

# Section 9

## Threads

- Thread terminology
- Thread types, series, and classes
- Thread representation
- Inch thread notes
- Metric thread notes
- Forming threads
- Measuring threads

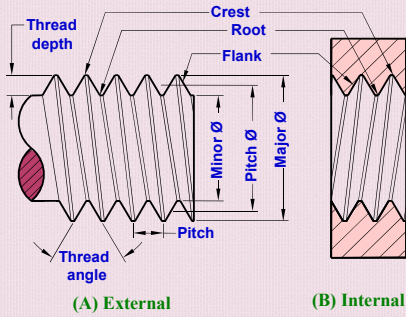
Section Views

This is a small sample of the thousands of fastener types.



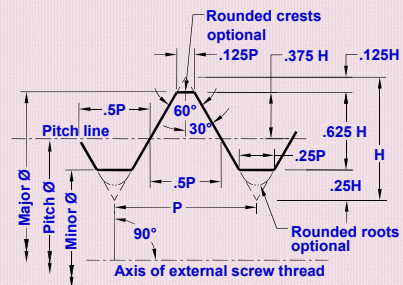
Section Views

Thread terminology which applies to any thread profile.



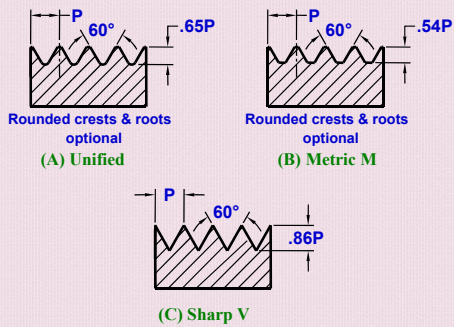
Section Views

The unified thread is the most common US thread



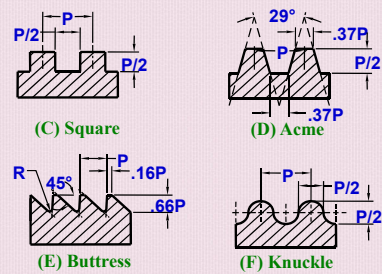
Section Views

Unified and Metric are the most common thread forms  
V Sharp is for fine adjustment or tight seals.



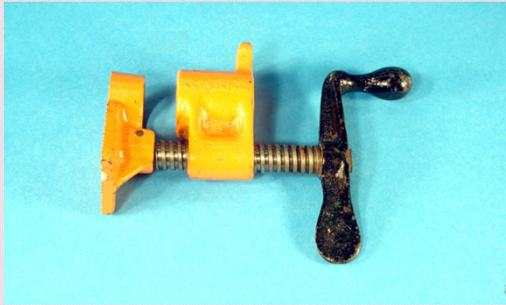
Section Views

Square, Acme, and Buttress – for transmitting power along the axis  
Knuckle – think light bulbs.



Section Views

This screw end of a bar clamp is an example of a square thread.



Section Views

This part, which is used with a small vice, uses an acme thread.

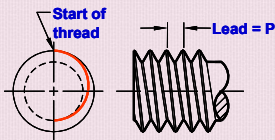


Section Views

A double thread moves twice the distance as a single thread on a 360° rotation.

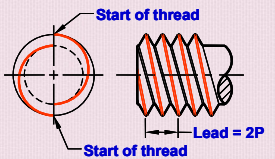
**Single Thread:**

One start  
360° rotation Lead = P



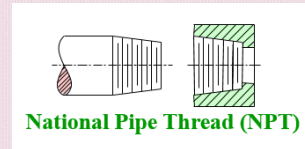
**Double Thread:**

Two starts  
360° rotation Lead = 2P



Section Views

NPT is used for tightly sealed joints

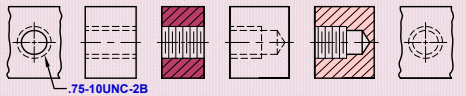


National Pipe Thread (NPT)

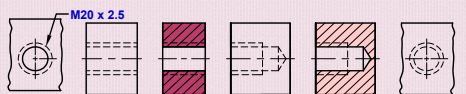
Section Views

Schematic & simplified thread representations are the same except for sectioning.

