

Chapter 11

Threaded Fasteners



TOPICS

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

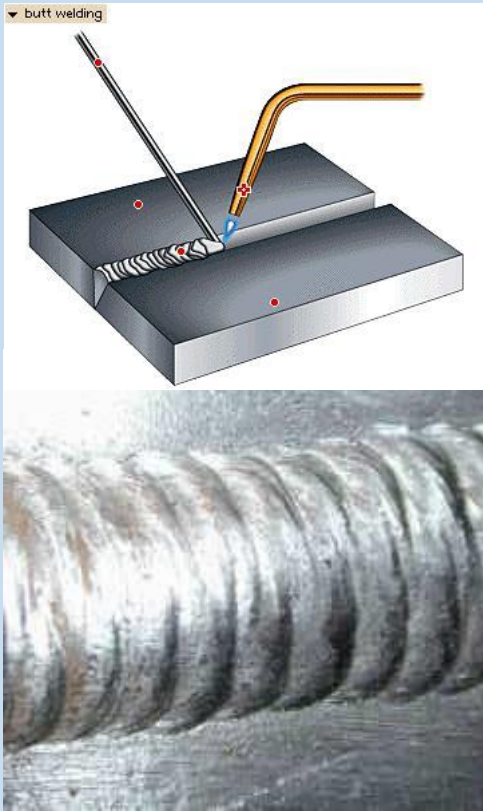
Introduction



FASTENING TYPE

1. Permanent

Welding



Gluing



Riveting



FASTENING TYPE

2. Temporary

2.1 *Threaded fastener*

- bolts
- studs
- screws



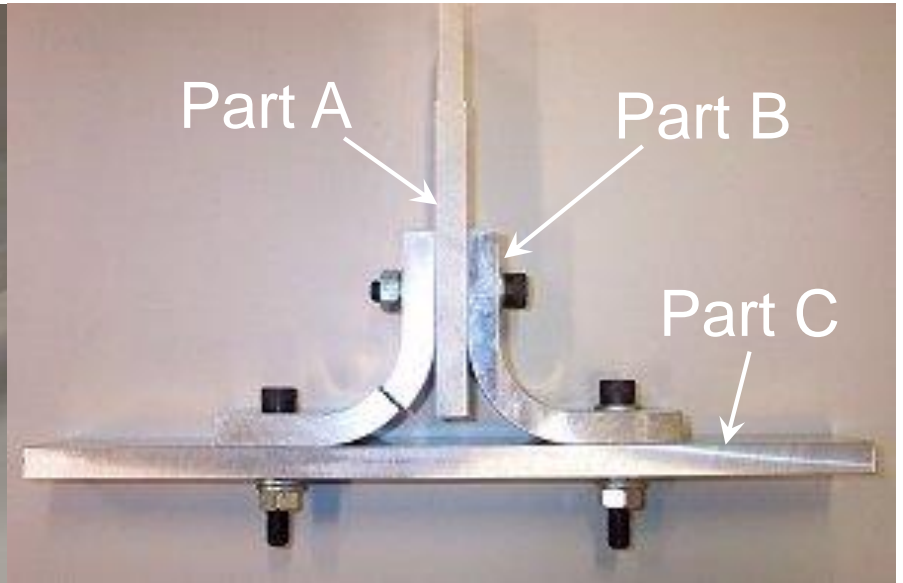
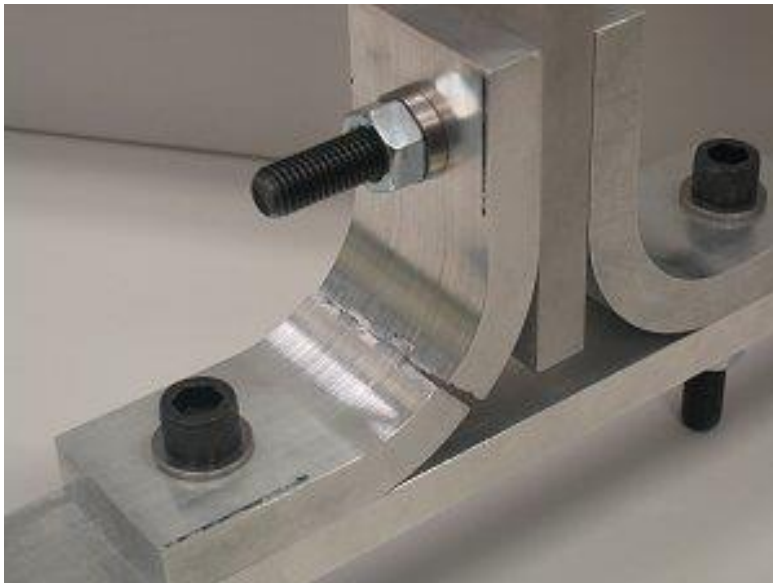
2.2 *Non-threaded fastener*

- 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***

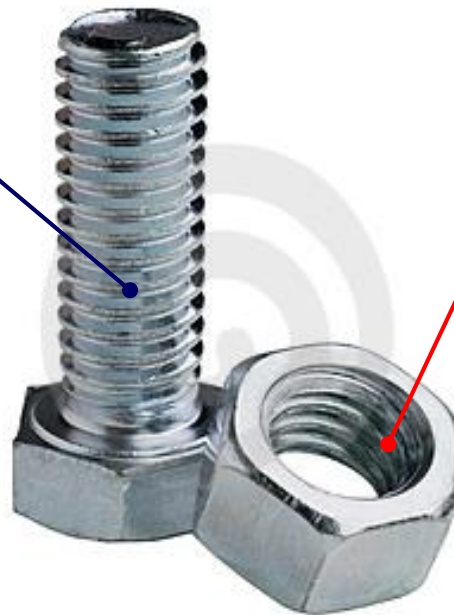
A thread cut on the **outside** of a cylindrical body.

***Internal (female)
thread***

A thread cut on the **inside** of a cylindrical body.

External thread

Internal thread



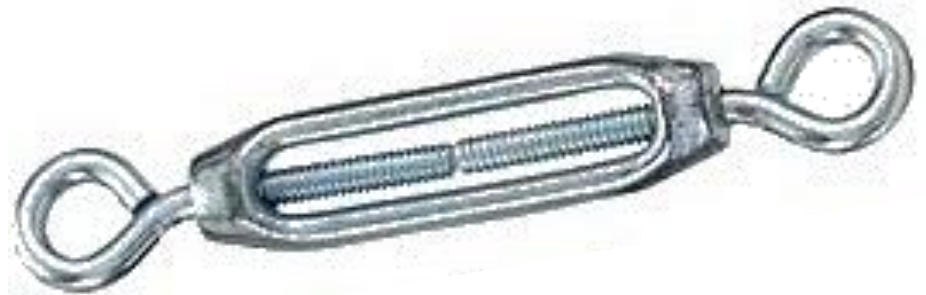
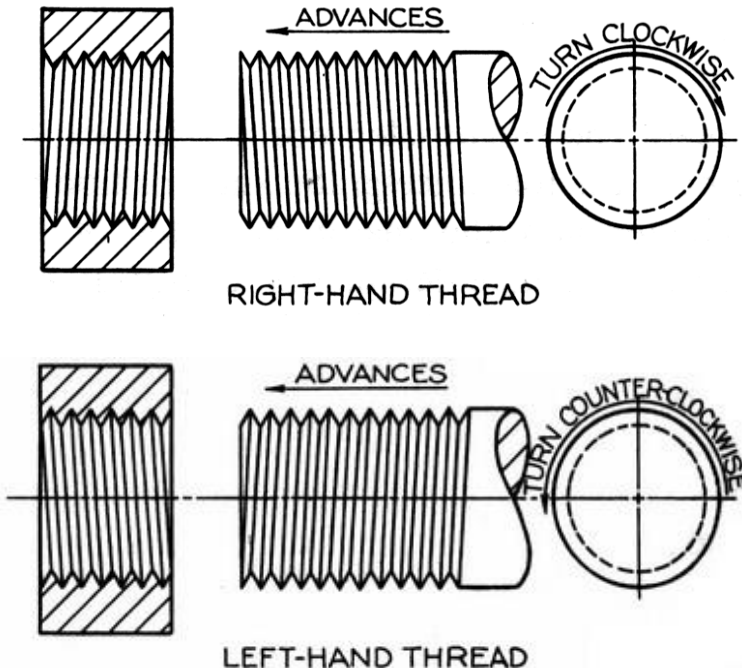
THREAD TERMINOLOGY

**Right-hand
thread**

Thread that will *assemble* when turned *clockwise*.

**Left-hand
thread**

Thread that will *assemble* when turned *counter-clockwise*.



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

THREAD TERMINOLOGY

Crest

The ***peak edge*** of a thread.

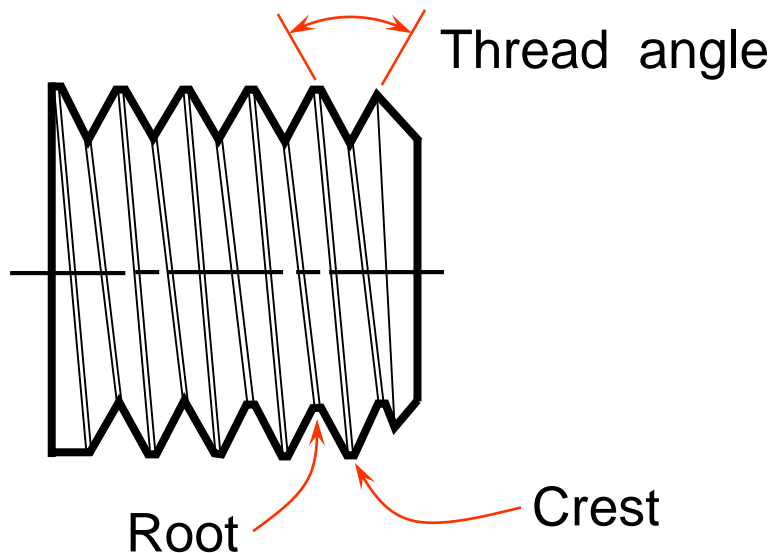
Root

The ***bottom*** of the thread cut into a cylindrical body.

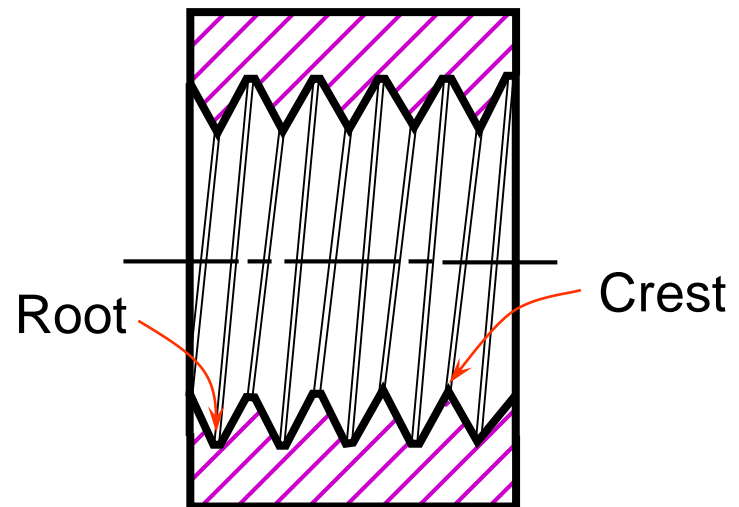
Thread angle

The angle between threads faces.

External Thread



Internal Thread



THREAD TERMINOLOGY

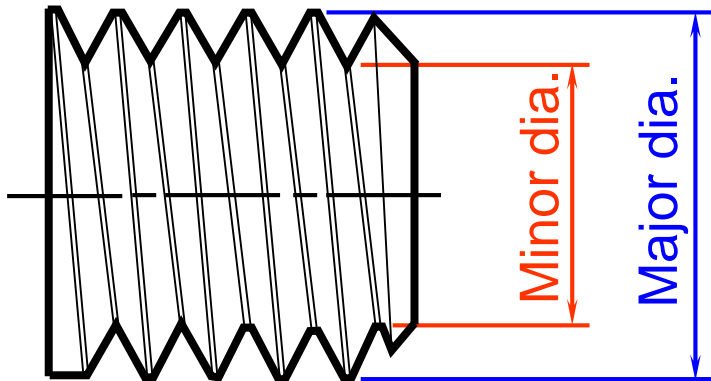
Major diameter

The ***largest diameter*** on an internal or external thread.

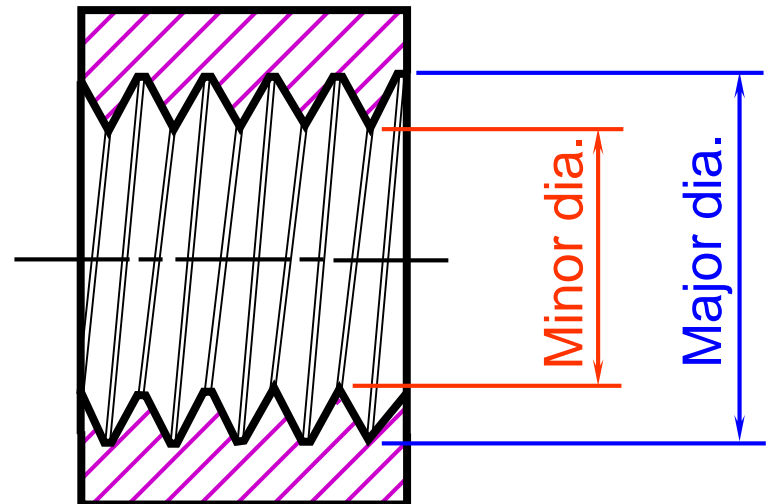
Minor diameter

The ***smallest diameter*** on an internal or external thread.

External Thread



Internal Thread



THREAD TERMINOLOGY

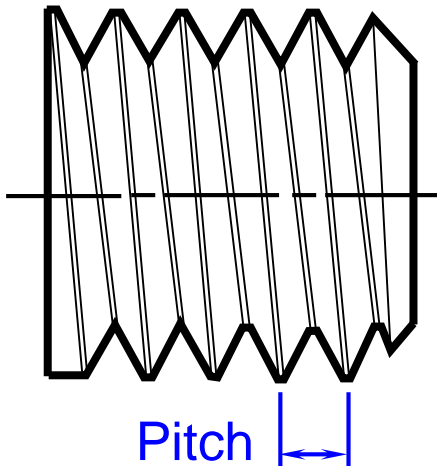
Pitch

The distance between crests of threads.

