

Knowledge domain: Mechanical
Unit: Attachment
Skill: Selecting Replacement Screws

Tools and Parts Required:

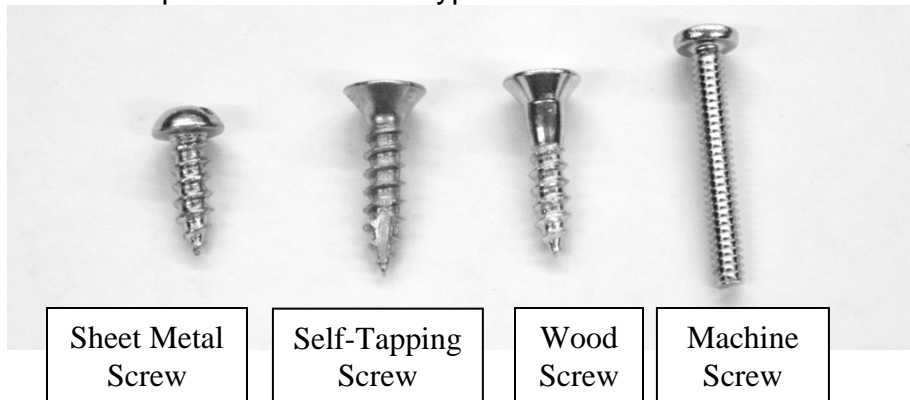
- 1) **Wood screws**
- 2) **Machine screws**
- 3) **Sheet metal screws**
- 4) **Self-tapping screws**
- 5) **High-low screws (optional)**
- 6) **Calipers**

Introduction

Screws and bolts are used to attach two pieces of material together. Screws and bolts are very similar. Many people use the words “screw” and “bolt” interchangeably. There are many types of screws and bolts. Most screws and bolts are steel, stainless steel or zinc-plated steel. There are also special screws created from other materials like nylon. Screws come in different types. There are wood screws, machine screws, sheet metal screws, high-low screws, self-tapping and more.

Example

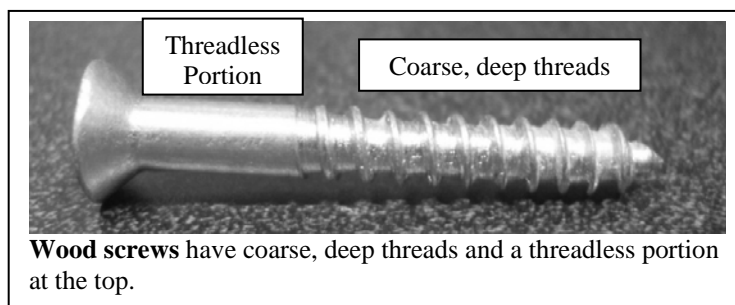
Below is a picture of different types of screws.



Identification and Diagnosis

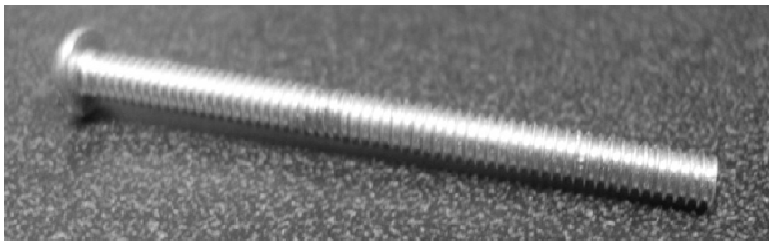
Devices in the hospital will often be missing screws. Replace these screws. The type of material that you are working with determines the type of screw you should use.

- 1) **Wood Screw:** Use a wood screw when you work with wood. The threads are usually coarse and deep. This helps the screw grab the wood. The top portion of the shank does not have



threads. This compresses the wood. Wood screws are available in steel, stainless steel, aluminum alloy or brass metal.

- 2) *Machine Screw*: Machine screws are used with metal. The threads of machine screws are finer than the threads of wood screws. The threads of a machine screw usually cover the entire length of the shank.



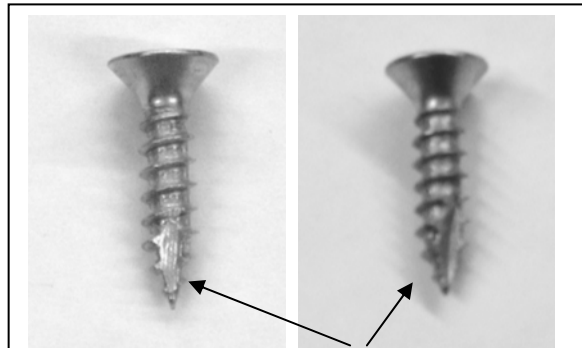
Machine screws have fine threads over entire length of the screw.

- 3) *Sheet Metal Screw*: Sheet metal screws are usually short. Sheet metal screws have coarse threads. The threads of a sheet metal screw cover the entire length of the shank.



- 4) *High-Low*: High-Low screws have two sets of threads with alternating heights. High-low screws are used in certain plastics.