**Schematic:**



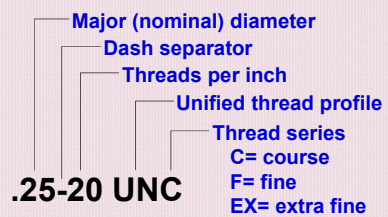
Thru holes  
Elevations of thru holes  
Sections & thru holes  
Elevation of blind tapped holes  
Section of blind tapped holes  
Bottom of blind tapped hole



**Simplified:**

Section Views

Major diameter, threads per inch, and profile are the minimum information in a unified thread specification.



Section Views

A unified thread specification can have many optional components.

Separator  
Double thread (double, triple, quadruple)  
Left hand (right hand if blank)  
External (A=ext, B= inter)  
Class of fit (1=loose, 2=avg, 3=tight)

**.25-20 UNC-2A LH DOUBLE X  
2LG HEX HD CAP**

Type of fastener  
Type of head on fastener  
Length of fastener

Section Views

The "M" for metric M profile, major Ø, and pitch are the minimum information in a metric M thread specification.

Metric M profile  
Major (basic) Ø in millimeters  
Separator  
Pitch in millimeters

**M16 X 2**

Section Views

This M profile specification includes tolerance class.

M16 X 2-5g6h

Pitch Ø  
Major Ø

Tolerance grade  
Tolerance position (allowance) external  
Tolerance grade  
Tolerance position (allowance) external

Tolerance class

Tolerance Grade  
tight medium loose  
3, 4, 5, 6, 7, 8, 9

Tolerance Position  
External Internal  
e=Large allowance G=Small allowance  
g=Small allowance H= No allowance  
h=No allowance

Section Views

Threads under .25" Ø are specified using gage size.

Gage no. machine screws less than .25" Ø are noted with a gage no. ranging from 0 (.060"), 1, 2... to 10 (.1900")  
Decimal equivalent of gage no. (optional) or alone without gage no.

Threads per inch  
Unified national fine profile

**NO 10 (.1900)-32 UNF-3A X .625  
FILL HD MACH SCR**

Fillister head machine screw  
Class of fit Exterior  
Length

Section Views

An ACME thread transmits a force along its axis on devices such as a car scissor jack or metal bench vice.

Major diameter  
Threads per inch  
Acme thread profile  
Class of fit

**1 3/4-6 ACME-2G**

Allowance (2 preferred, 3, or 4 loose)  
G = general  
C = centralized

Section Views

National pipe thread is a tapered thread to help form a tight seal.

Major Ø  
Threads per inch  
National pipe thread

**1/4-18 NPT**

Section Views



A buttress thread is used to transmit a force in one direction only.

**Major Ø**  
**Threads per inch**  
**Buttress Thread**

**.625-20 BUTT**

**BUTT-PULL (BUTT)**  
**BUTT - PUSH**

Section Views

Each Unified diameter has a Coarse, Fine, & Extra Fine series.

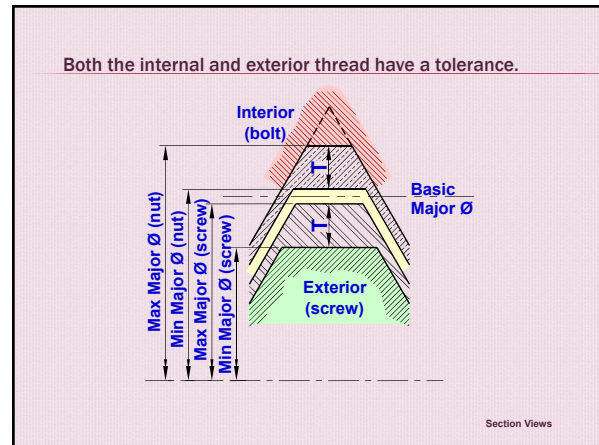
Nominal Diameter	Coarse NC UNC		Fine NF UNF		Extra Fine NEF UNEF	
	Thds. Per Inch	Tap Drill	Thds. Per Inch	Tap Drill	Thds. Per Inch	Tap Drill
.500	13	.4219	20	.4531	28	.4646
.625	11	.5313	18	.5781	24	.5781
.750	10	.6563	16	.6875	20	.7031

Section Views

Metric also has classes  
fine thread is larger than for the coarse thread.