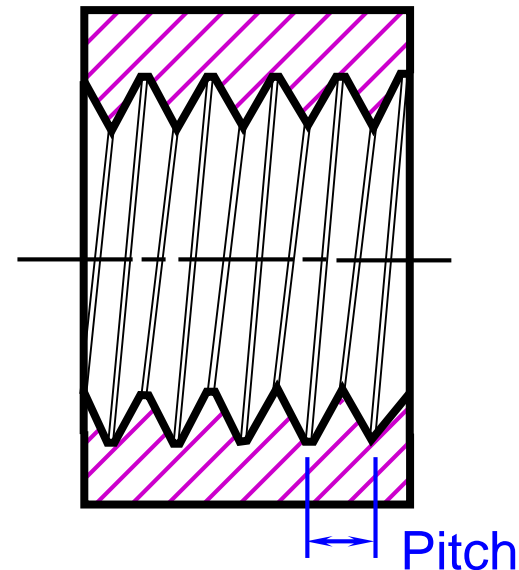
Lead

The distance a screw will advance when turned 360°.

External Thread



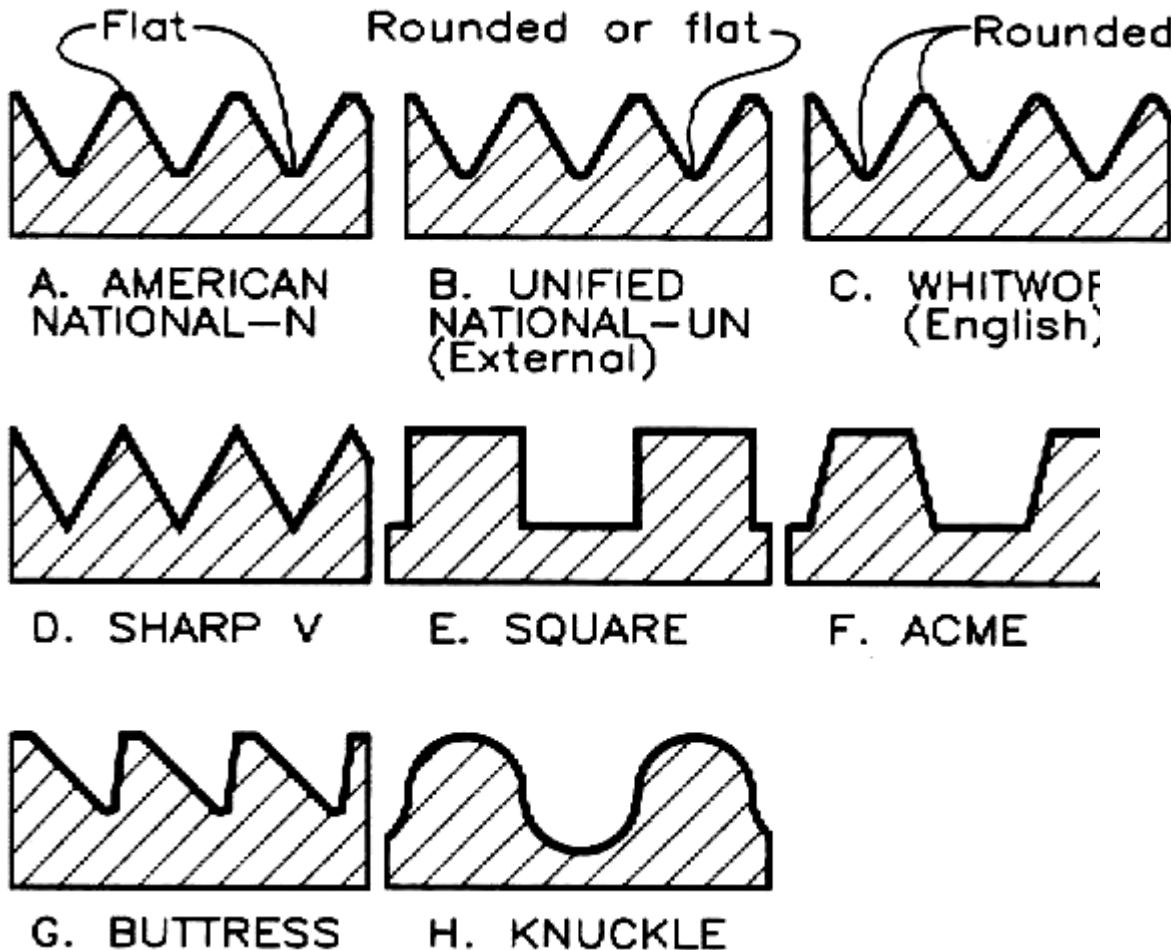
Internal Thread



THREAD TERMINOLOGY

Thread Form

Form is the profile shape of the thread.



Example :

“knuckle thread form”



EXTERNAL THREAD CUTTING

Tools

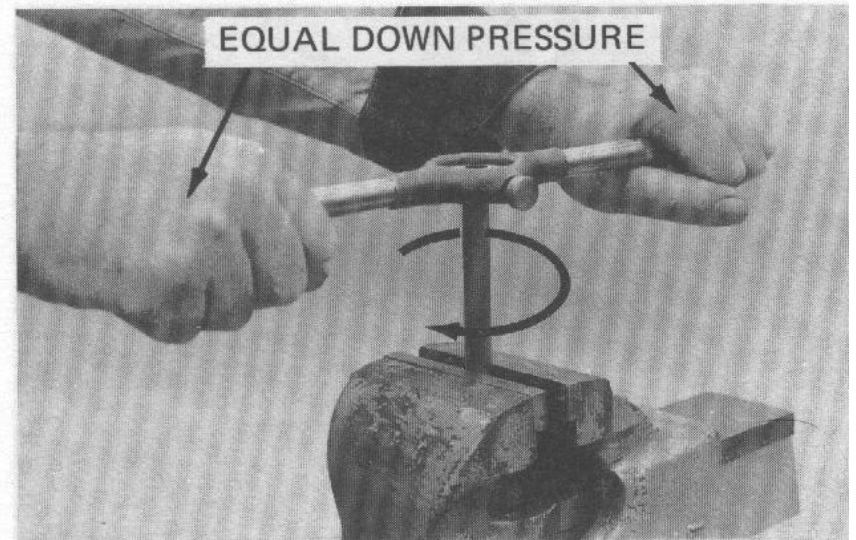
- Threading Die



- Die stock



Operation



INTERNAL THREAD CUTTING

Tools

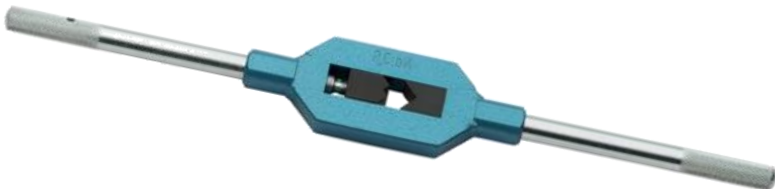
- Twist drill



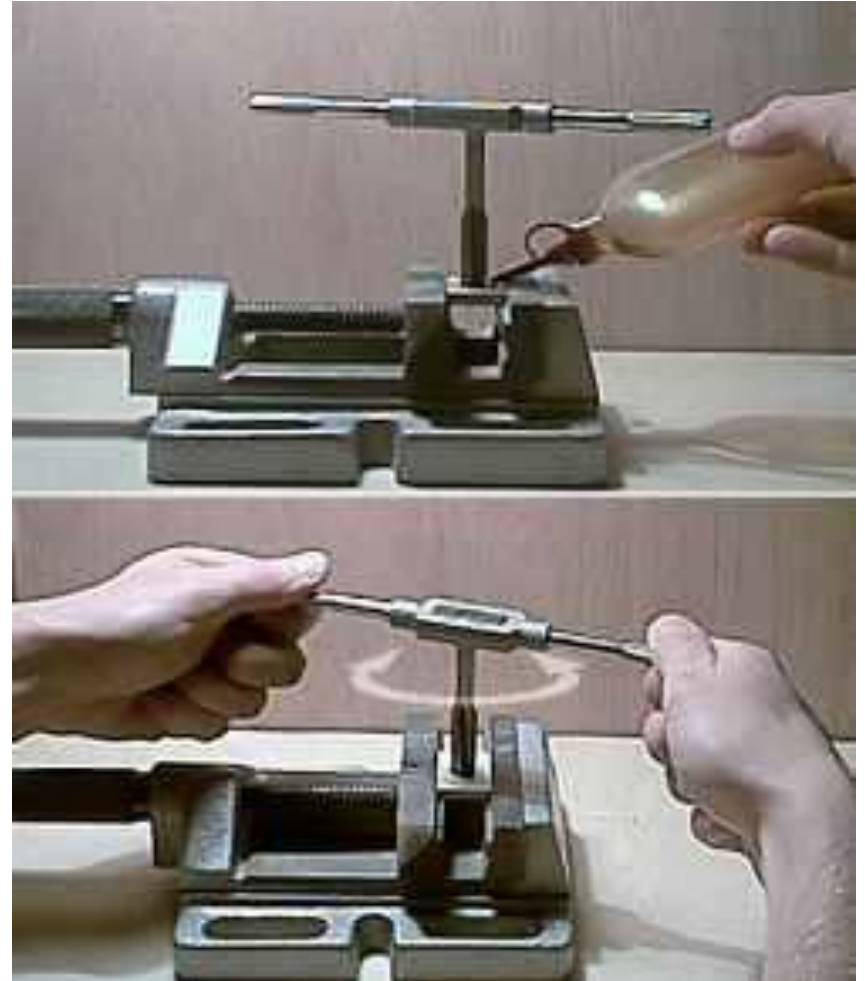
- Tap



- Tap wrench

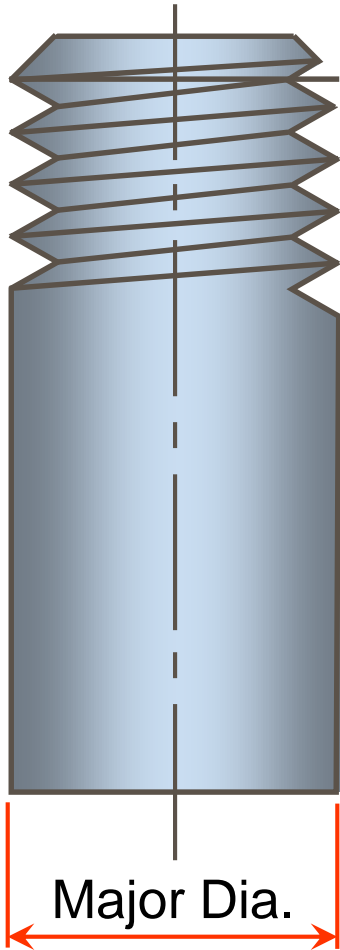


Operation

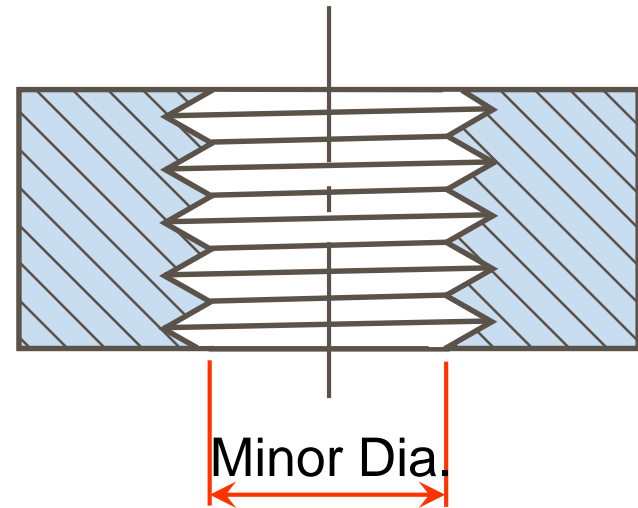


COMPARISON OF THREAD CUTTING

External Thread



Internal Thread





Thread Drawing

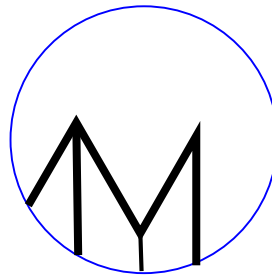
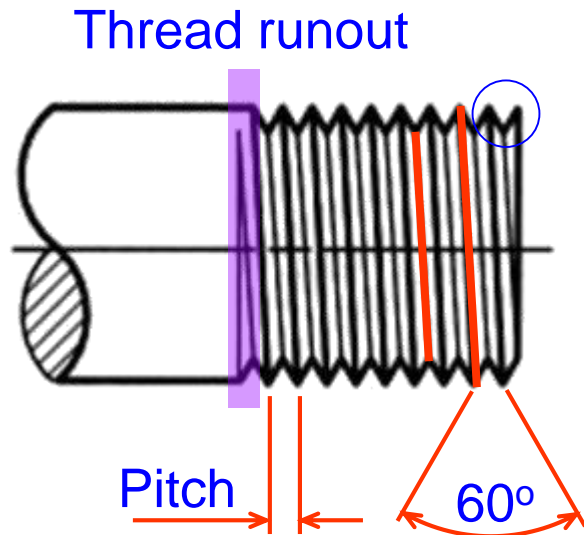
THREAD REPRESENTATION

1. ***Detailed*** representation
2. ***Schematic*** representation
3. ***Simplified*** representation

