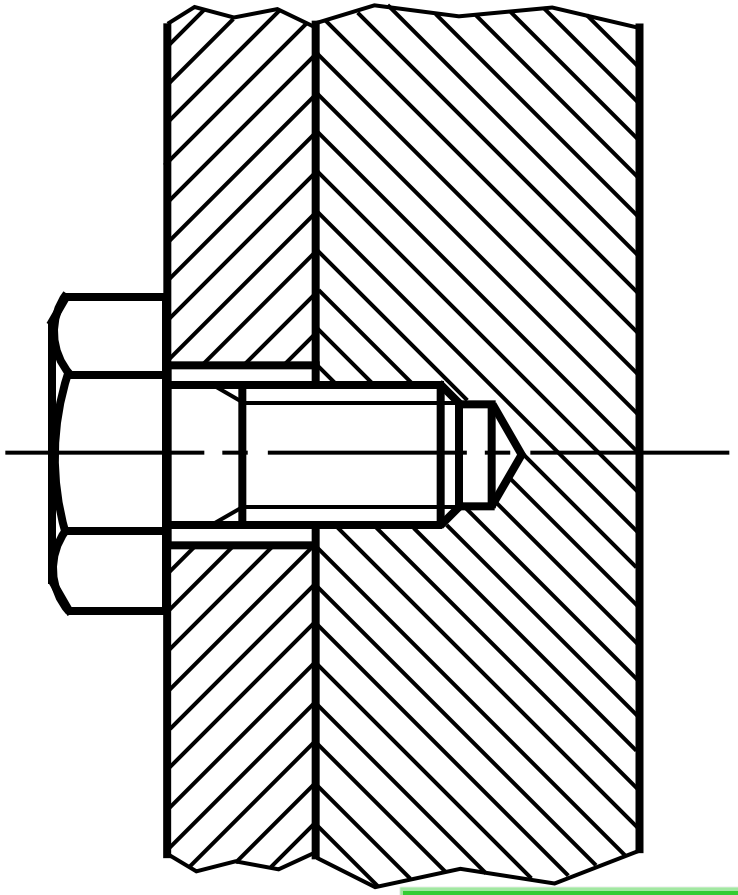
(C) Reduce the hole diameter.

(D) Add washer at bolt head.

Correct | Inappropriate | Wrong

Let’ s think together…

- What do you think about the following suggestions for design ***improvement*** ?



(A) Nothing have to be changed.

(B) Use a bolt with shorter thread length.

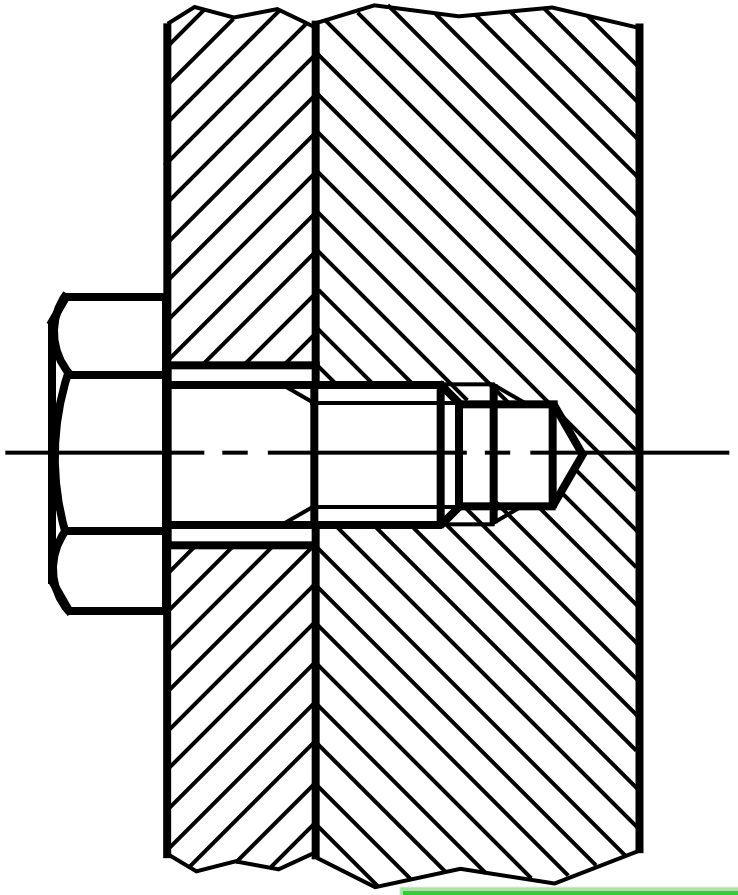
(C) Add washer.