Coarse (general purpose)		Fine	
Basic Dia & Pitch	Tap Drill Dia	Basic Dia & Pitch	Tap Drill Dia
M12 x 1.75	10.30	M12 x 1.25	10.5
M14 x 2	12.00	M14 x 1.5	12.5
M16 x 2	14.00	M16 x 1.5	14.5
M18 x 2.5	15.50	M18 x 1.5	16.5

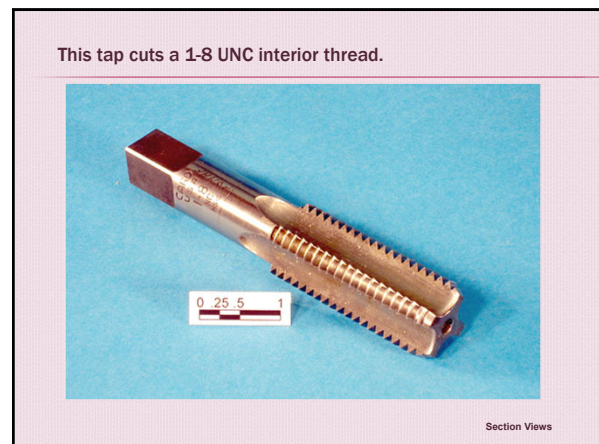
Section Views



A tap cuts internal threads and can be held by a straight handled tap wrench.

**Tap**  
**Straight handled tap wrench**

Section Views

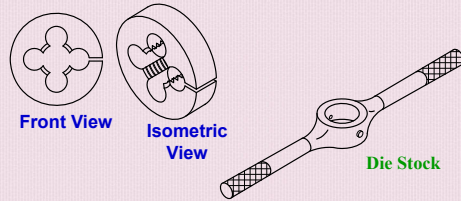


This interior thread cutting tap is held by a "T" handled tap wrench.



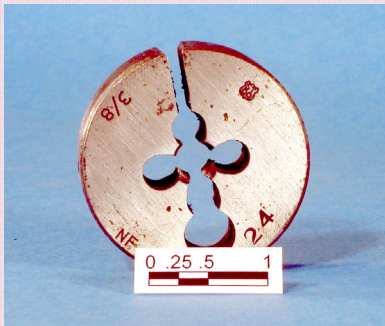
Section Views

A round die is used to cut external threads and is held using a die stock.



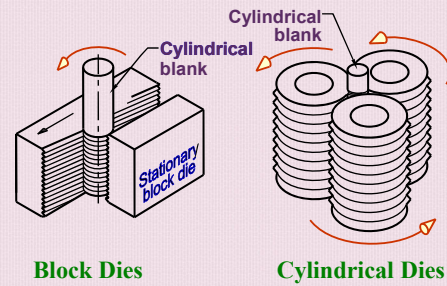
Section Views

This die cuts a 3/8-24 UNF exterior thread.



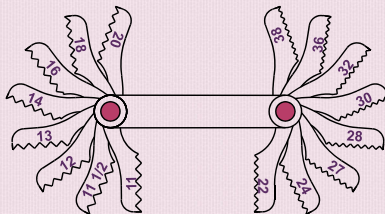
Section Views

There are two rolling methods for forming threads.



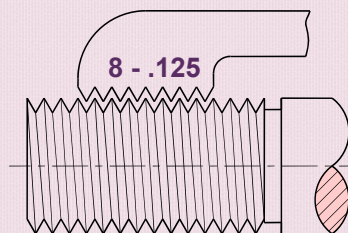
Section Views

A screw pitch gage is used to measure the threads per inch of a thread.



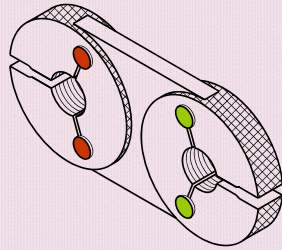
Section Views

The screw pitch gage must be matched to the existing thread.



Section Views

A ring thread gage is used to test the accuracy of an external thread with a slightly tight and a slightly loose end.



Section Views

This GO / NoGo gage checks the fit of interior threads.



Section Views

The anvil on the pitch micrometer is "M" shaped to fit over a thread.



Section Views

By Comparison, a normal micrometer has flat anvils.



Section Views