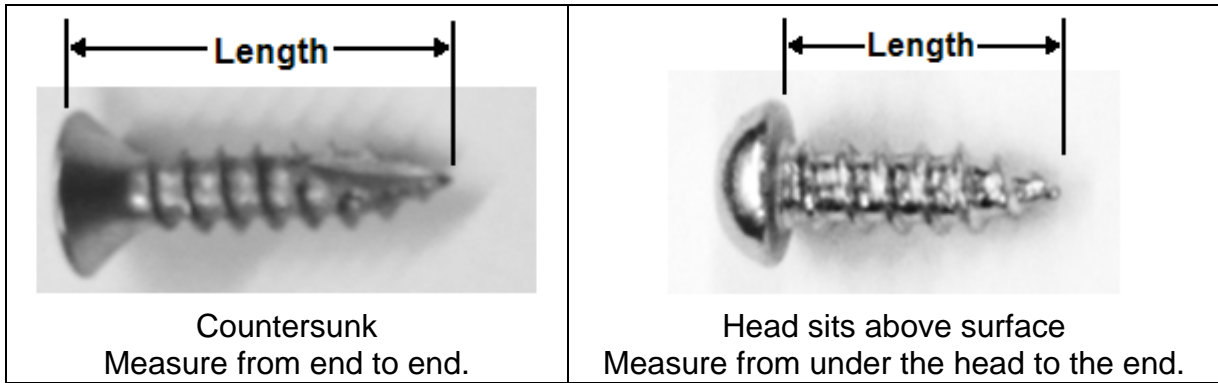
- 5) *Self-Tapping*: Self-Tapping screws have a drill-shaped point to cut through the material. This eliminates the need for drilling a pilot hole. Self-tapping screws are used in softer materials such as wood and plastic. Do not use self-tapping screws in hard materials.



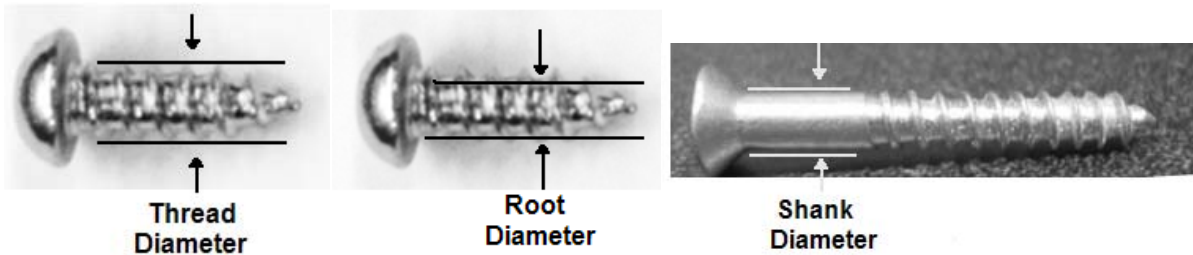
Self-tapping Screws have drill-shaped points.

Procedure

1. Identify the material you are working with. With this information, determine the **type** of screw you need. (See Identification and Diagnosis section for types.)
2. Measure the **fastener length**. The fastener length is measured from where the material surface is supposed to be, to the end of the fastener.



3. Measure the **fastener diameter**. Use a caliper if you have one. Most screws are measured by the thread diameter (see picture). Measure wood screws by the shank or root diameter. Machine screws have standard sizes (see chart below).



US Machine Screw Diameter		
Size	Thread Diameter (inches)	
	Decimal	Nearest Fractional
4	.11	7/64
6	.14	9/64
8	.16	5/32
10	.19	3/16
12	.21	7/32

4. If you need a machine screw, measure the **thread pitch** or **thread count**. Thread pitch or thread count is only used on machine screws.
- Metric: Thread Pitch. Thread pitch is the distance between threads in millimeters.
 - US: Thread Count. Count the number of threads per inch (TPI). TPI is only used for American fasteners.

Metric Sizes				
Bolt Diameter	Thread Pitch			
	Standard	Fine	Extra or Super Fine	JIS
2	0.4	-	-	0.4
2.5	0.45	-	-	0.45
3	0.5	-	-	0.5
4	0.7	-	-	0.7
5	0.8	-	-	0.8
6	1	-	-	1
7	1	-	-	1
8	1.25	1	-	1.25
10	1.5	1.25	1	1.25
12	1.75	1.5	1.25	1.25
14	2	1.5	-	1.5
16	2	-	-	1.5
18	2.5	-	-	1.5
20	2.5	-	-	1.5

US Sizes		
Bolt Size	Threads Per Inch (TPI)	
	Coarse Thread (UNC)	Fine Thread (UNF)
#0000	-	160
#000	-	120
#00	-	90
#0	-	80
#1	64	72
#2	56	64
#3	48	56
#4	40	48
#5	40	44
#6	32	40
#8	32	36
#10	24	32
#12	24	28
1/4	20	28
5/16	18	24
3/8	16	24
7/16	14	20
1/2	13	20
9/16	12	18
5/8	11	18
3/4	10	16
7/8	9	14
1	8	12*
1-1/8	7	12
1-1/4	7	12
1-1/2	6	12

5. Select the appropriate screw based on the material type and screw size.

Note: Sometimes you may have a bolt without the matching nut, or a nut without the matching bolt. If you are missing a nut or bolt, determine the diameter, and thread measurements of the missing piece by measuring the piece you have. You can also bring the nut or bolt to the hardware store to look for the corresponding piece.

Exercise

Your instructor will give you the different types of screws. Identify the material used with each screw.

Your instructor must verify your work before you continue.

Preventative Maintenance and Calibration

Always calibrate every medical device before returning it to use.