(D) Increase drill and thread depths.

Correct | Inappropriate | Wrong

Let’ s think together…

- What do you think about the following suggestions for design ***improvement*** ?



(A) Nothing have to be changed.

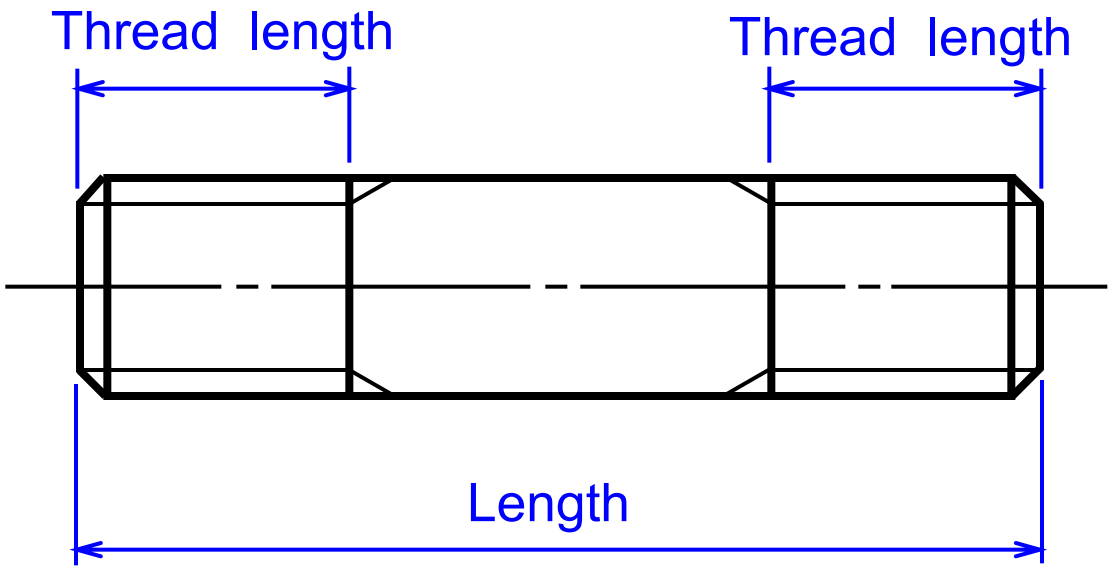
(B) Use a bolt with slightly longer thread length.

