Earnest

FASTENER CONCEPTS

Understanding the Different Styles of Patches on Fasteners.

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Many of us are familiar with the different styles of locking nuts that are available within our industry (all metal Stover® style locknuts, hex serrated flange lock nuts, or nylon insert lock nuts), but when it comes to screws, we are limited in the styles of locking options available.

The use of patches on threaded fasteners can be a very effective way of improving a fastener assembly's resistance to coming loose in high vibration applications.

Patches are typically grouped into three different categories:

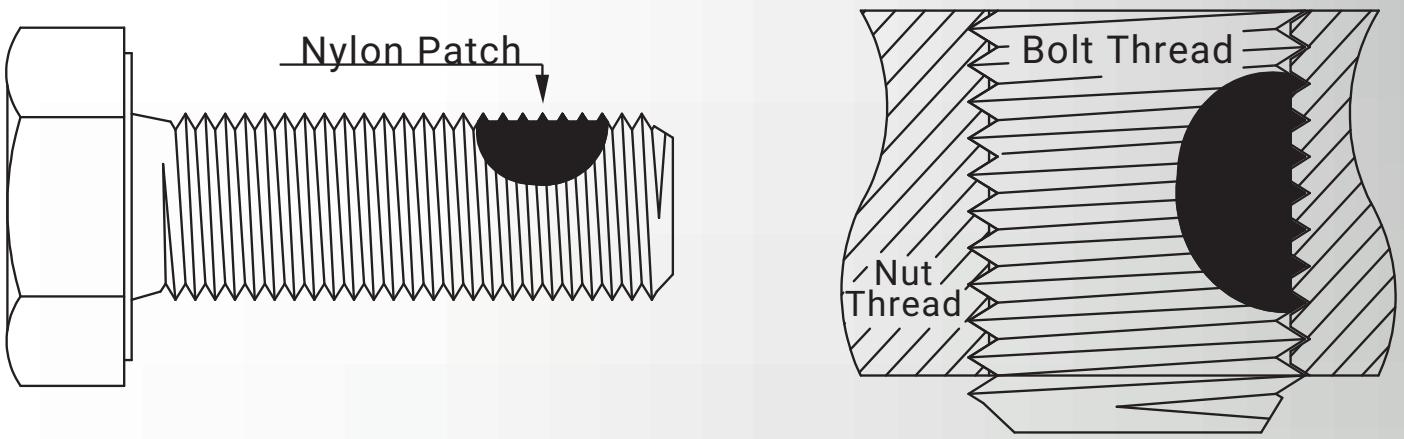
1. **Nylon Patch**
2. **Chemical (or Adhesive) Patch**
3. **Sealing Patch**

Deciding which style of patch is needed for your application will also depend on three key factors:

Application	Best Patch Material
1. Patch must be re-usable	Nylon Patch
2. Requires maximum holding strength in a one-use patch	Chemical Patch
3. Patch must provide a leak resistant seal	Sealing Patch

The Nylon Patch

The nylon patch (also called a non-metallic resistant prevailing torque patch) is a popular choice for use on both screws and nuts. The nylon patch material is applied by heating the nylon to its liquid state and then pouring the liquid nylon onto the threads of the screw or nut. The nylon is applied to just one side of the thread, covering between 90° to 180°. Typically, when the patch is applied, the first one to two threads are left clear of the nylon (to ensure easy installation of the nut) with the nylon covering the next four to seven threads.



Applying the nylon patch to one side of the thread's circumference allows it to lock in place by causing a wedging action to occur between the mating threads when they are assembled.

Nylon patched screws and nuts are also re-usable. They can be disassembled and reassembled up to five times and still provide a locking action. The temperature range of a nylon patch is the same as a nylon insert lock nut at 250° F maximum.

The Nylon Patch (cont.)

Prevailing torque patches can be made from other plastic materials other than nylon and alternative patching materials can be rated for use in temperatures of up to 400° F. Nylon patches can be applied 360° around the thread, however, this much coverage is typically done to create a sealing action in the threads (see sealing patches below).

The different companies that apply nylon patches tend to color code the nylon to make it distinctive to them (Nylok typically uses a blue nylon while ND Industries uses a yellow nylon). When you are dealing with a nylon patch, the performance characteristics of the patch are the same regardless of the color.

The industry standard that defines the performance requirements for nylon (or non-metallic) patches is the Industrial Fasteners Institute standard IFI-124 (for inch screw threads), IFI-155 (for inch nut threads) and IFI-524 (for metric screw threads).

The location and length of the nylon patch can be adjusted for specific applications. When used in a pre-tapped blind hole, the standard location of the patch (the first one to two threads are left clear of the nylon with the patch covering the next four to seven threads) will ensure that maximum locking action occurs. For applications where a nut is being installed onto the screw thread, the location of the patch must be located to ensure that the nut is assembled over the patched threads.

The nylon patch should not be confused with the nylon pellet or nylon plug. A nylon pellet works by drilling a hole into the screw thread and inserting a round or rectangular shaped pellet of nylon into the threads. The nylon pellet locking thread is an older Mil-Spec type of fastener that is not as commonly used as the nylon patch.