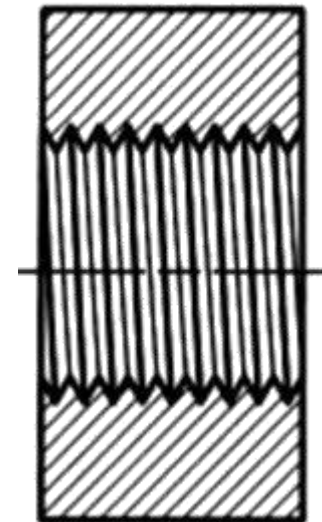
DETAILED REPRESENTATION

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

External thread



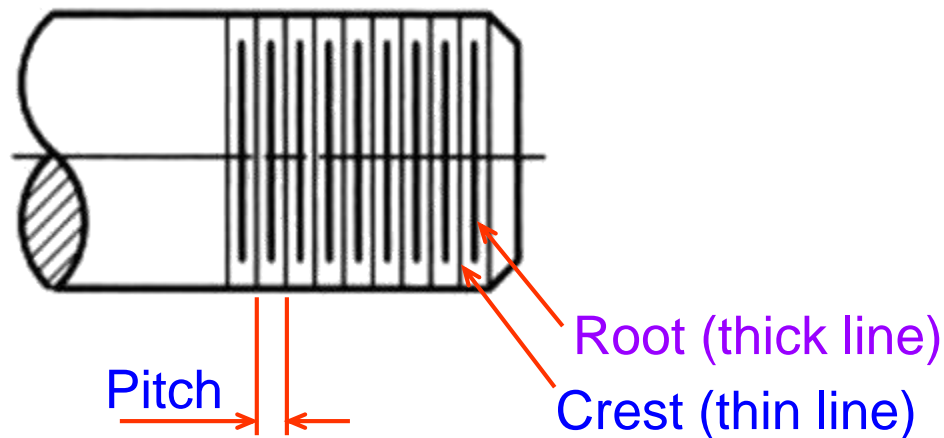
Internal thread



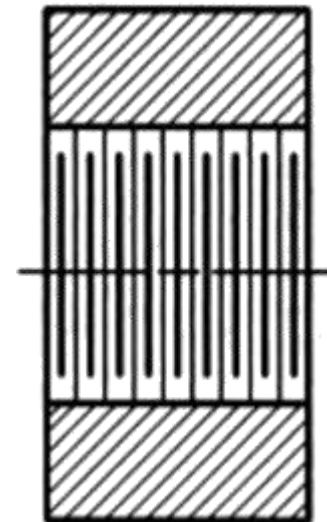
SCHEMATIC REPRESENTATION

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

External thread



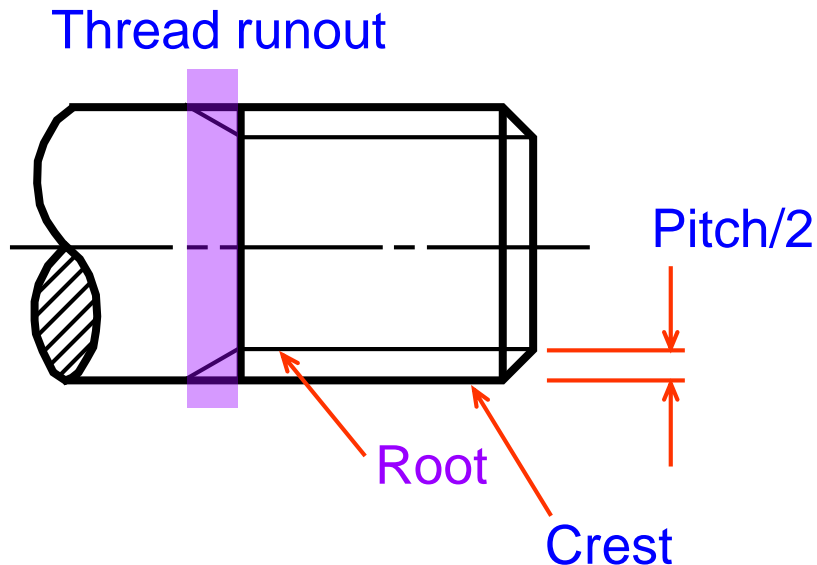
Internal thread



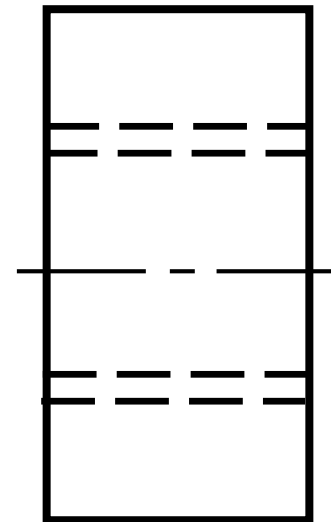
SIMPLIFIED REPRESENTATION

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

External thread



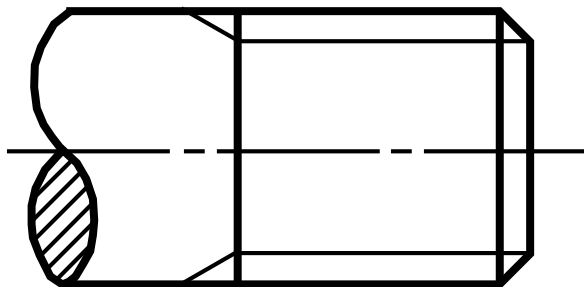
Internal thread



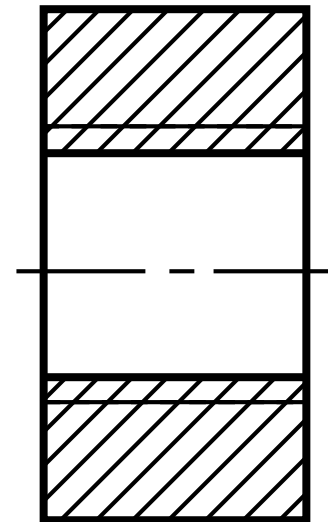
SIMPLIFIED REPRESENTATION

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

External thread

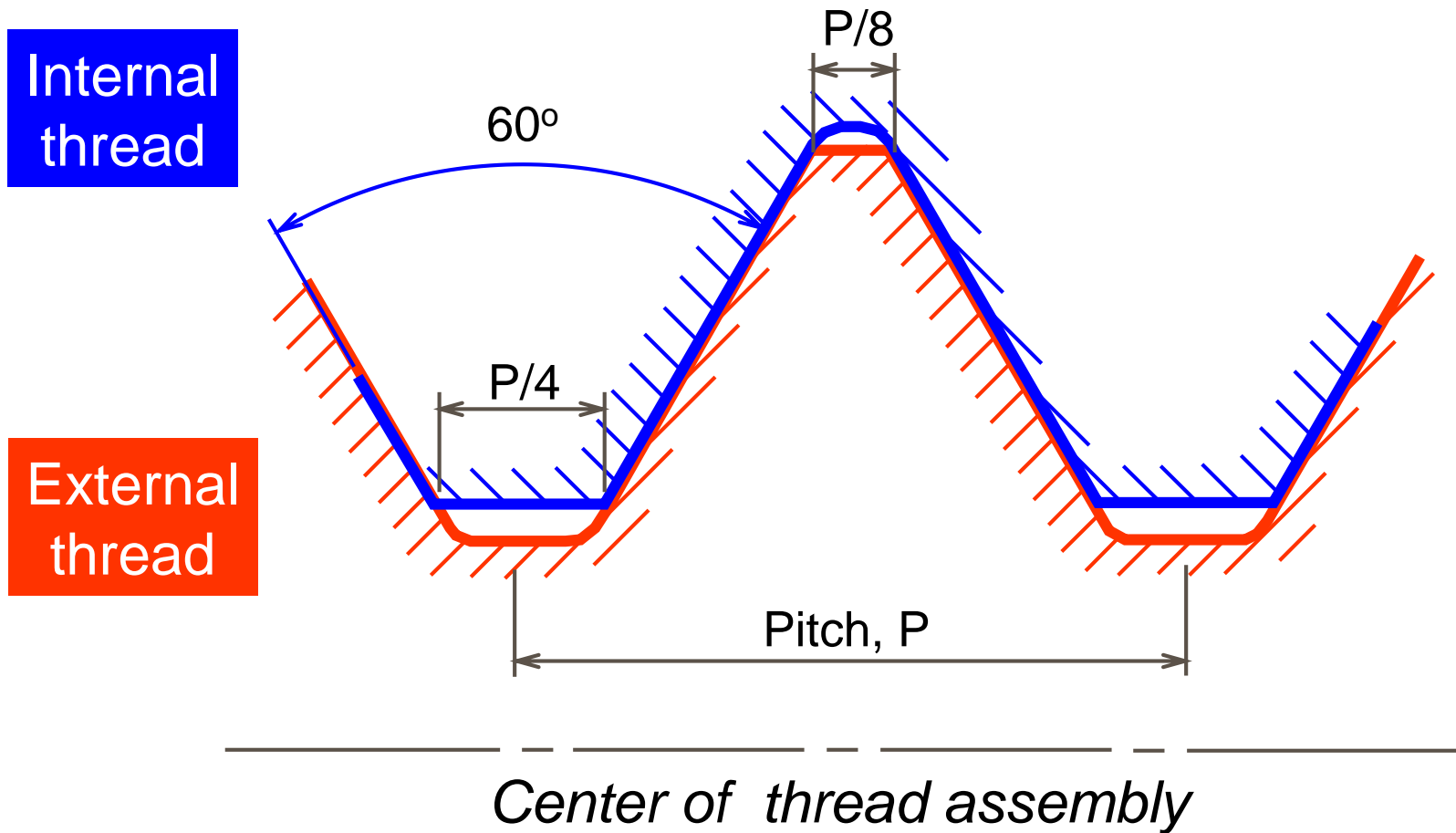


Internal thread



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 \approx Tap drill size

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

$$\text{Minor diameter} = \text{Major diameter} - \text{Pitch}$$

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 \approx Tap drill size

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

$$\text{Minor diameter} = \text{Major diameter} - \text{Pitch}$$

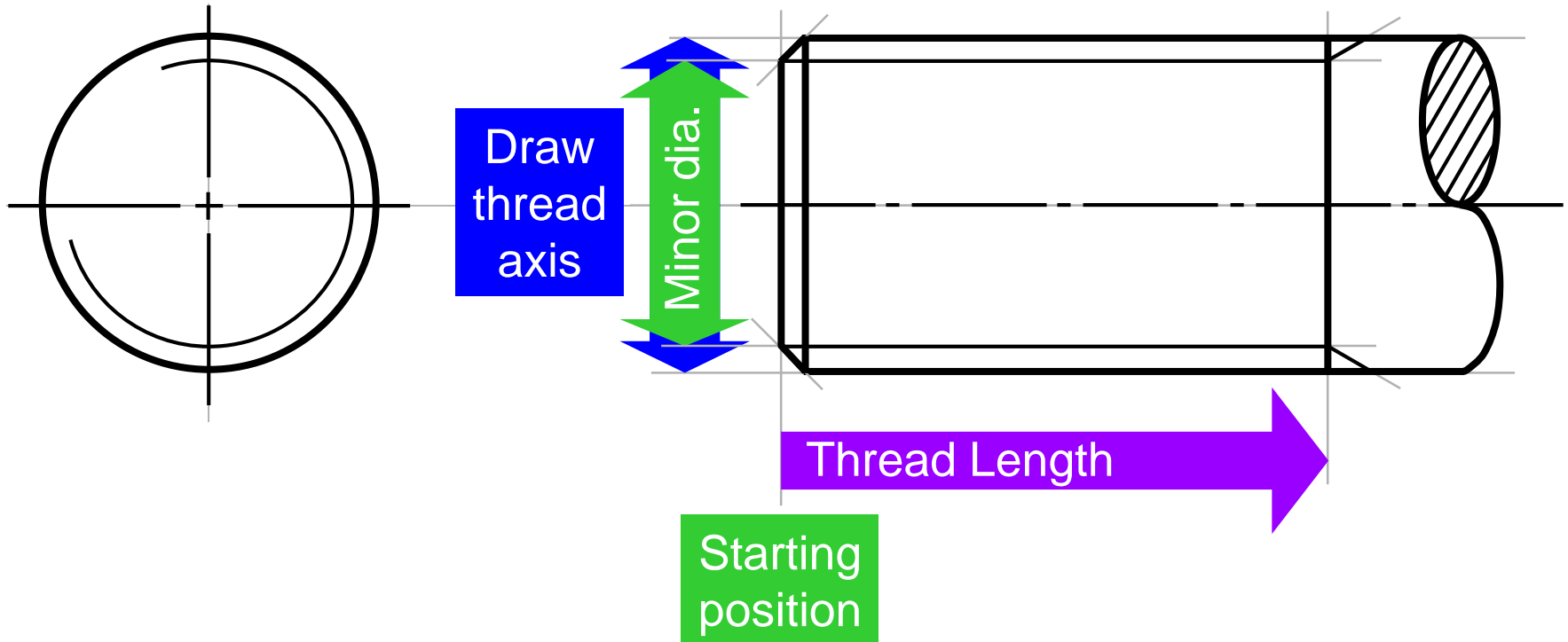
DRAWING STEPS OF EXTERNAL THREAD

Draw an arc that
represents a root.

Draw a circle that
represents a crest.

