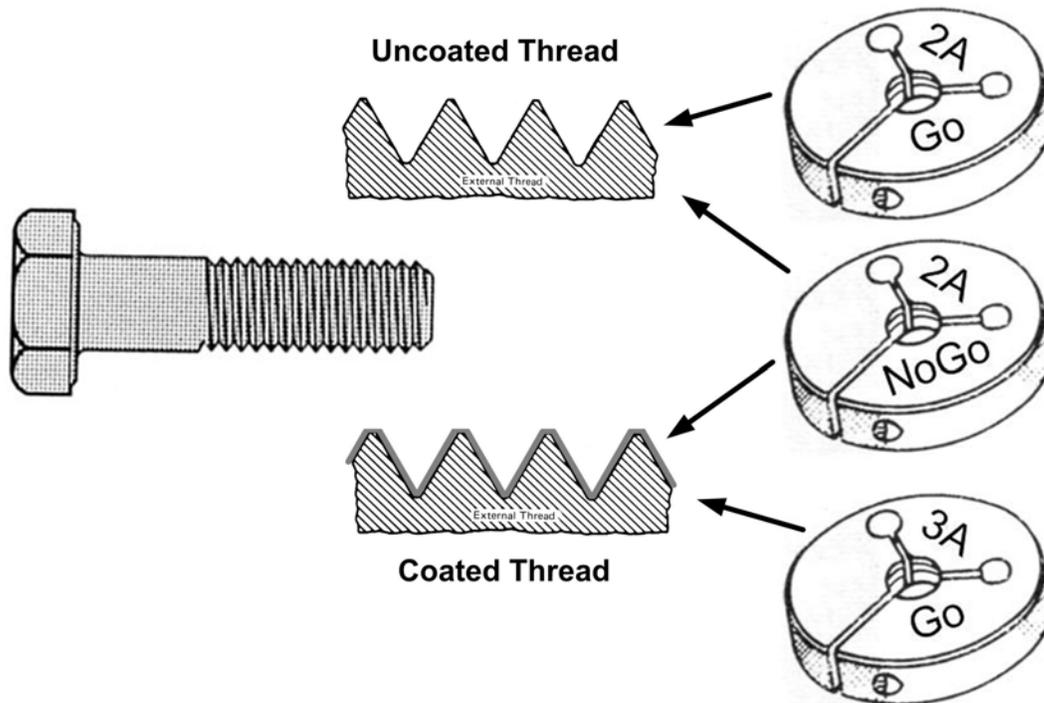


Only the GO Size Is Different After Plating on External Inch Threads



Of all of the questions I answer each month, the one that still occurs with the greatest frequency is related to the proper size gaging requirements for standard threads after they are plated or coated. In this article I will address the answers regarding external inch threads. In a future article I will explain the answer to this issue for external metric threads.

The B1 Committee of the American Society of Mechanical Engineers (ASME) in the United States is the creator and maintainer of the standards for all inch screw threads. The standard for the standard machine 60° screw thread geometry and sizes is ASME B1.1.

The majority of screw and bolt drawings for inch parts state "Class 2A Threads" and then goes on to specify plating somewhere else on the drawing. Here in lies the source of confusion.

Below is the applicable statement from ASME B1.1-1983:

7.2 Material Limits for Coated Threads

Unless otherwise specified, size limits for standard external thread Class 2A apply prior to coating. The external thread allowance may thus be used to accommodate the coating thickness on coated parts, provided that the maximum coating thickness is no more than one-fourth of the allowance (see Fig. 5). Thus, the thread after coating is subject to acceptance using a basic Class 3A size GO thread gage and a Class 2A thread gage for either minimum material or NOT GO. Where external thread has no allowance, or allowance must be maintained after coating, and for standard internal threads, sufficient allowance must be provided prior to coating to assure that finished product threads do not exceed the maximum-material limits specified. For thread Class 3A, Class 2A allowances in accordance with Tables 20 to 30 or Table 32 should be applied whenever possible (see paras. 7.4, 7.5, and 7.6).

This statement in B1.1 means that the threads described on a drawing as "Class 2A" are to be inspected using the size limits for Class 2A BEFORE PLATING OR COATING. This means that the Class 2A GO and 2A NOGO limits and gages must be used to inspect and accept the pre-plated or coated threads.