Correct | Inappropriate | Wrong

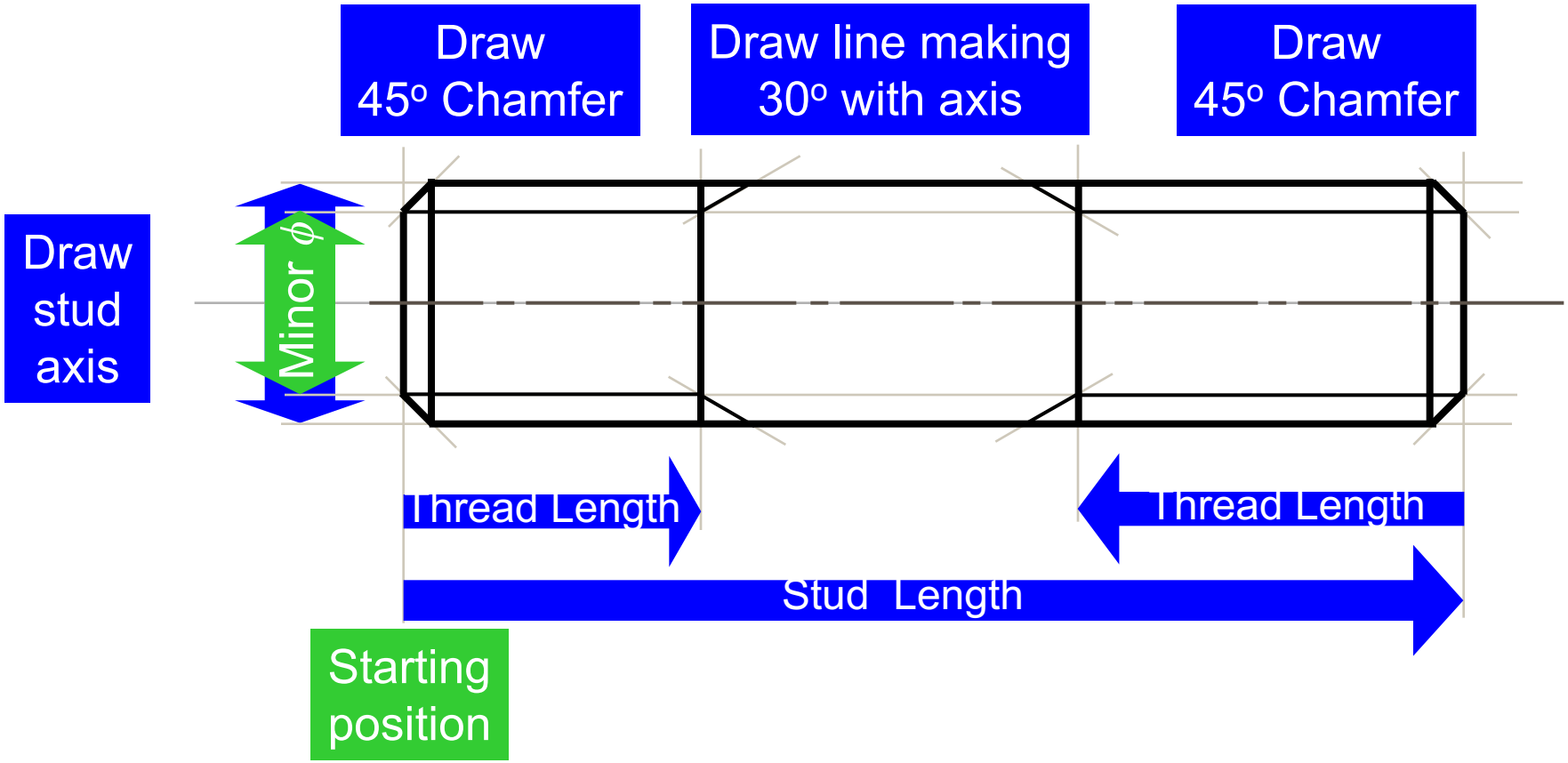
STUD : Terminology

Stud is a *headless* bolt, threaded at both ends.