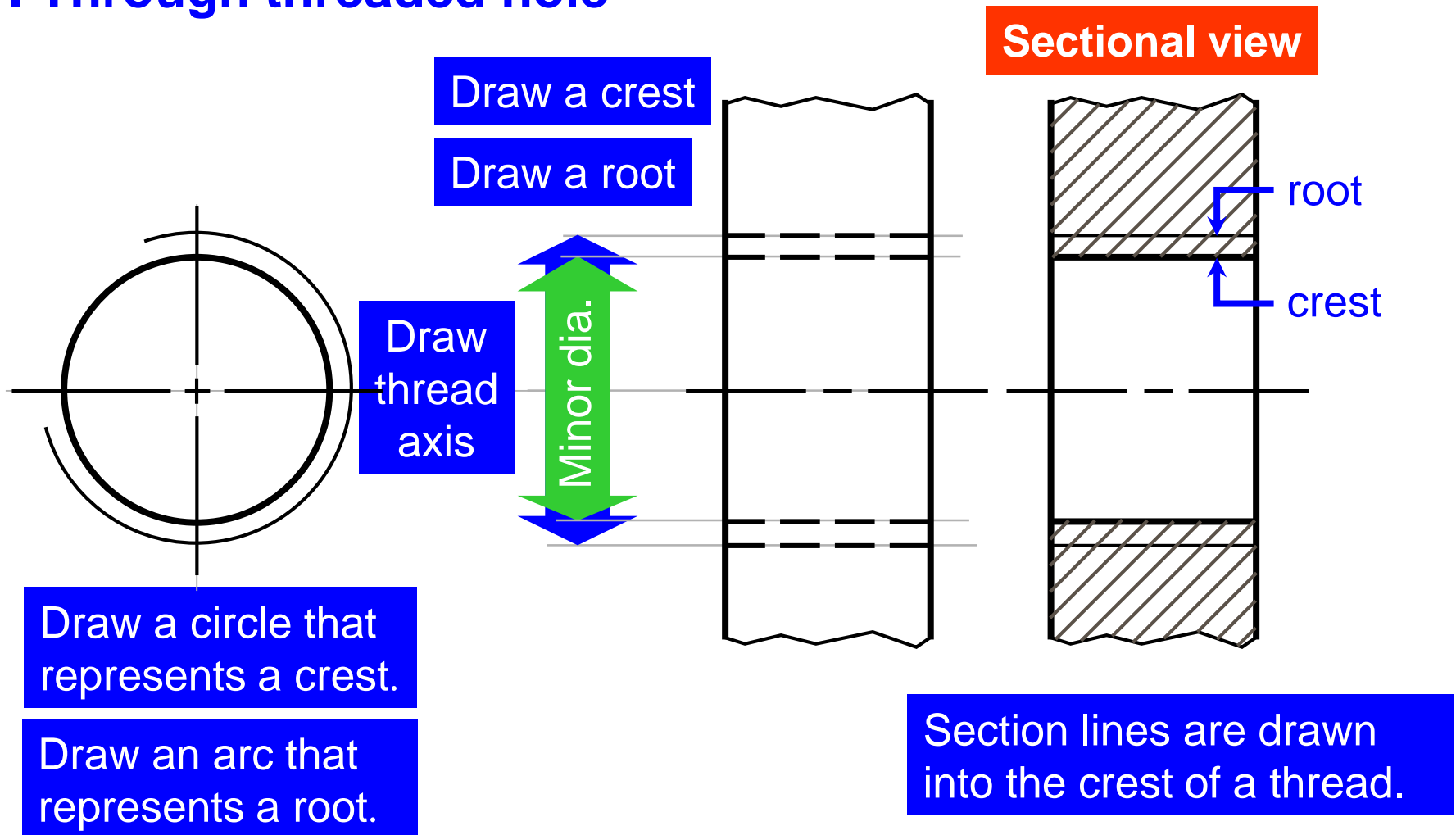
Draw
45° Chamfer

Draw line making
30° with thread axis



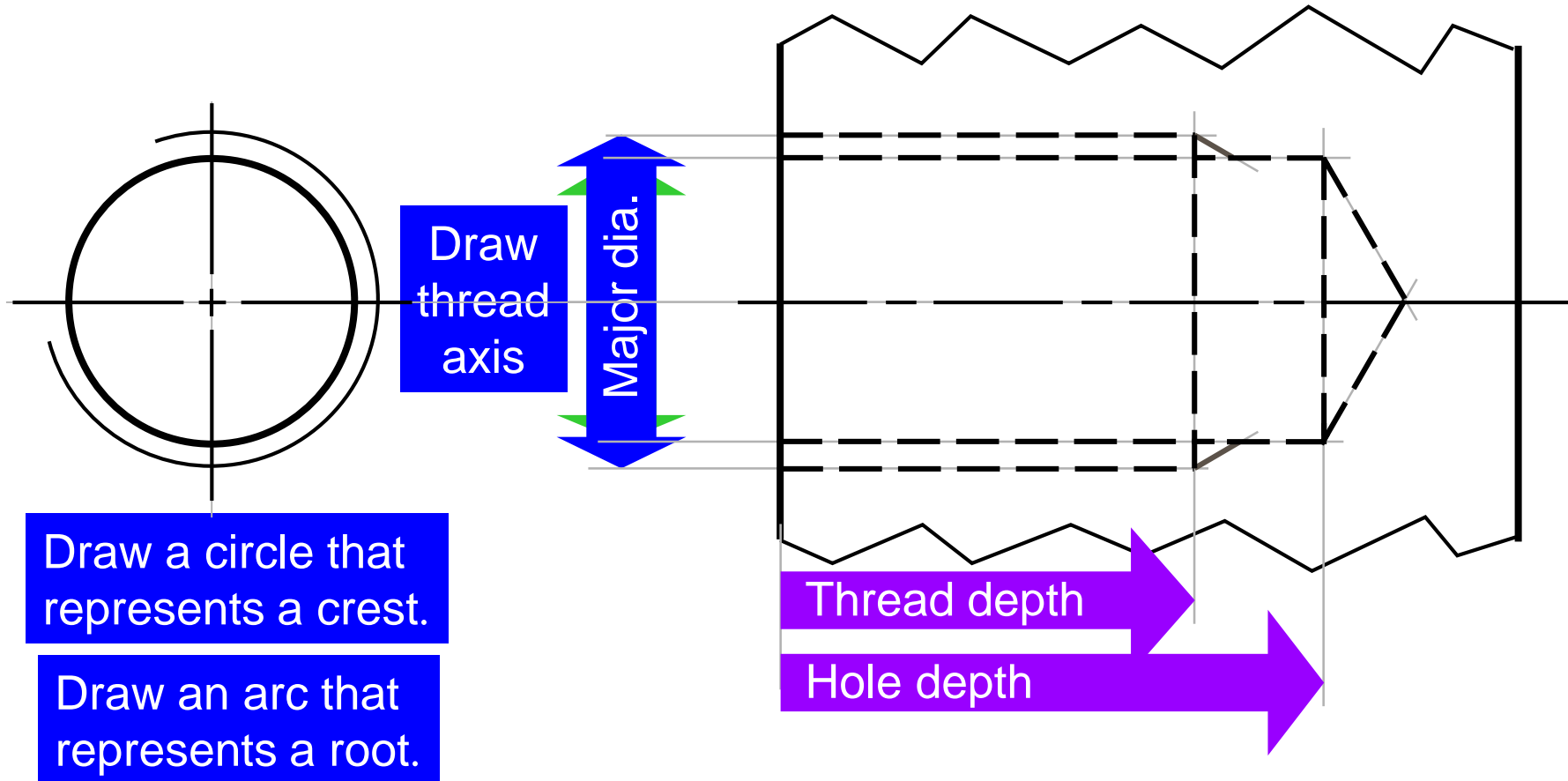
DRAWING STEPS OF THREADED HOLE

1. Through threaded hole



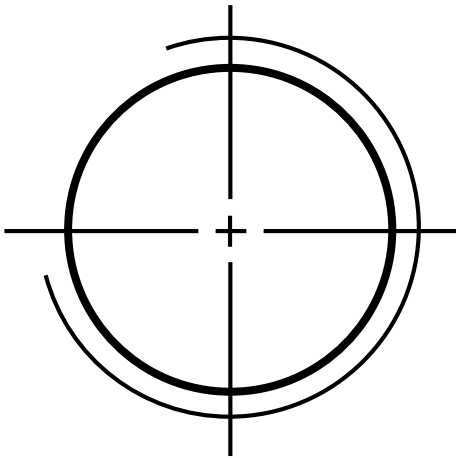
DRAWING STEPS OF THREADED HOLE

2. Blinded threaded hole

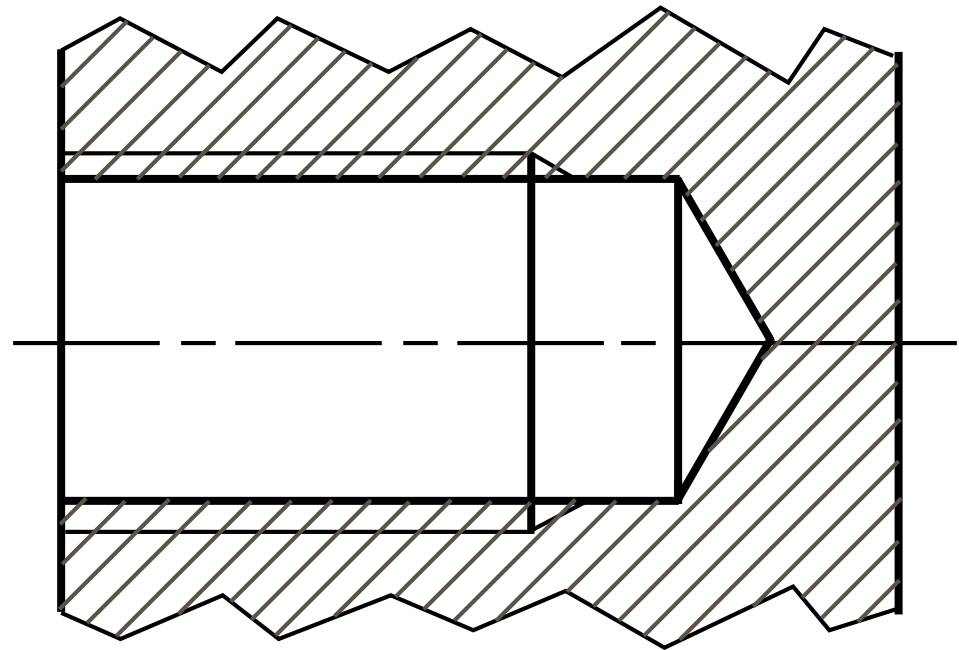


DRAWING STEPS OF THREADED HOLE

2. Blinded threaded hole

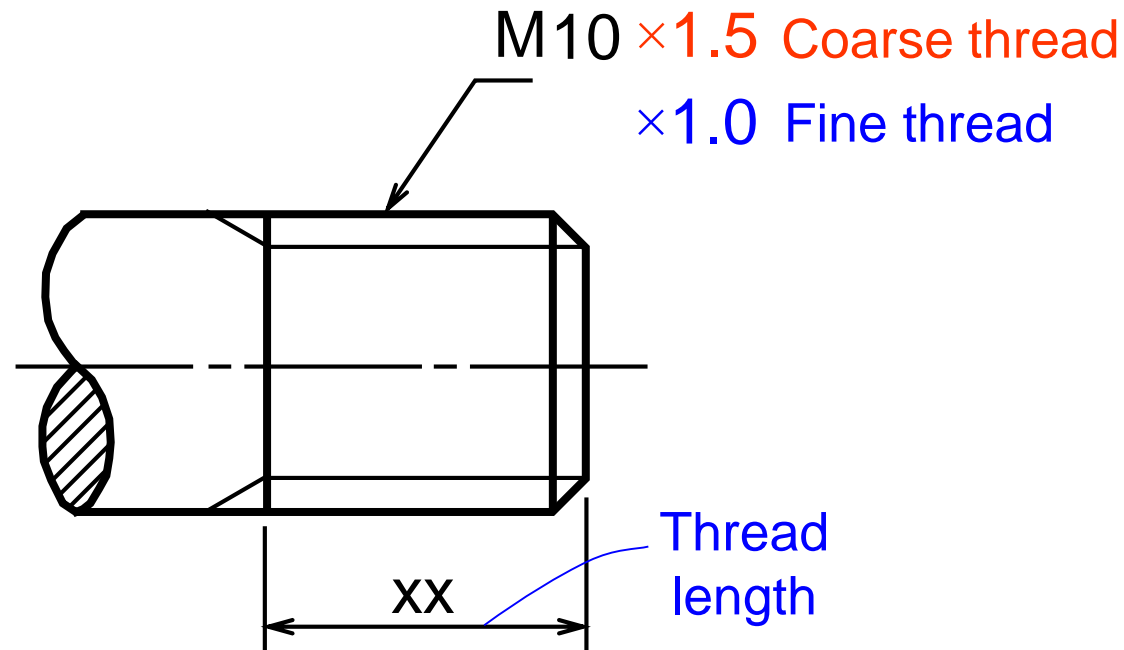


Sectional view



DIMENSIONING EXTERNAL THREAD

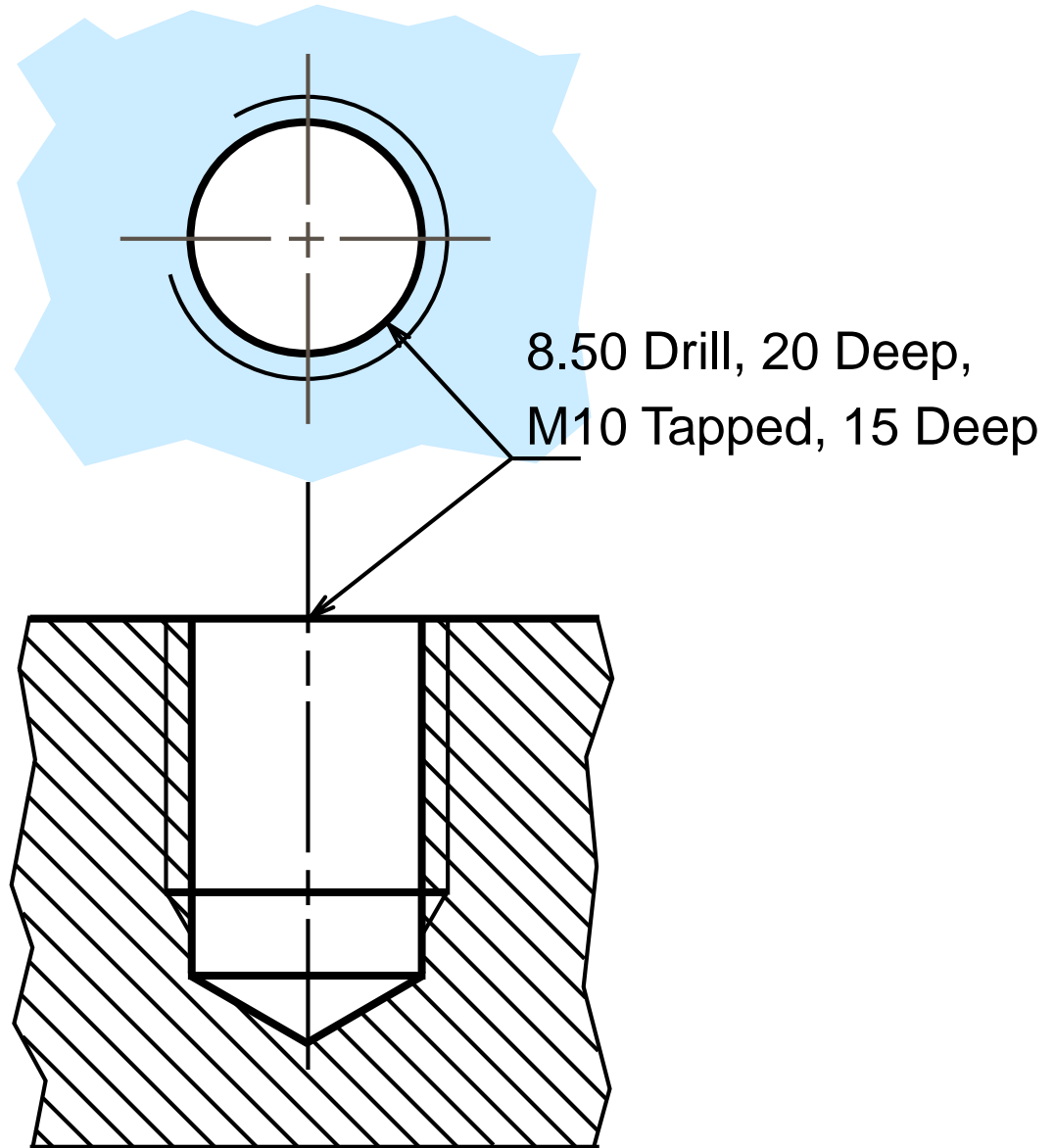
- Use *local note* to specify :- *thread form*, *nominal size*, *pitch* (if it is a fine thread)
- Use *typical method* to specify :- *thread length*.