After the threaded parts are plated or coated they must be inspected using the Class 3A GO thread limits and gages and the 2A NOGO limits and gages for inspection and acceptance.

NOTE: For this rule to apply, the plating or coating that is specified must not be thicker than $\frac{1}{4}$ of the total "allowance designated in the B1.1 standard. This normally limits the plating thickness to approximately .0003". If thicker plating or coating is specified, the pre-plating/coating sizes must be adjusted smaller so the parts will be acceptable using the Class 3A GO limits and gage and the Class 2A NOGO limits and gages after plating or coating. It must be noted that the plating/coating thickness builds up four times faster on the thread pitch diameter than it does on the surface of the screw or bolt head. Due to the combined geometry of the 60° thread form, if plating or coating measures .0001" on a screw or bolt head, that thickness measures .0004" on the pitch diameter of the same part.

A drawing designating a 1/4-20 "Class 2A" thread and also designating plating or coating on the parts must use the following limits and gages for accepting the threads before and after plating or coating:

Pre-plating or Pre-coating Thread Limits							
Thread Size	Thread Class	Major Diameter		Pitch Diameter		Allowance	Maximum Plating or Coating Thickness
		Max. GO	Min. NOGO	Max. GO	Min. NOGO		
1/4-20	2A	0.2489	0.2408	0.2164	0.2127	0.0011	0.00028
	3A	0.2500	0.2419	0.2175	0.2147	0.0000	0.00000
After Plating or Coating Thread Limits							
Thread Size	Thread Class	Major Diameter		Pitch Diameter		Allowance	Maximum Plating or Coating Thickness
		Max. GO	Min. NOGO	Max. GO	Min. NOGO		
1/4-20	2A	0.2489	0.2408	0.2164	0.2127	0.0011	0.00028
	3A	0.2500	0.2419	0.2175	0.2147	0.0000	0.00000

The only exception to this B1.1 rule is if the part drawing specifically states "2A AFTER PLATING/COATING". In these cases the pre-plate threads must be made smaller than the standard 2A size limits so that after they are plated or coated they will not exceed the standard 2A GO and 2A NOGO size specifications.

As stated in the beginning, this is the most misunderstood rule regarding the inspection of screw threads. This misunderstanding is a major source of disputes between threaded product suppliers and purchasers each year. I hope this brief article will help to clarify this issue for all of those involved in the inspection and acceptance of externally threaded inch screws, bolts, and components.