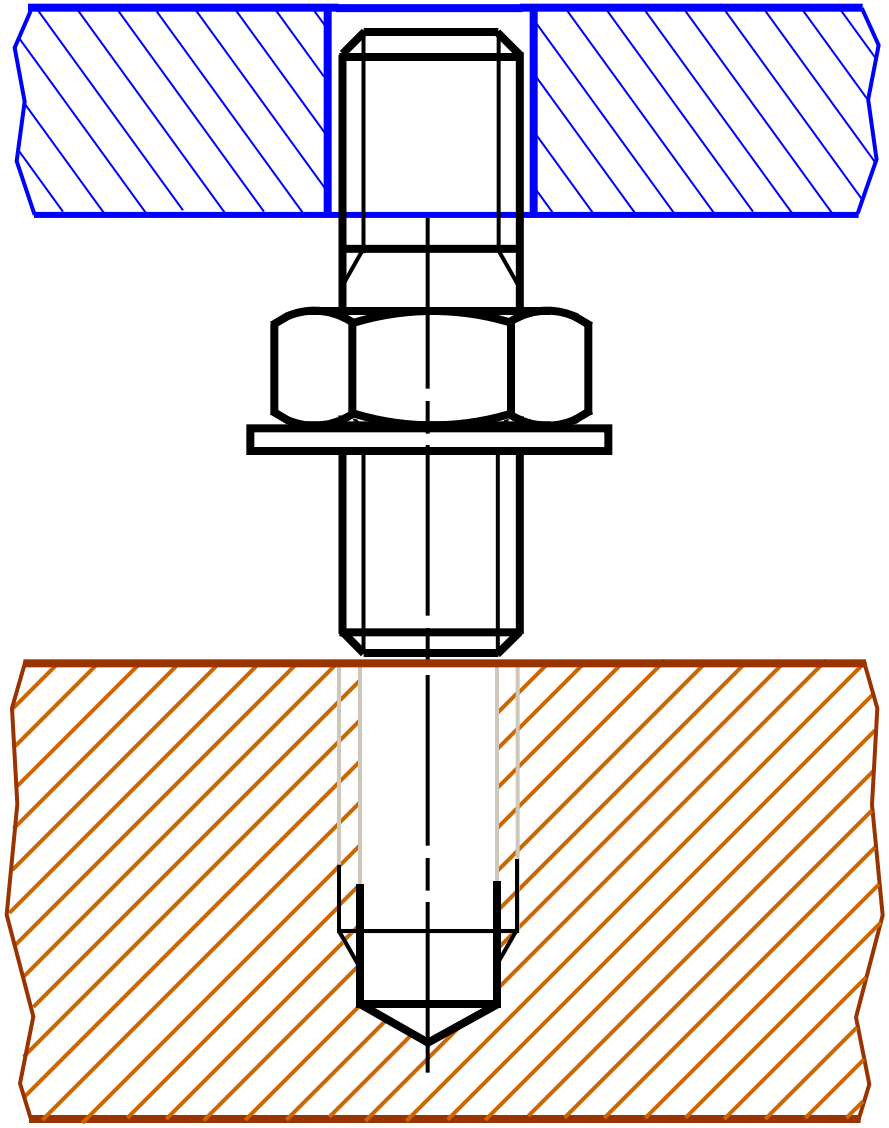
Drawing representation



STUD : Drawing steps



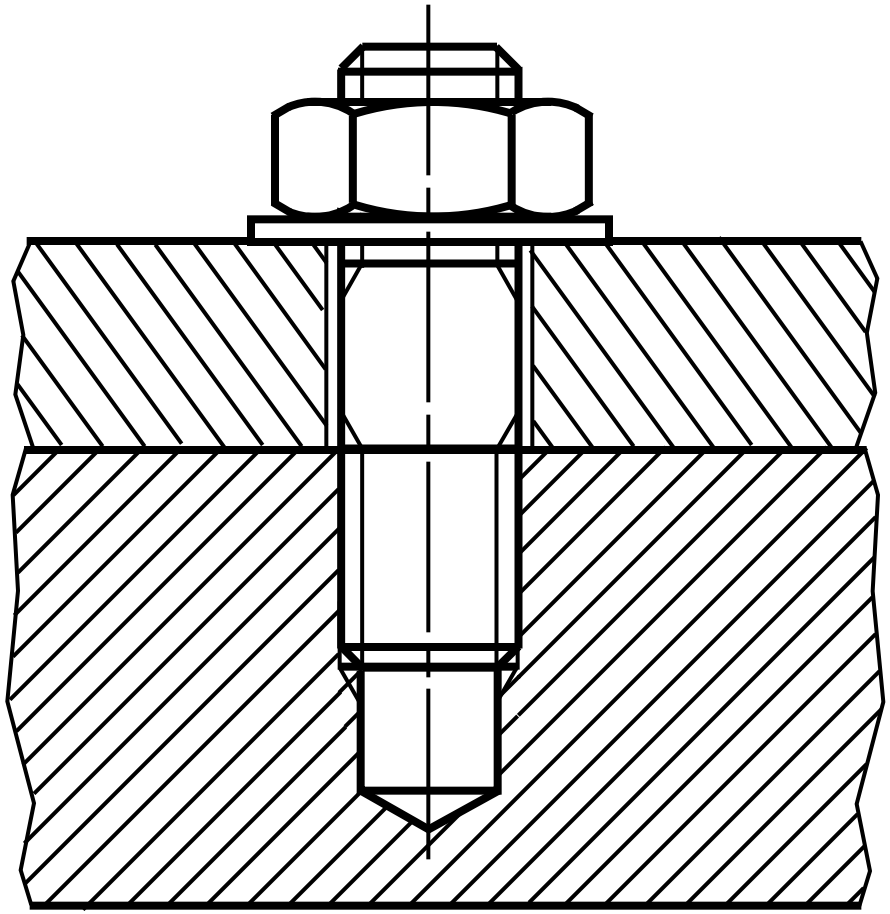
STUD : Application



1. Drill a hole.
2. Tap a hole.
3. Screw a stud.
4. Place the part to be fastened.
5. Insert washer and fastened a nut.