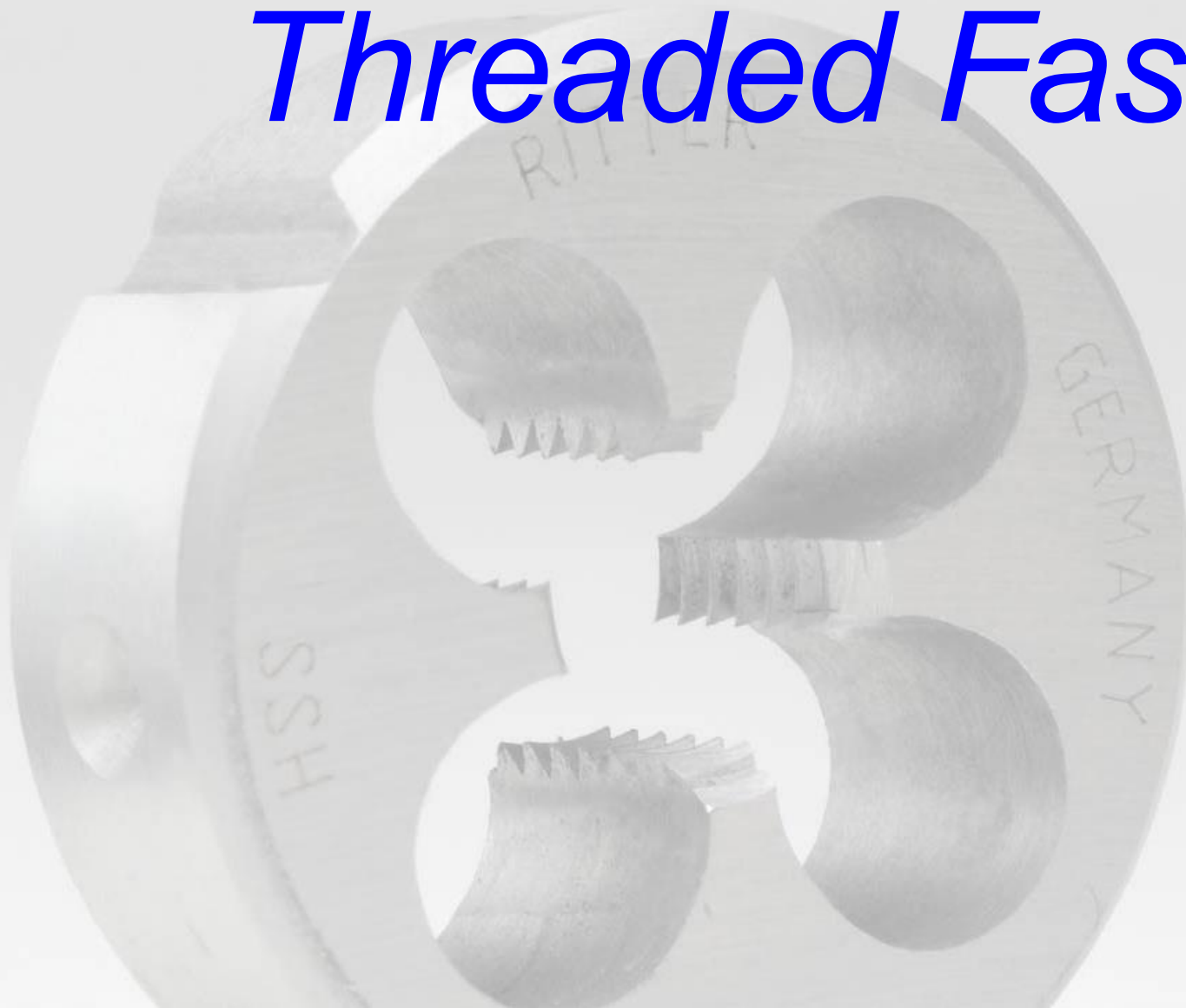
DIMENSIONING THREADED HOLE

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

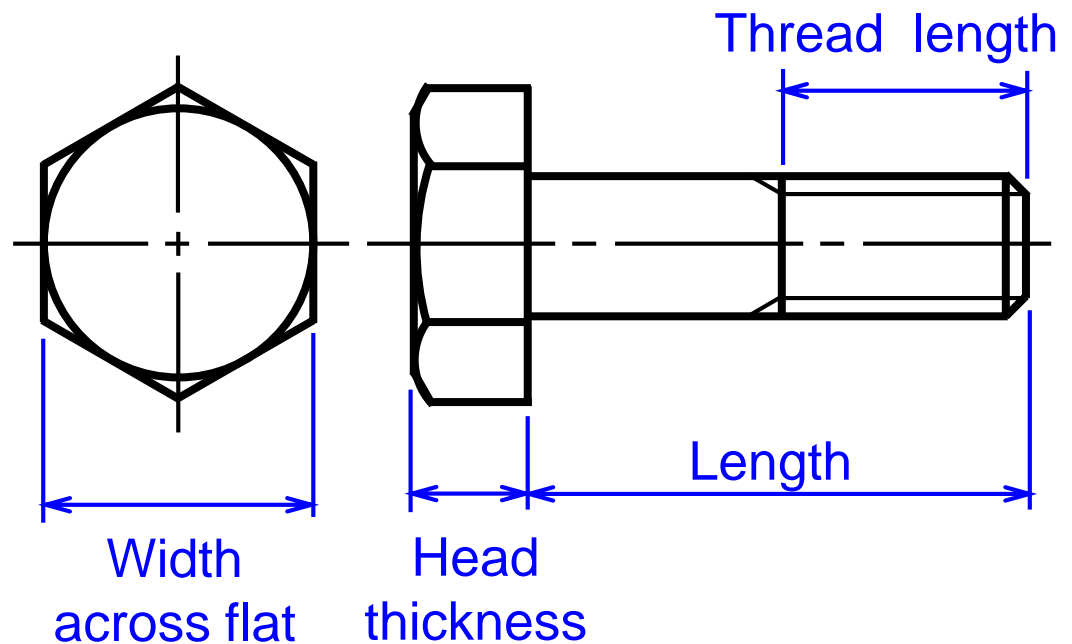


BOLT : Terminology

Bolt is a threaded cylinder with a head.

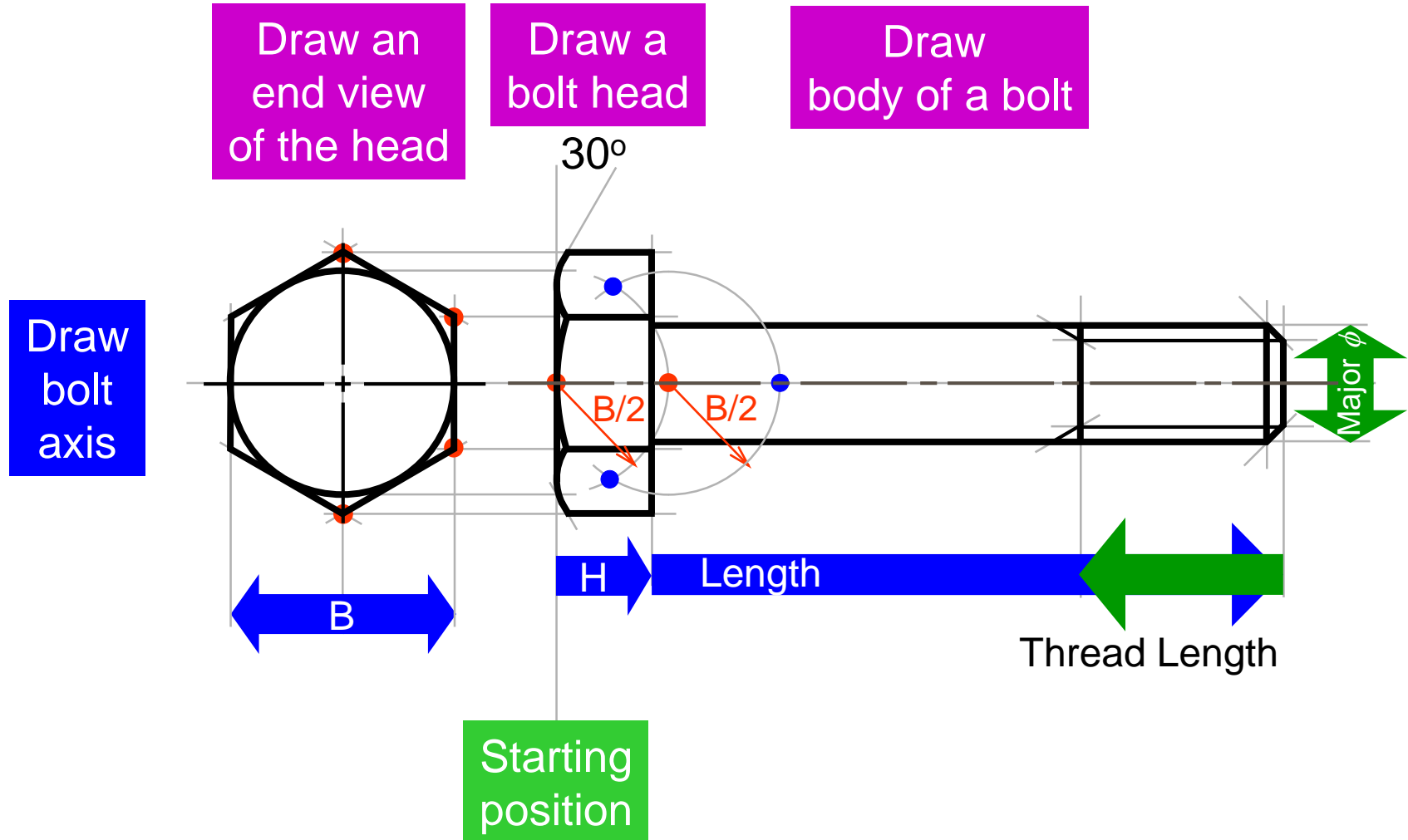


Hexagonal head
bolt and nut



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

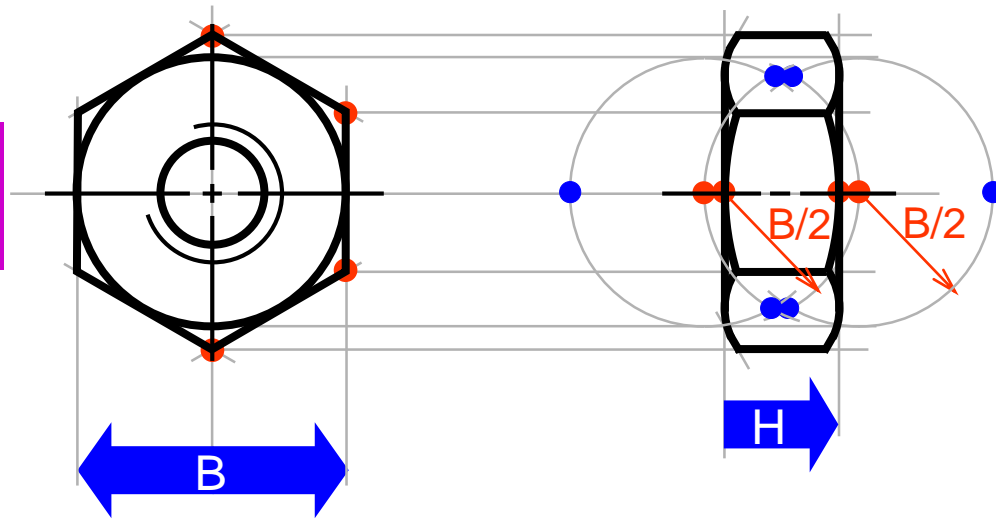
BOLT : Drawing steps



NUT : Drawing steps

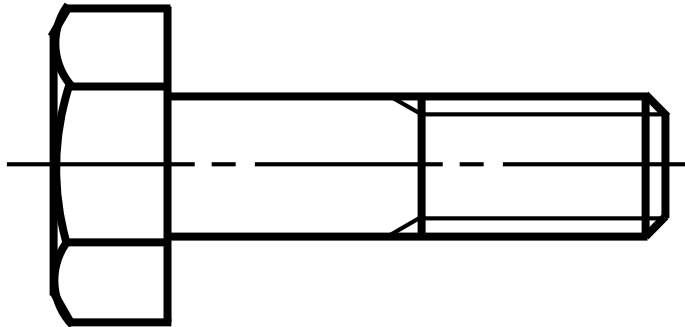
Dimensions of the nut are given in Table 9.14.

Draw an end view
of the nut

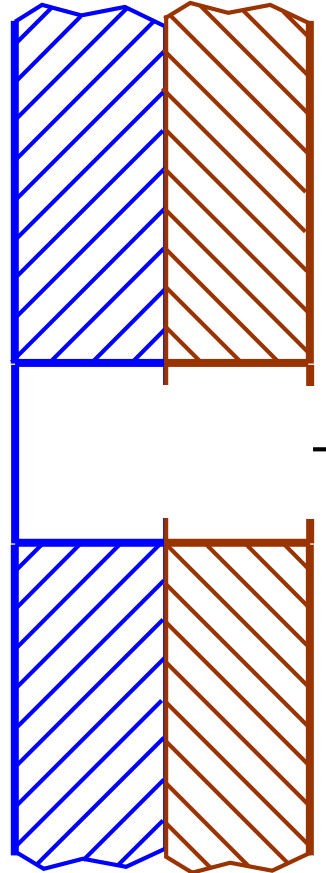


Dash lines represent
a threaded hole are
omitted for clarity.