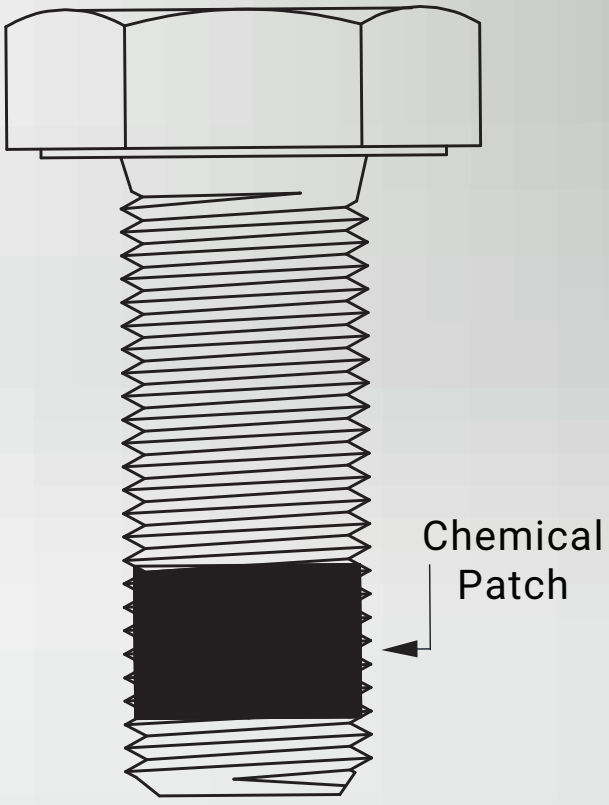
The Chemical Patch

The term chemical patch is used to describe an adhesive patch material that works by gluing the threads together within the assembly. The adhesive patch that is applied to the threads will not cure until the screw is assembled onto a mating thread and is sealed from the air (known as anaerobic adhesives). Chemical patches are applied a full 360° around the thread and come in various formulas.

Depending on the applicator, the adhesive can be epoxy or acrylic based. The epoxy style of chemical patch is the most commonly applied chemical patch used within our industry. You will often hear it referred to as micro-encapsulated epoxy, meaning that the two parts of the epoxy will not mix until they are assembled into a mating thread. The acrylic style patch can offer higher temperature ranges and added resistance to various chemicals over an epoxy patch.

These pre-applied chemical patches are designed to provide similar performance to the liquid Loctite style of thread lockers. The pre-applied chemical patch also provides the convenience of having the patch already present on the threads, without the need for the assembler to remember to apply a liquid patch at the time of assembly.

The coverage area of a chemical patch is similar to that of a nylon patch. The first one to two threads are free from adhesive, with the next four to seven threads covered 360° with the patch material.



The Chemical Patch (cont.)

Pre-applied chemical patches are available in various formulas that determine how much holding power they provide (from medium strength to high strength). Chemical patch providers also color code their chemical patches, so it's important to know that the color of the patch has meaning. There is no industry standard that specifies what the color should be for a high strength or medium strength formula. The largest manufacturers of pre-applied patches are 3M Corps' Scotch-grip, Loctite's DriLoc, and ND Industries' Vibra-Tite. All of which are available in multiple formulas that can provide various strengths, temperature resistance, and chemical resistance.

The chemical patch is considered to be a one-time use patch, meaning that once the screw has been assembled and allowed to set (typically for 24 hours to achieve its full strength), it cannot be disassembled and then reassembled to create another locking action.

Most manufacturers will list a one to two year shelf life on an unused patched screw as after that time it will no longer be able to provide its maximum holding strength. Once they are assembled, however, the patch has an unlimited lifespan as long as the screw is not disassembled.

The industry standard that defines the performance requirements for chemical patches is the Industrial Fasteners Institute standard IFI-125 (for inch screw threads), IFI-160 (for inch nut threads) and IFI-525 (for metric screw threads).

Just like the nylon patch, the location and length of the chemical patch can be adjusted for specific applications. When used in a pre-tapped blind hole, the standard location of the patch (the first one to two threads are free from adhesive with the chemical patch covering the next four to seven threads) will ensure maximum locking action occurs. For applications where a nut is being installed onto the screw thread, the location of the patch must be located so that the nut is assembled over the patched threads.

The Sealing Patch

A sealing patch is typically used on pipe or hydraulic fittings to ensure that the threads provide a leak proof seal when assembled. Sealing patches are typically made using special or softer materials that create a liquid tight seal in the thread.

Sealing patches are also applied to standard screw and nut threads for use in applications that require a liquid tight seal on the threads. Sealing patches are typically not designed to provide a locking action like a chemical or standard nylon patch. Note that a nylon patch that has been applied a full 360° around the thread will provide both a sealing and locking action.

Sealing patches are applied a full 360° around the threads. On pipe and hydraulic fittings, the first one to two threads are left free of the patch material and then the remaining threads are coated. For screw threads the sealing patch is typically applied to the first five to ten threads of the screw.

Sealing patches do not have an industry standard performance spec (such as a nylon or chemical patch). The performance of the sealing patch is defined by the manufacturer (Loctite's Dri-Seal, 3M/Nylok's Precote, ND Industries Vibra-Seal, etc). Each manufacturer will color code their version of the sealing patch to identify it with them, therefore, the color of the patch material is significant to ensure you have the correct patch for your application.

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