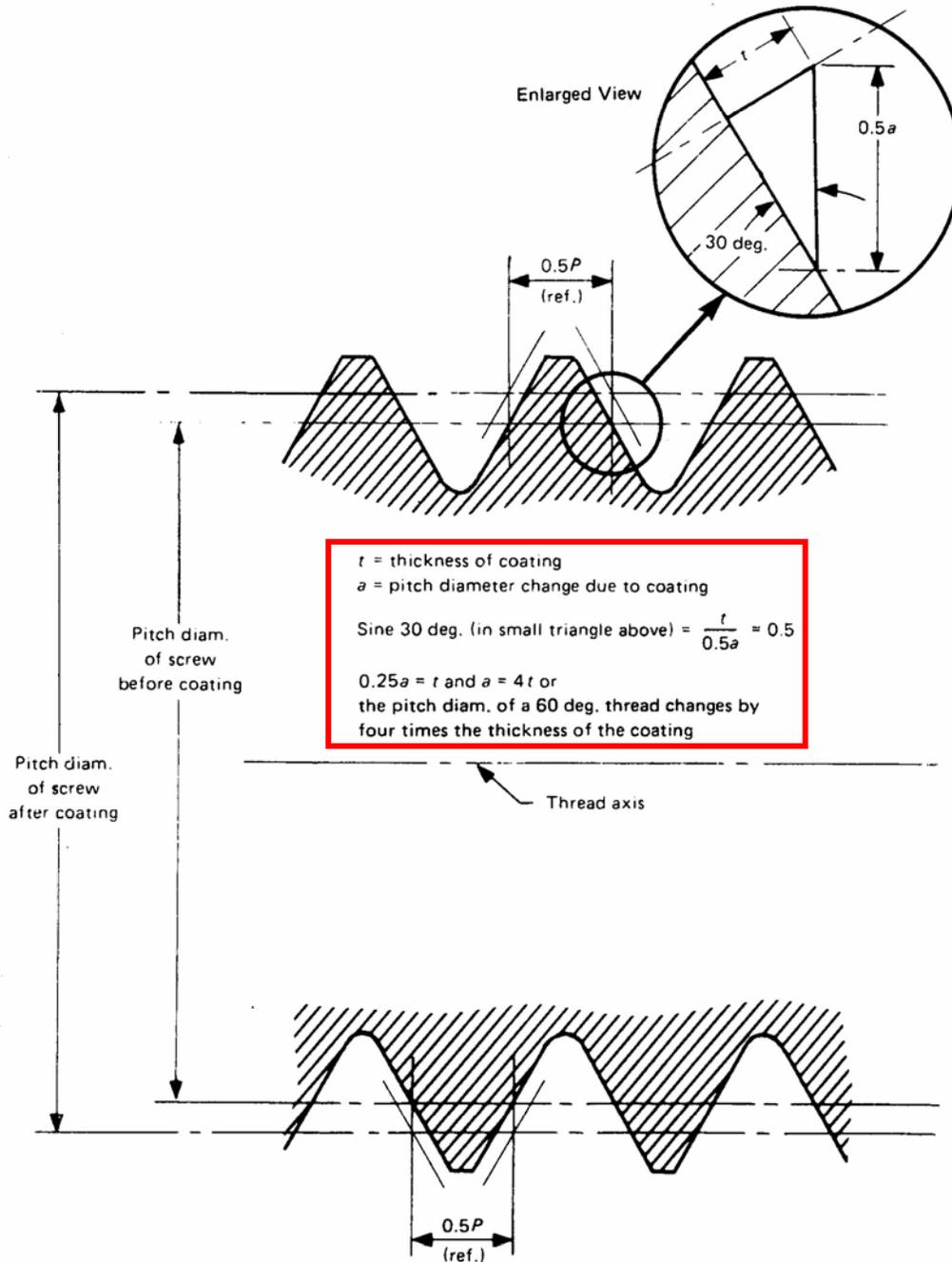


FIG. 5 RATIO OF PITCH DIAMETER CHANGE TO THICKNESS OF COATING ON 60 DEG. THREADS



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Joe Greenslade has been active in the fastener industry since 1970. He has held positions with major fastener producers in sales engineering, marketing, product design, manufacturing management, and research and development management.

Mr. Greenslade currently owns his own firm that designs and manufactures gaging devices used in the fastener industry and is an internationally accredited calibration services provider. He holds 12 US patents on various fastener-related products. Joe Greenslade has authored over 200 trade journal articles on fastener applications, manufacturing, and quality issues. He is one of the fastener industry's most frequent speakers at trade association meetings and conferences. He is the youngest person ever inducted to the Fastener Industry Hall of Fame.

Mr. Greenslade is active in the following fastener industry associations and societies:

- Former Chairman, American Society of Mechanical Engineers, B1.1 Screw Thread Standards Subcommittee
- Secretary, American Society of Mechanical Engineers, B1.2 Screw Thread Gaging Subcommittee
- Member, American Society of Mechanical Engineers, B1.3 Screw Thread Acceptability Subcommittee
- Member, American Society of Mechanical Engineers, B18 Fastener Standards Subcommittees
- Member, American Materials and Testing Society F16 Fastener Testing Subcommittee
- Member, Society of Automotive Engineers Ship Systems & Equipment Fastener Subcommittee
- Member, Board of Directors of the American Association for Laboratory Accreditation (A2AL)
- Member, American Measuring Tool Manufacturers Association
- Associate Members, Industrial Fastener Institute
- Associate Member, National Fastener Distributor Association
- Former Member, The Fastener Quality Act Public Law Task Force
- Member, Screw Thread Conformance Task Force (STC-TF) for the revision of aerospace thread and thread gaging practices for the Federal Aviation Administration (FAA) and the Department of Defense (DOD).

Mr. Greenslade works as a consultant with fastener suppliers and end users on product design, applications engineering, and quality issues. In this capacity he works to resolve fastener applications problems, to help select the best fastening approaches in new product designs, to assist in the standardization of fasteners used within an organization, and to provide training on various aspects of fastening technology and fastener quality assurance. He also serves as Expert Witness in litigation involving fastener related issues.

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