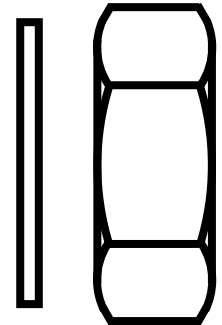
BOLT : Application



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



2. Insert a **washer**.

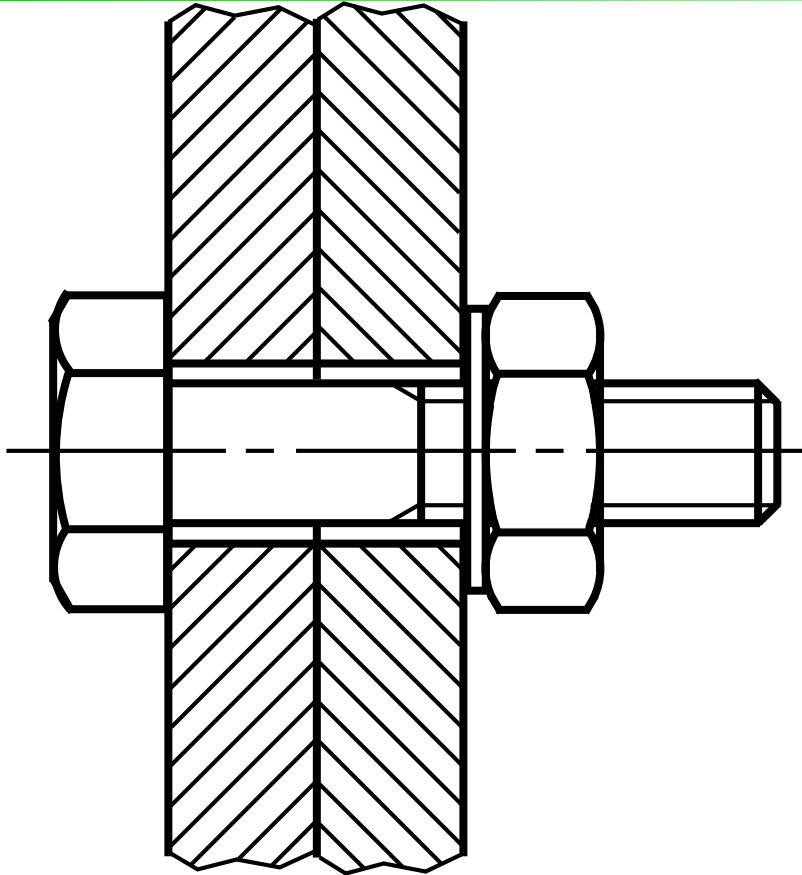


3. Screw a **nut**.

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

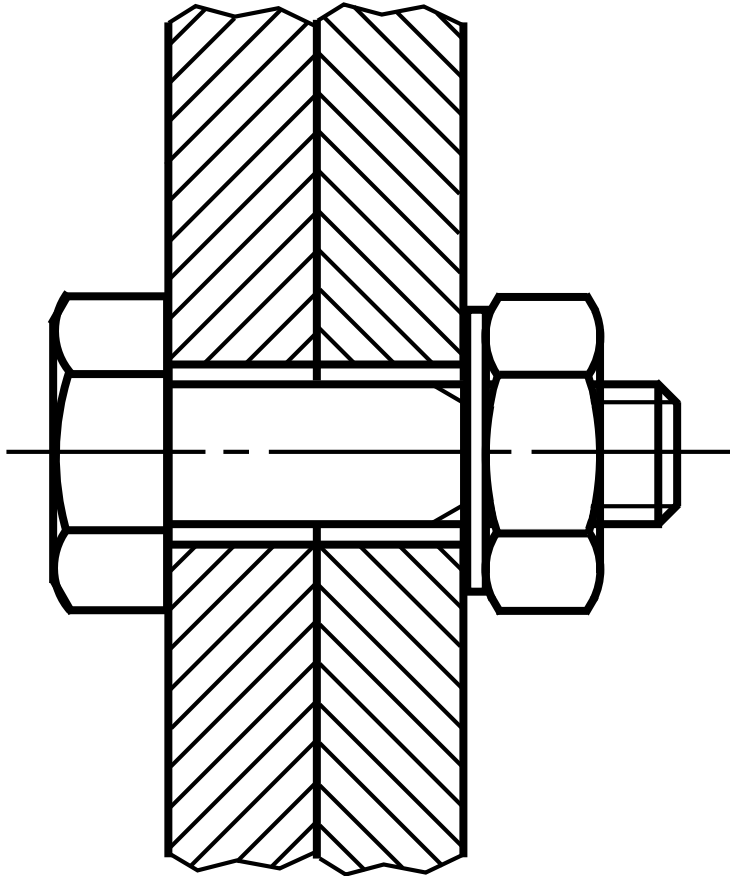
Inappropriate

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

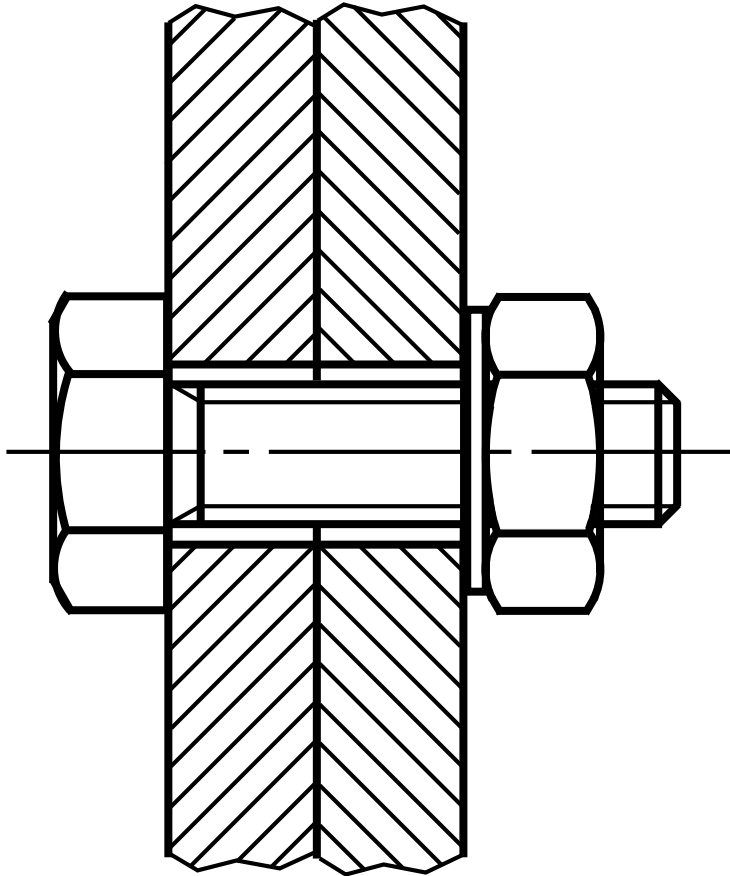
Inappropriate

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.

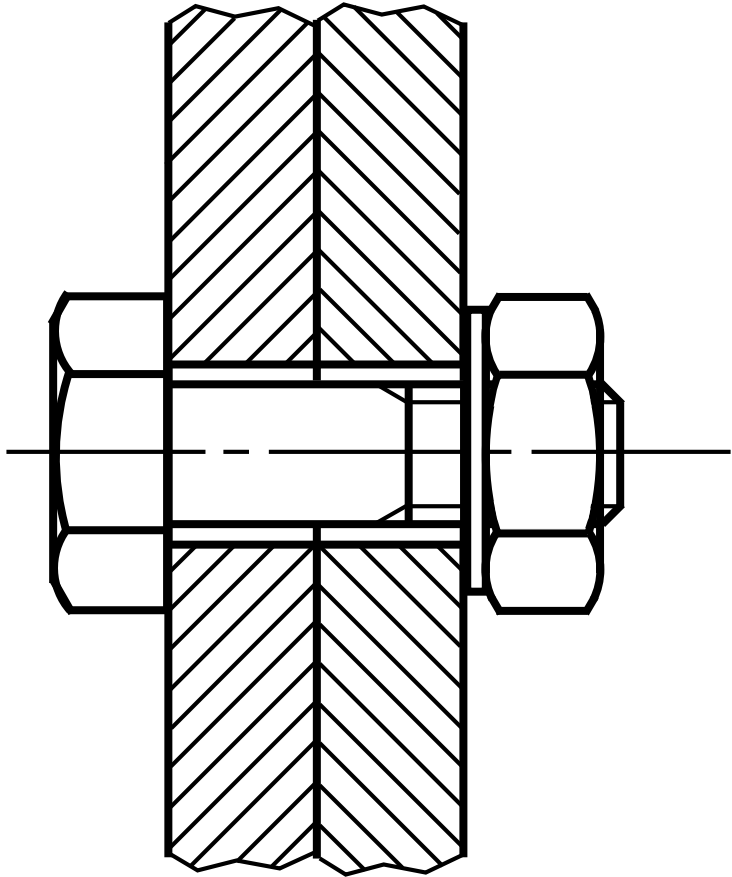
Correct

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.