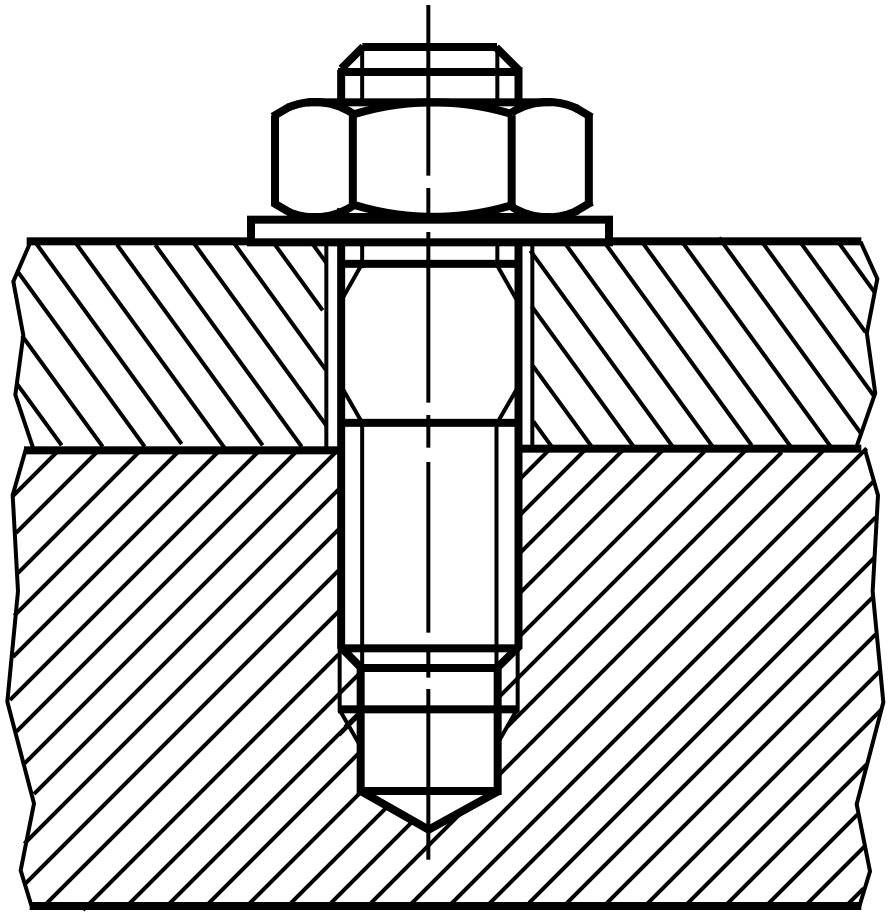
Let’ s think together…

- What is the mistake in the following use of stud ?



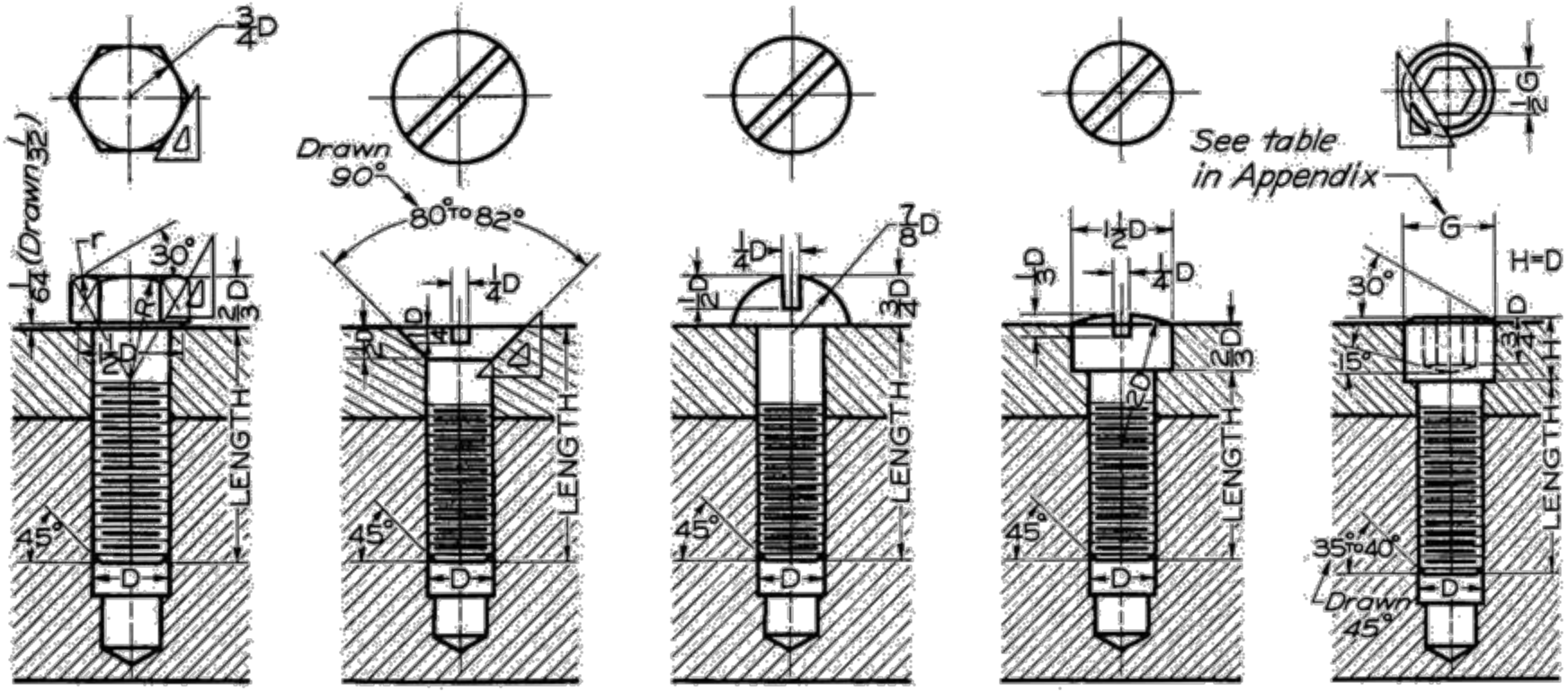
Let’ s think together…

- What is the mistake in the following use of stud ?

