



## General Motors Position On Modern Day Fasteners

The AERA Technical Committee offers the following information on the use of modern day fasteners for GM automotive engines and vehicles. With the advancement of technology and improved vehicle components, fasteners and the method of clamping has evolved in recent times. The following information is supplied by GM service and is to be used while working on their vehicles.

Vehicle Information: All 2008-2016 including export models.

The following is information regarding the proper reading of torque specifications and the re-use of fasteners. The desired result of tightening a fastener is to obtain a proper clamping force between the parts. The clamping force prevents loosening when the vehicle is in use and external forces act on the clamped parts.

All fasteners have a specified torque. The method used for a particular application is determined by engineering and specified in the service information. It is necessary to apply the fastener torque to the specific fastener identified. Applying torque to the mating fastener can damage the fastener, mating components or provide insufficient clamp load. For example, when installing the adjust link on the 2014 Corvette rear suspension, the service information calls for tightening the adjust link nut to 70 N.m (52 lb. ft.), not the cam bolt.

There are three different methods for the specification of tightening fasteners by GM:

Torque (T),  
Torque Plus Angle (TA),  
Torque Plus Angle to Yield (TAY).

Torque Plus Angle to Yield (TAY) is sometimes referred to Torque To Yield (TTY).

A fastener specification of Torque Plus Angle (TA) - for example, 30 N.m (22 lb. ft.) + 120 degrees - has more clamping force than a fastener specification of Torque (T) - for example, 30 N.m (22 lb. ft.). A fastener specification of Torque Plus Angle to Yield (TAY) has more clamping force than a fastener specification of Torque Plus Angle (TA).

### Torque (T)

A fastener with a Torque (T) specification can be tightened with a conventional torque wrench.

**Tip:** Generally, externally threaded fasteners (bolts, screws, studs) tightened to this specification method can be reused, unless otherwise specified in the service information.

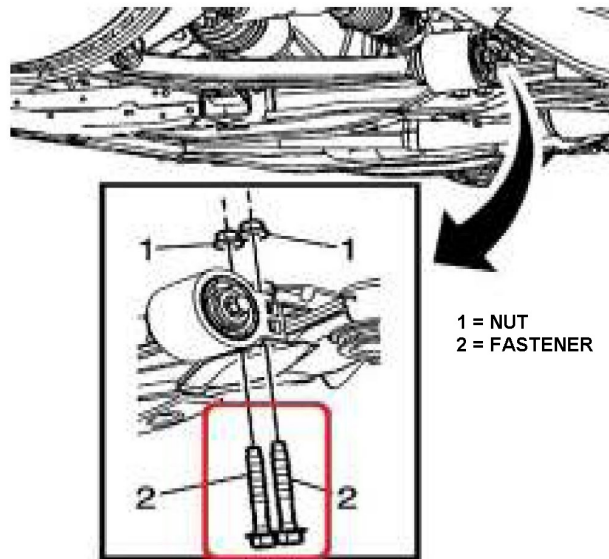
### Torque Plus Angle (TA)

A fastener with a Torque Plus Angle (TA) specification must be tightened first to the torque part of the specification and then must be tightened further by the addition of the specified angle. The angle must be applied relative to the mating fastener, if present, or relative to the mating surface. A backup wrench

must be used, if required, to prevent the rotation of the mating fastener while the angle is added to the fastener with the Torque Plus Angle (TA) specification.

**Tip:** Generally, externally threaded fasteners tightened to this specification method can be reused, unless otherwise specified in the service information.

### Torque Plus Angle to Yield (TAY)



**A fastener with a Torque Plus Angle to Yield specification (TAY) (as illustrated above) is tightened in the same way as the fastener with the Torque Plus Angle (TA) specification.**

The difference between a Torque Plus Angle (TA) specification and a Torque Plus Angle to Yield (TAY) specification is the tightening results in permanent deformation of the externally threaded fastener.

**Tip:** Externally threaded fasteners tightened to this specification method must not be reused and must ALWAYS be replaced if loosened.

### Tightening in Stages

Generally, Service Information specifies a fastener tightening specification in stages. An individual fastener with a Torque (T) specification is tightened to the specified torque in one pass.

For Torque Plus Angle (TA) and Torque Plus Angle to Yield (TAY) specification fasteners, the fasteners are tightened in stages. All the fasteners are tightened to a torque specification on the first pass. Next, they receive another tightening to a specified angle (in degrees) on the second pass. Sometimes, more than two passes are required.



Always refer to the appropriate service Information for proper tightening in stages.

On applications with more than one fastener, such as wheel nuts or cylinder head bolts, the fasteners should be tightened to specification by alternating between the fasteners to ensure the parts are not distorted and that the fasteners are torqued evenly. Once a specified minimum of torque has been achieved for each bolt, the bolts should be tightened completely to specification.

#### Reusing the Fastener

Think of an externally threaded fastener (bolt, screw or stud) as a spring. As a Torque (T) or Torque Plus Angle (TA) tightening specification is applied, the spring (externally threaded fastener) is stretched. With a Torque (T) or Torque Plus Angle (TA) tightening specification, the spring returns to its original length (elastically stretched) when loosened. In the case of a Torque Plus Angle to Yield (TAY) tightening specification, the spring is overstretched (plastically deformed) and does not return to its original length.

For this reason, the Torque Plus Angle to Yield (TAY) tightening specification requires the externally threaded fastener to ALWAYS be replaced.

In the service information, the following warning will be shown when a Torque Plus Angle to Yield (TAY) specification fastener is used:

**Warning:** This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fasteners could cause damage to the vehicle, component, or bodily injury.

**Tip:** There is no effect to the object in which the externally threaded fastener is threaded. It can be either a nut or a threaded hole in a component. If a nut is present, it can be reused.

#### Why Do Engines Specify TA or TAY Torque Specifications

With the added benefit of increased clamping force, a smaller fastener can be used when a Torque Plus Angle (TA) or Torque Plus Angle to Yield (TAY) tightening specification is quantified. For example, an M12 size bolt with a Torque Plus Angle to Yield (TAY) specification can be used in place of an M16 size bolt with a Torque (T) specification. The use of Torque Plus Angle (TA) and Torque Plus Angle to Yield (TAY) specifications result in a reduction in the vehicle weight and, therefore, improved fuel economy.