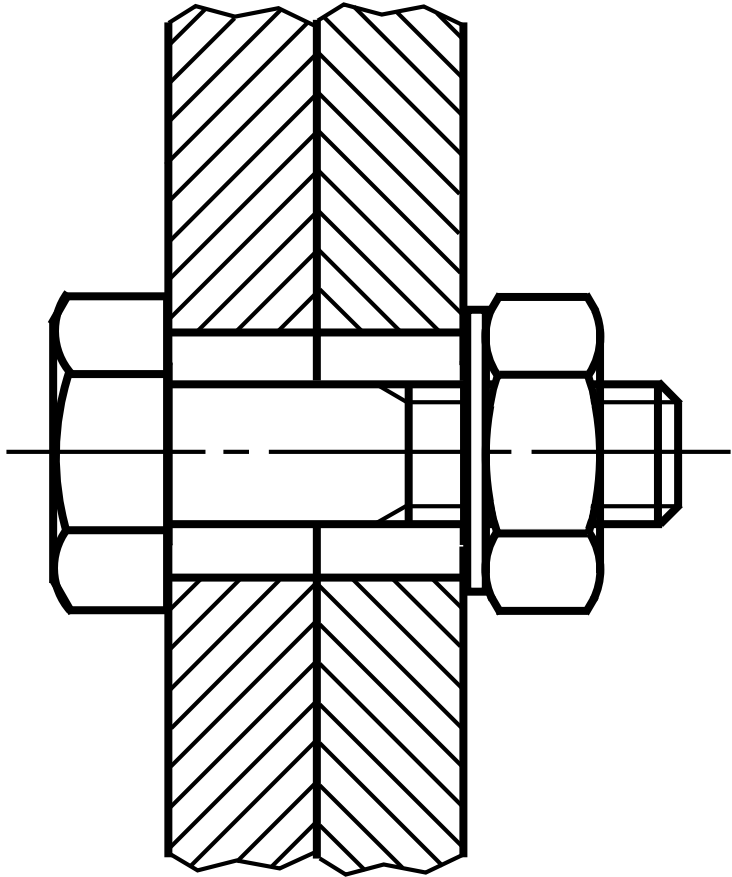
Correct

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

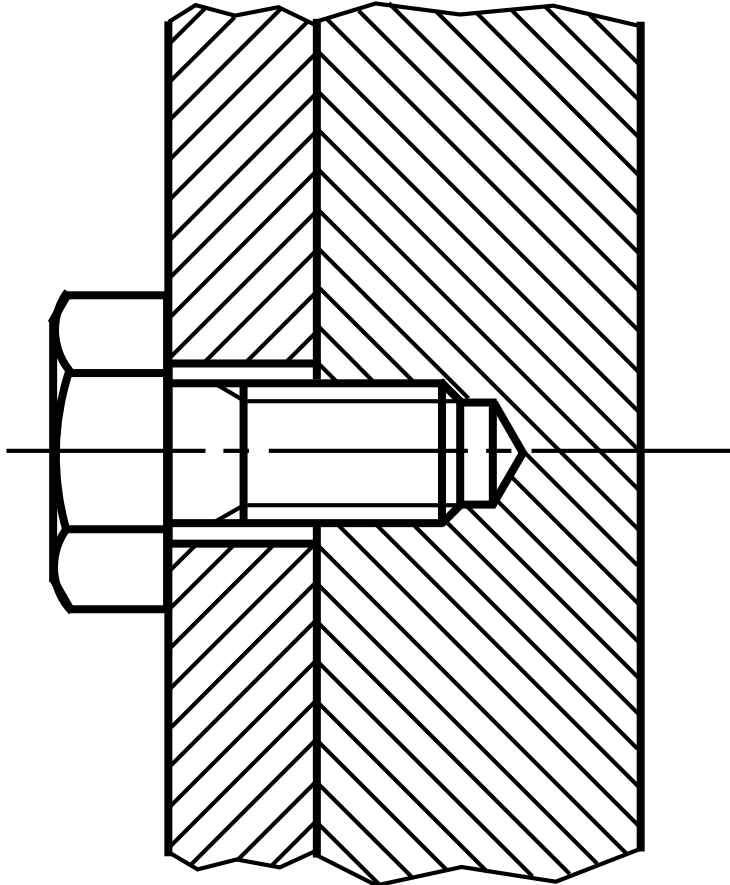
Inappropriate

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

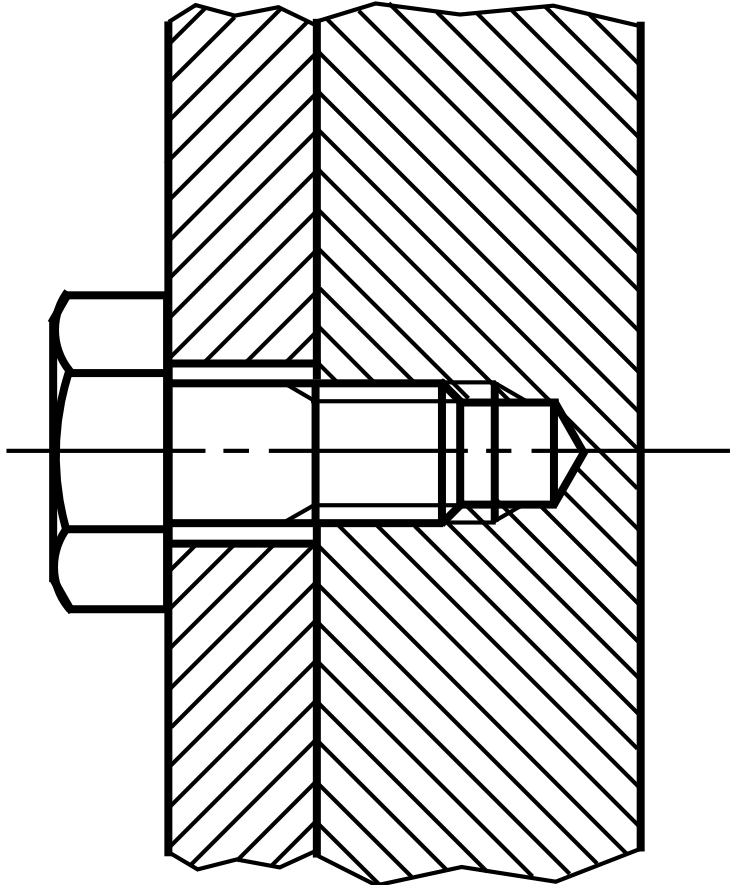
Inappropriate

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

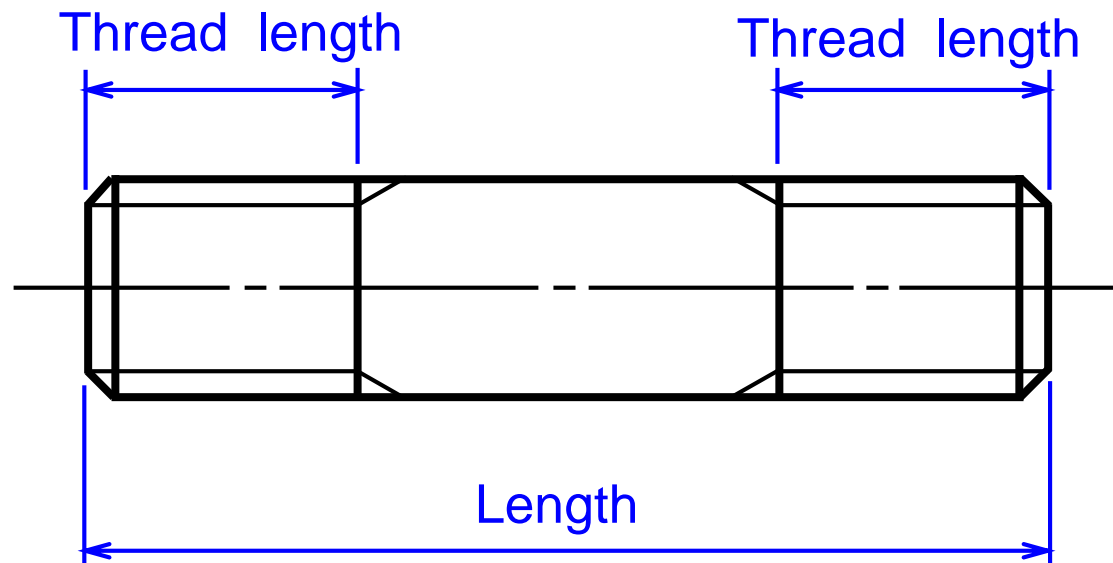
Wrong

STUD : Terminology

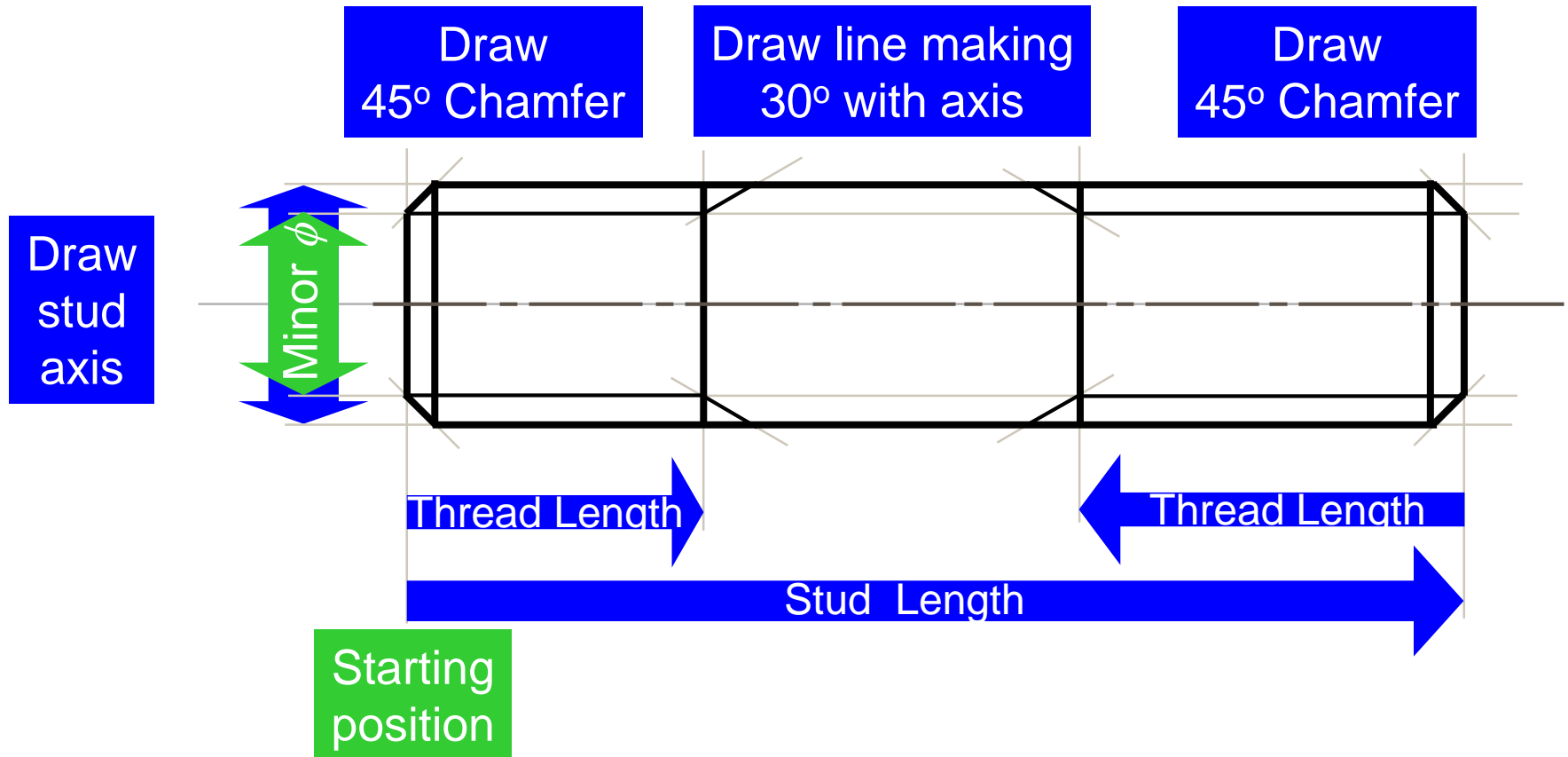
Stud is a *headless* bolt, threaded at both ends.



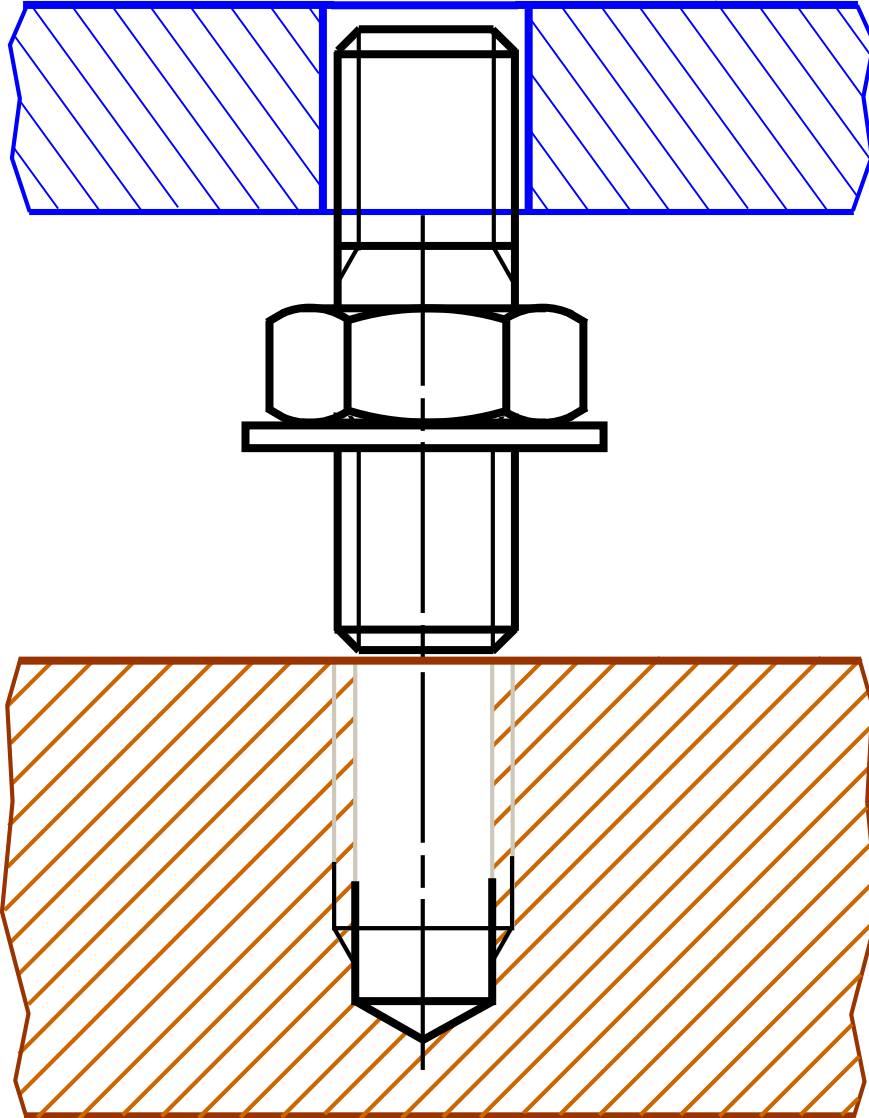
*Drawing
representation*



STUD : Drawing steps



STUD : Application



1. Drill a hole.

2. Tap a hole.

3. Screw a stud.

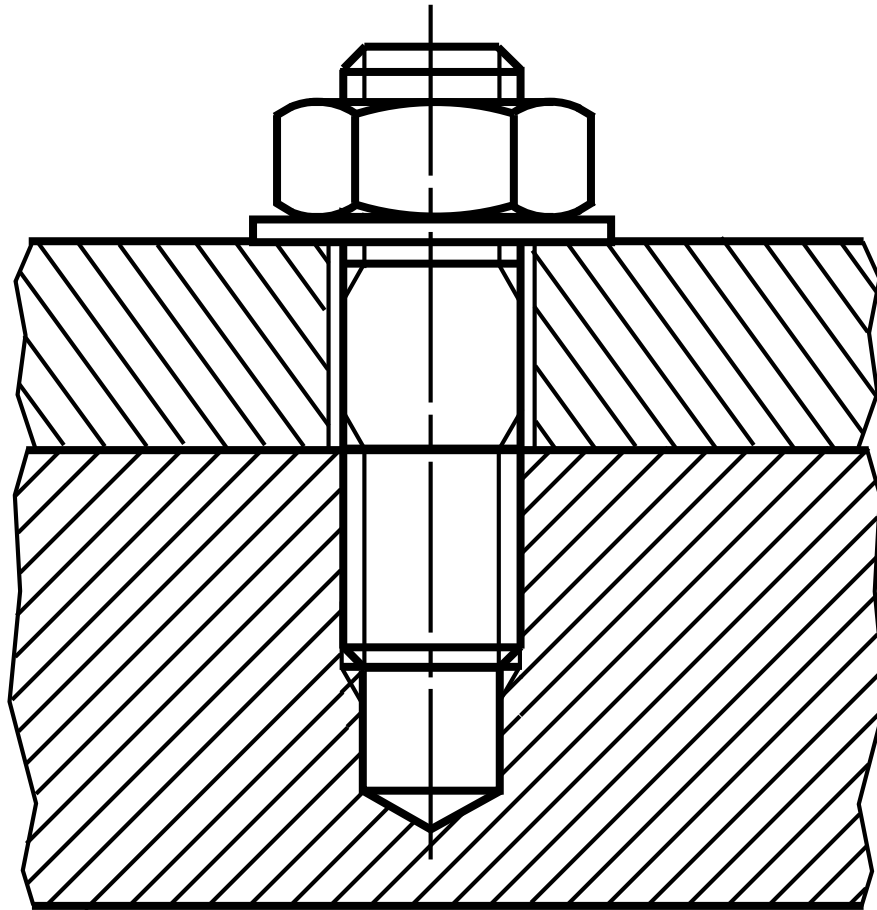
4. Place the part to be fastened.

5. Insert washer and fastened a nut.

Let's think together...



