








## Understanding Nuts, Bolts, and Screws

### Nuts

In this context nuts are metal bits that go on the end of a bolt. Regardless of whether a nut is metric or imperial there are three common types found on wheelchairs. Four other types that you may come across are also described.






Name	Picture	Comment
Hex nut		Most common fastener where loosening is not likely to occur. Nut thread and diameter have to be matched to the bolt in order to work.
Acorn or Cap nut		A nut with a domed top to prevent contact with the external thread. Particularly useful on footrests and armrests. Nut projects out a little, but there are no sharp edges.
Nylock nut		Very common on wheelchairs. A nylon insert at the top of the nut provides a locking feature. The nylon insert, it is claimed, helps to seal the bolt thread against seepage of water, oil, petrol, paraffin or other liquids such as urine. It is meant to be used only once. I use them as long as I can't turn them by hand.
Wing nut		A nut with 'wings' for hand tightening.
Flange nut		A nut with a built in washer, not as good as a real washer since it turns with the nut.
Jam nut		A nut with a reduced height. May be a regular hex or nylock nut.
Tee nut		A nut designed to be hammered into wood to create a threaded hole.

### Bolts

Welds are used to hold parts of a structure together in a permanent way. Welding is usually the cheapest, strongest, and lightest way of connecting two pieces of metal.

Nuts and bolts are used to hold parts of the wheelchair together in a permanent or semi permanent way. Depending upon the specific wheelchair; the fasteners used may be metric (mm) or imperial (inches). Some North American chairs are imported from Europe and modified for the local market by the addition of footrests or armrests. These hybrids often have metric fasteners for the frame and imperial fasteners on the North American bits. So be warned you may have both metric and imperial nuts and bolts on the same chair, don't take anything for granted.

Bolts usually, but not always have identifying markings on the head. The most common markings indicate the strength of the bolt and also if it is metric. Never use a lower grade bolt to replace a higher one.

Imperial (SAE) Bolt	Relative Strength	Metric Bolt
 Grade 1 or 2	60	
 Grade 5	120	
 Grade 8	150	
Stainless and Titanium markings vary. Most are non-magnetic	100	Stainless and Titanium markings vary. Most are non-magnetic






### Bolt size

The size of the specific bolt is indicated by a series of numbers here is the key to the code.

SAE Imperial	What it refers to		Metric
5/16 x 18 x 1-1/2	Bolt description		M8 - 1.25 - 25
5/16	Outside thread diameter (inches)	Outside thread diameter (mm)	M8
18	Number of threads per inch	Distance between threads (mm)	1.25
1-1/2	Length of bolt (inches)	Length of bolt (mm)	25

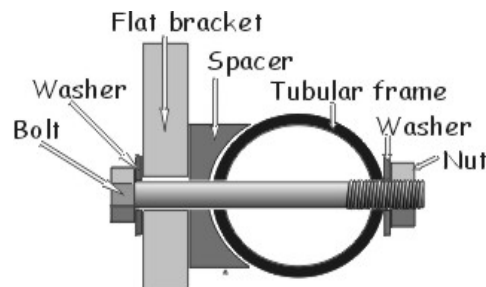
### Washers

Circular discs of metal with a hole in the middle are found in many locations on a wheelchair. They protect the soft aluminum frame, perform a spacing function for camber and offsets and help to stop nuts from loosening over time.





Name	Picture	Comment
Flat washer		A flat washer used to distribute load and protect softer material.
Fender washer		An oversize flat washer used to further distribute load especially on soft material.
Finishing washer		A washer used to obtain a 'finished' look. Usually used with oval head screws on upholstery.
Split lock		The most common style of washer used to prevent nuts and bolts from backing out.
Internal/External tooth washers		A washer with 'teeth'. Used to prevent nuts and bolts from backing out. Not used much on wheelchairs since it tends to chew up the soft aluminum. If used on a wheelchair protect the frame with a flat washer.

### Placement of nuts bolts and washers

In wheelchairs it is not unusual to find spacers shaped in such a way that a flat bracket can be mounted to a tubular frame. In this instance the proper order for assembly is as follows:



### Other fasteners you may come across

Name	Picture	Comment
Wood screw		Screws with a smooth shank and tapered point for use in wood. Found in custom seating systems.
Machine screw		Screws with threads for use with a nut or tapped hole, typically used to secure seat upholstery.
Sheet metal screw		Screws with a point for use in sheet metal. Often used to keep back sling attached to cane.
Set screw		Used to hold things in place once they are positioned properly.