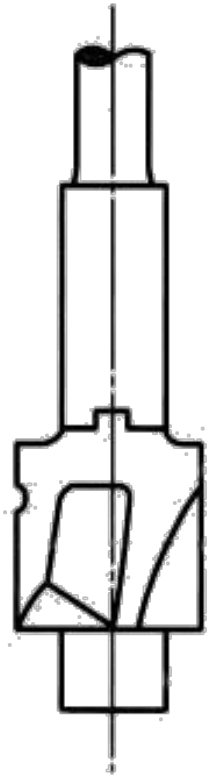


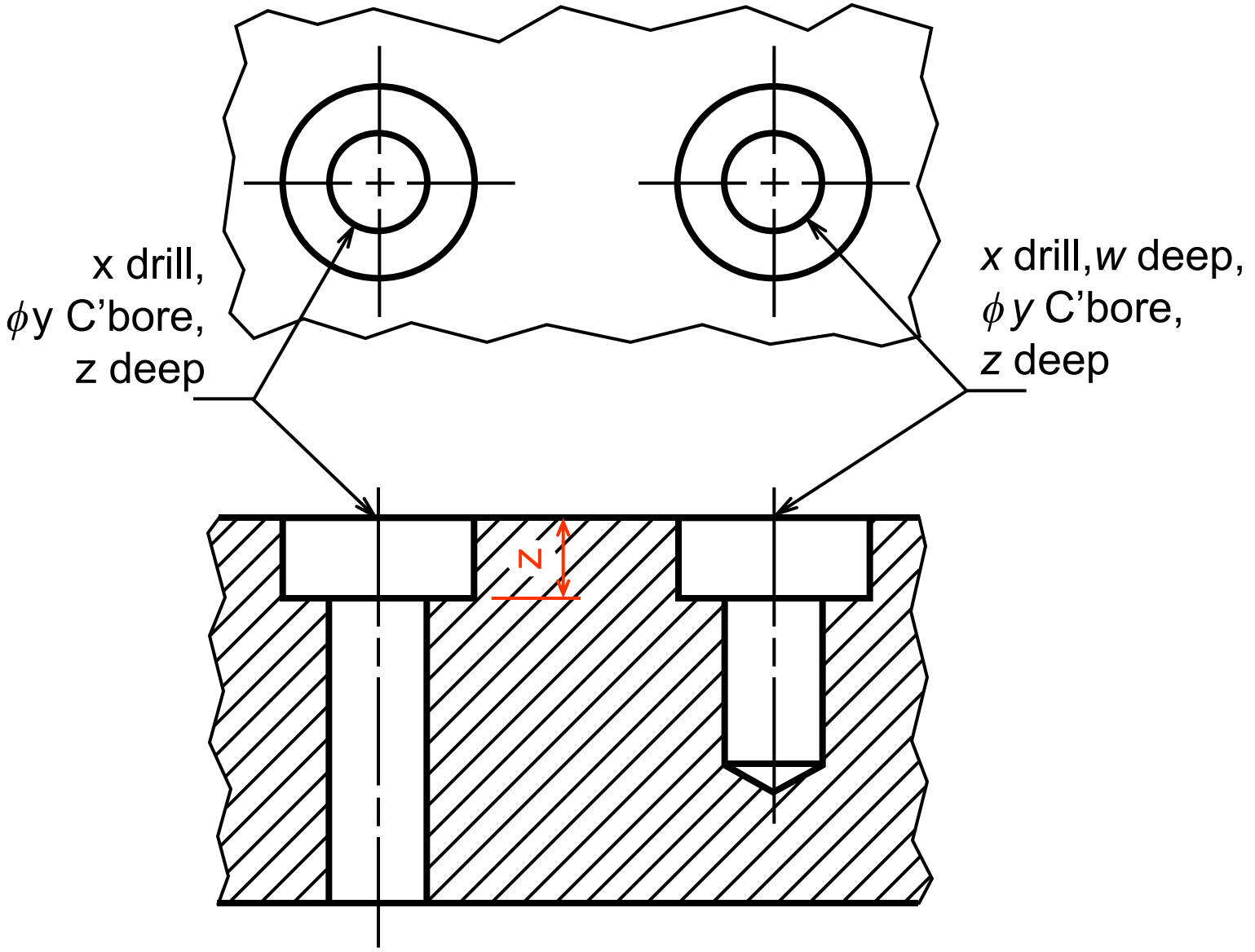
CAP SCREW : Terminology

Cap screw is similar to bolt, but has a longer thread than a bolt.

