

**NC Department of Insurance
Office of the State Fire Marshal - Engineering Division
325 N. Salisbury St, Raleigh, NC
919-647-0000**

Thread Compounds and PTFE¹ tape

Code: Fuel Gas Code
Section: 403.9.3ⁱ, 305.1ⁱⁱ
Code: Residential Code
Section: G2408.1

Date: August 20, 2019

Question:

Is the use of PTFE tape on pipe threads **never allowed** in conjunction with thread compound?

Answer:

No.

Question:

Is the use of PTFE tape on pipe threads **always allowed** in conjunction with thread compound?

Answer:

No.

There are many, many different thread compounds compatible with gas piping, and different thicknesses and additives of PTFE tape also available for gas piping. It is difficult to say “**always allowed**” or “**never allowed**” because that would require a side-by-side analysis of all products and product combinations and their respective manufacturer’s installation instructions. Many of these instructions simply do not address the issue so further polling would be required.

**However, there is not a blanket prohibition for using
thread compound in conjunction with the appropriate
PTFE tape for gas piping.**

In

Figure 2 there is an excerpt from the installation instructions from a thread compound manufacturer. Please note the yellow-highlighted sections indicating it needs to be touching the metal to cure properly. If PTFE tape is used with this product, there is not predictable surface

¹ Familiarity with the Teflon brand of fluoropolymers has led to the practice of erroneously referring to PTFE-based thread seal tape as "Teflon tape". Chemours, owner of the Teflon trademark, no longer manufactures any thread seal tape,[1] and the company has launched a campaign[11] against the practice[Wikipedia,2018]

contact with the metal in all places. Therefore, this is a product that could not be used in conjunction with PTFE thread sealing tape.

Now, look in

Figure 2, which is a can of a more common, but different type of thread compound, and the directions acknowledges people will be using it with PTFE sealing compound, and to be careful to not overtighten the joints. This product happens to be one that does not harden and is not required to have contact with the metal in order to work.

Figure 1: Installation Instructions-Requires contact with metal

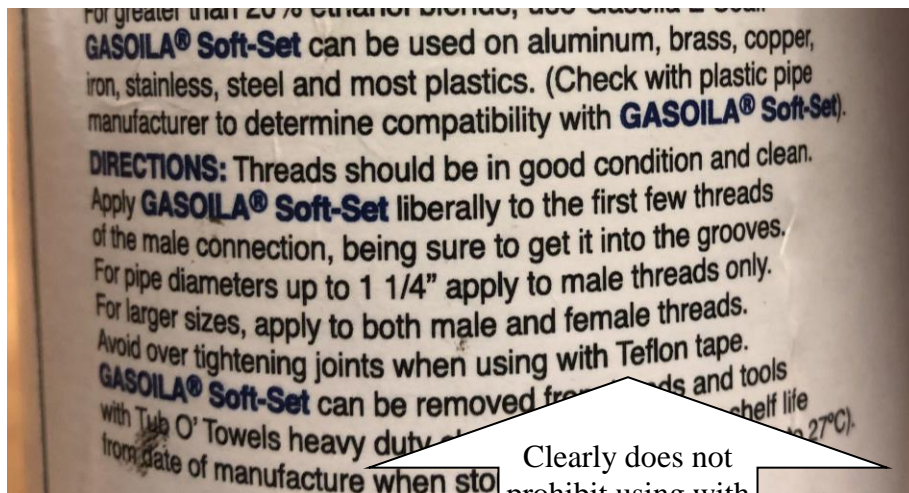
Description

FasSeal ATS is an excellent general-purpose Pipe Thread sealant that provides an instant permanent seal to pipe threads. Anaerobic sealants cure in the absence of air **and the presence of metal** to form a solid polymer. Im sealing threads securely. Anaerobic Pipe Thread Sealants are your best choice for high performance thread sealing, especially when a system has to be put back into service quickly and without leaks.

Substrates

Metal Threads Only, Steel, aluminum and Brass. Ideal for Fittings, Pipes, Valves, Gauges, and Connections in Hydraulic, Pneumatic, Lubrication, Steam, and Refrigerant Systems.

Figure 2: Installation instructions - Teflon tape use not prohibited



Clearly does not prohibit using with Teflon tape. Not required, but also not prohibited.

Follow-up Question#1:

Is the use of **yellow** PTFE tape on pipe threads **the only** PTFE tape **ever** allowed for propane or natural gas?

Answer:

Almost always yes.

Although the tape suppliers to the gas industry typically use yellow PTFE for fuel gases, there are manufacturers that make white high-density PTFE made for fuel gases which meet the industry-recognized standards^{iii iv} for thickness and resistance to being dissolved by propane and other additives. Some countries have adopted color standards, and others have not². So, although the vast majority of PTFE pipe thread tape marketed for fuel gas piping threads is yellow, a few minutes of Google searching will yield some white PTFE tapes with the exact same characteristics as yellow PTFE. To keep things simple, it is recommended yellow PTFE be used, or a question is likely to be asked as to the suitability of the white tape.