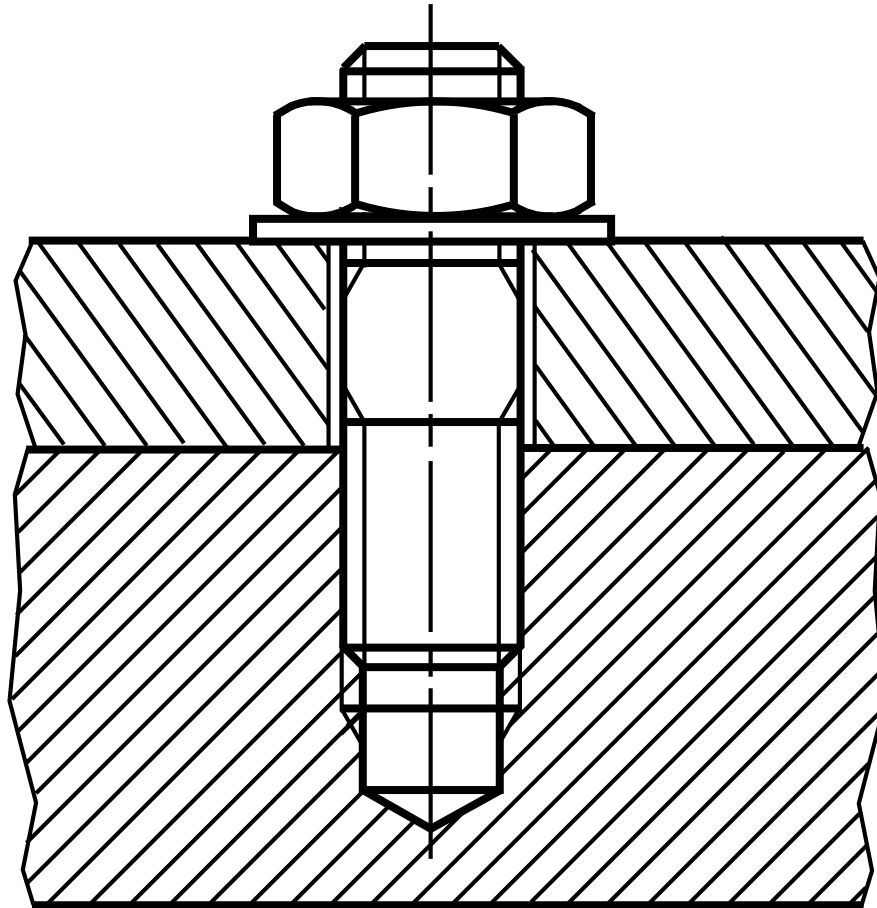
◆ What is the mistake in the following use of stud ?



Let's think together...

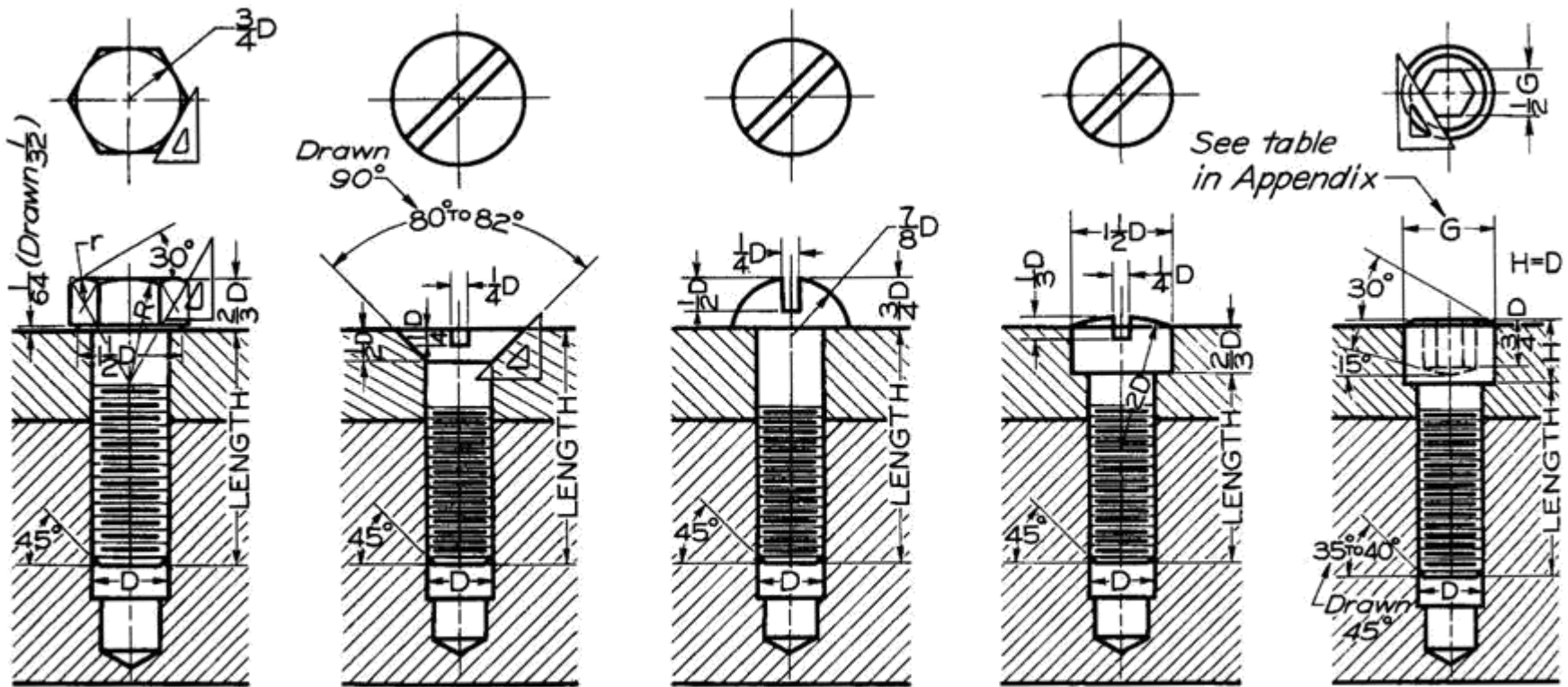


◆ What is the mistake in the following use of stud ?

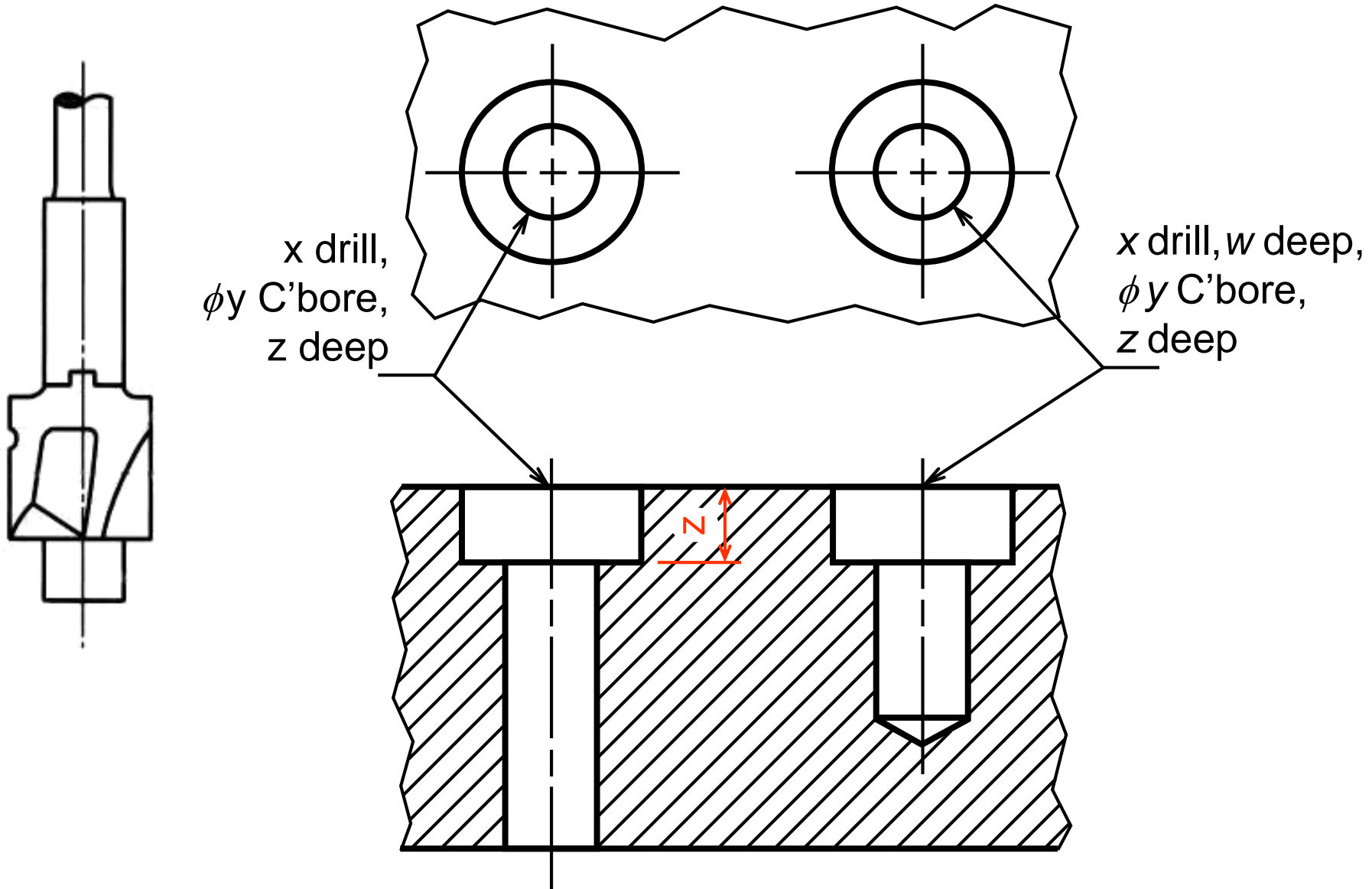


CAP SCREW : Terminology

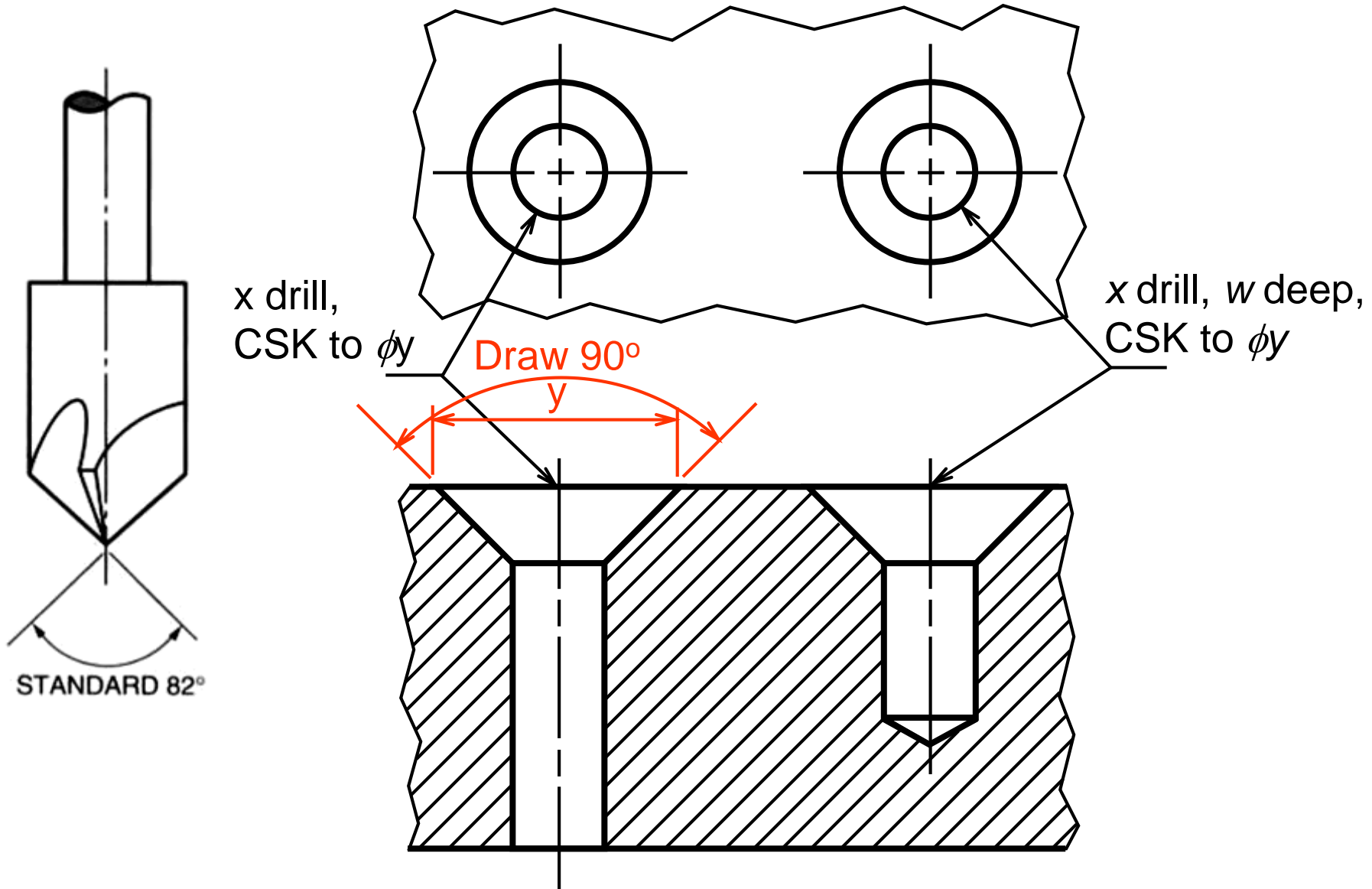
Cap screw is similar to bolt, but has a longer thread than a bolt.



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.



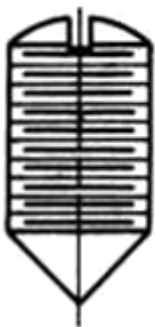
Slotted



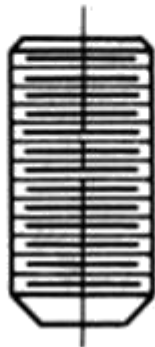
*Hexagonal
Socket*



*Fluted
Socket*



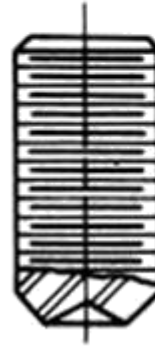
*Cone
Point*



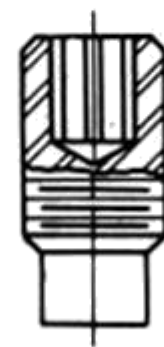
*Flat
Point*



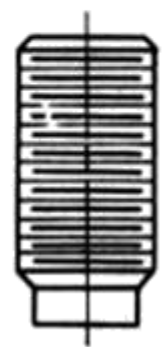
*Oval
Point*



*Cup
Point*



*Full Dog
Point*



*Half Dog
Point*

SET SCREW : Application