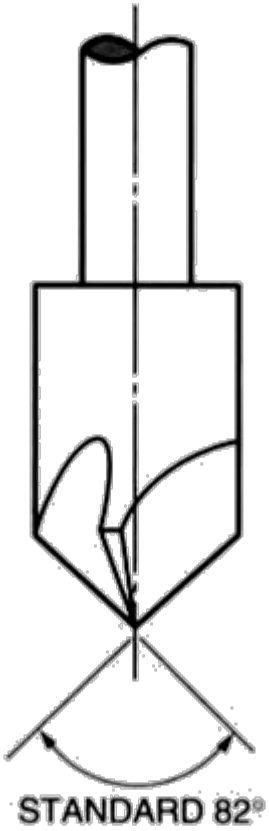


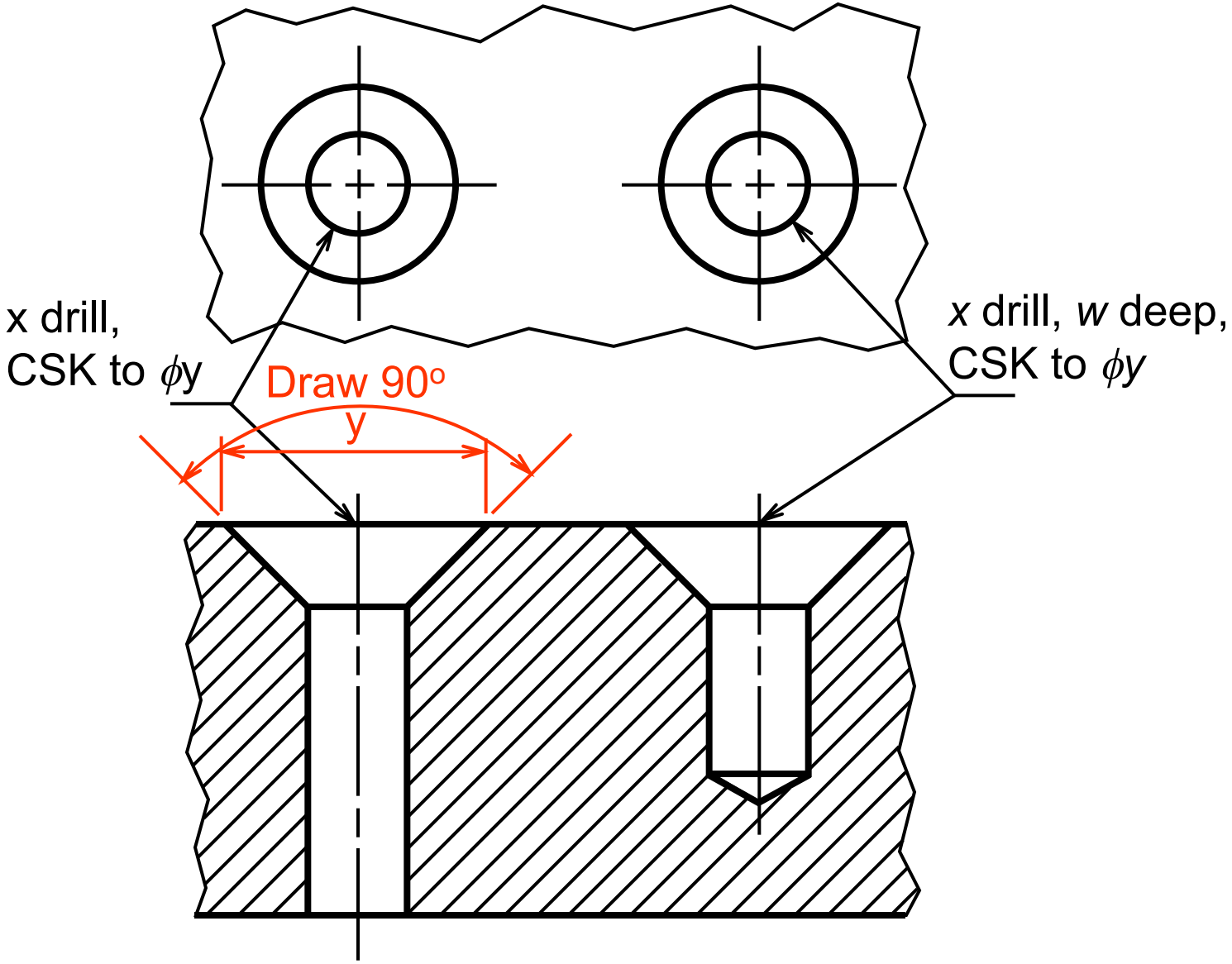
CAP SCREW : Counterbore hole





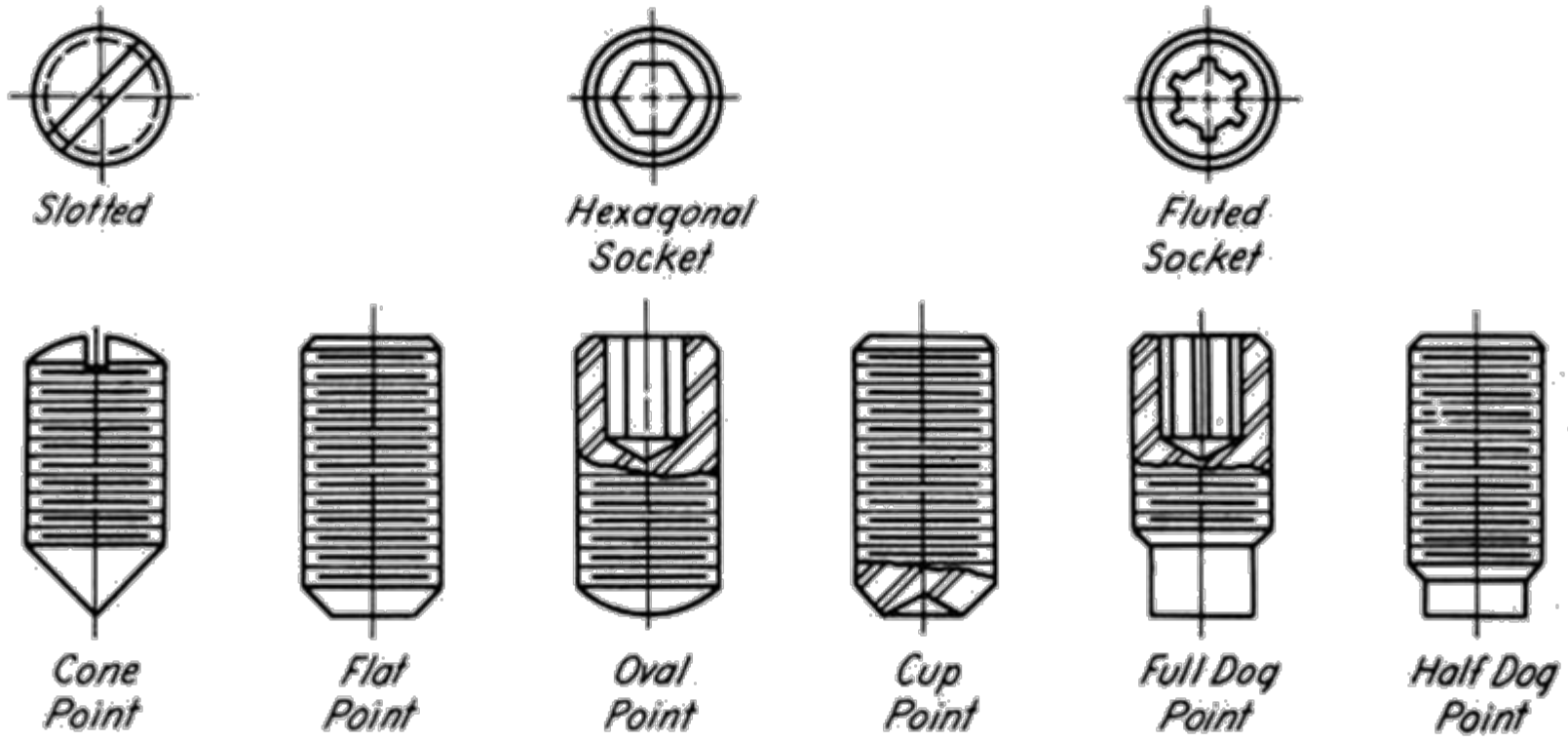
CAP SCREW : Countersink hole





SET SCREW : Terminology

Set screw is a threaded cylinder used to prevent rotation or movement between parts.



SET SCREW : Application