Follow-up Question#2:

Is the use of low-density white PTFE tape not specifically resistant to propane on pipe threads **always prohibited** for fuel gas piping?

Answer:

Almost always yes.

The tapes used for thread sealing need to do at least three³ things, (1) be capable of resisting the dissolving action of propane and other common additives to propane and natural gas (propane exists in natural gas during certain times of the year in small amounts), (2) be capable of filling the long, spiral void that exists between the inside of the pipe and the outside world, and (3) be capable of not allowing the product inside the pipe from diffusing through the material itself. If the difference between the two tapes was only thickness, you could simply wrap more wraps. However, the PTFE marketed for fuel gases is also denser, meaning it prevents the gas molecules from seeping through it over time. So, if the low-density PTFE is used, it is not known if it will prevent the fuel gases from diffusing through it or being dissolved over its life by additives like propane. There simply is not enough verifiable technical data available without purchasing the

² NC has no specific color requirement for PTFE tapes used for gas piping, other than what may be embedded in manufacturer's installation instructions.

³ Lots of other things also, but that is beyond the scope of this interpretation.

CSA ANSI LC-7 standard to allow the use of the low-density PTFE tape for use with the fuel gases propane and natural gas.

This office (NCDOI) does not have a copy of CSA ANSI LC-7. This standard goes into detail of the requirements of the various compounds and tapes.

Summary

To keep things simple, contractors and code officials would love everything to be black and white, or in this case yellow and white. However, this is a case where the code language defers to the manufacturer's installation instructions and the underlying listings and standards. Those standards do not go into all conceivable combinations, therefore there are certainly preferred methods, but there is not one right way and one wrong way.

To *help* keep it simple, if the installer uses yellow PTFE labeled for all gas piping, it would certainly be a quicker visual evaluation by the code official. This would go for cases where thread compounds are used as well as for times it is not used. If compounds are used, the ones that specifically allow simultaneous PTFE use allows for faster verification also. The use of white PTFE tape for gas piping threads will justifiably result in questions from the code official.

Also, no pipe compound or tape is a substitute for inadequate threads, see NCFGC 403.9^v and subsequent subsections. However, if there is an issue with the threads, the appropriate section or subsections in NCFGC 403.9 need to be adhered to by the installer and cited by the code official if that is the underlying issue.

Finally, this interpretation is not a substitute for vocational training, or meant as an installation or assembly guide. As the installation instructions say for both thread compounds and PTFE tape, do not misapply them such that the compounds or bits of tape end up being pushed into the gas stream as this will result in plugged regulators and other ills.

There are many instructions by equipment manufacturer's that prohibit the use of PTFE tape, not because of product or code issues, but because of installation issues and over-application of tape that results in bits of tape sheared off during installation, and those tape fragments getting stuck in the downstream regulators and valves.

Keywords:

Teflon

ⁱ**403.9.3 Thread compounds.** Thread (joint) compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or to any other chemical constituents of the gases to be conducted through the piping.

ⁱⁱ**305.1 General.** Equipment and appliances shall be installed as required by the terms of their approval, in accordance with the conditions of listing, the manufacturer's instructions and this code. Manufacturers' installation

instructions shall be available on the job site at the time of inspection. Where a code provision is less restrictive than the conditions of the listing of the equipment or appliance or the manufacturer's installation instructions, the conditions of the listing and the manufacturer's installation instructions shall apply. Unlisted appliances approved in accordance with Section 301.3 shall be limited to uses recommended by the manufacturer and shall be installed in accordance with the manufacturer's instructions, the provisions of this code and the requirements determined by the code official.

ⁱⁱⁱCSA ANSI LC 7-2009

American National Standard For Pipe Joint Sealing Compounds And Materials
standard by CSA Group, 02/01/2009

^{iv} There are two US standards for determining the quality of any PTFE tape. MIL-T-27730A (an obsolete military specification still commonly used in industry in the US) requires a minimum thickness of 3.5 mils and a minimum PTFE purity of 99%. [4] The second standard, A-A-58092, [5] is a commercial grade which maintains the thickness requirement of MIL-T-27730A and adds a minimum density of 1.2 g/cm³. [5] Relevant standards may vary between industries; tape for gas fittings (to UK gas regulations) is required to be thicker than that for water. [Wikipedia, 2018]

^v**403.9 Metallic pipe threads.** Metallic pipe and fitting threads shall be taper pipe threads and shall comply with ASME B1.20.1.

403.9.1 Damaged threads. Pipe with threads that are stripped, chipped, corroded or otherwise damaged shall not be used. Where a weld opens during the operation of cutting or threading, that portion of the pipe shall not be used.

403.9.2 Number of threads. Field threading of metallic pipe shall be in accordance with Table 403.9.2.

403.9.3 Thread compounds. Thread (joint) compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or to any other chemical constituents of the gases to be conducted through the piping.