

Questions about Fastener Standards

扣件博士：扣件标准问与答

Dr. Fastener:

In 1841, Sir Joseph Whitworth presented his paper, "A Uniform System of Screw Threads" to Great Britain's Institution of Civil Engineers, launching the first ever industrial standard. Since then, fastener standards have often led the way and are integral parts of many national and international standards organizations' resources. In fact, today, there are thousands of different fastener standards. Keeping track of and understanding them can often be an overwhelming task. In this segment, Dr. Fastener will answer some frequently asked questions about fastener standards.

Q: What is a fastener standard?

A: A fastener standard is a document either generated by an organization that composes and maintains industrial standards or an organization that uses fasteners, with the purpose of creating a uniform framework from which to assess product, performance, or process against. Fastener standards give us information like what material we should use, what dimensions to make the parts to, how parts should perform, what tests to use, and other information like that.

Q: What are the different types of standards?

A: There are thousands of fastener standards out there, but they generally can be categorized into one of several types; Product/Dimensional Standards, Material Standards, Test Standards, Process/Method Standards, Quality Standards, and Procurement Standards. For fasteners, the most common of these are Product/Dimensional Standards and Material Standards. Just about any part that is considered a standard will have an associated Product/Dimensional Standard. This document will either provide or reference all the necessary information to actually produce the part. Not only will it provide dimensions and important manufacturing information but, also, either specify or refer the user to additional standards or sources of information for the required raw materials, tests, quality practices, and other related information necessary to adequately define the part. Material standards may provide information about the raw material, processing information such as heat treating and plating, mechanical properties and performance, or testing. There are some standards written exclusively for the purpose of defining testing for fasteners, a special process or method, the quality system or practices to employ, or the purchasing requirements.

Q: Can you explain what a Consensus Standard is?

A: A Consensus Standard is one that was developed and maintained by a Consensus Standards Organization. A Consensus Standards Organization is one that has processes in-place to assure that the standard is developed by a diverse group of subject matter experts under strict structural protocols that guaranty agreement of these experts in the final output. Examples of Consensus Standards Organizations are the International Organization for Standardization (ISO), the American Society of Testing and Materials (ASTM), the Japanese Industrial Standards Committee (JISC), and the Deutsches Institut für Normung (DIN), to name a few. Although each Standards Organization has their own rules and methods of ensuring the quality and integrity of their standards, they all work in a similar fashion. Essentially each organization creates a technical committee for fasteners and recruits a group of fastener subject matter experts. They often take special care to make sure that the make-up of these committees is balanced, so that no particular interest (such as manufacturers, distributors, or end users) has a dominating influence on the outcome of the standard. The process then requires back and forth dialog between the experts and a layered approval process that has checks and balances along the way to make sure that dissenting views must be heard and resolved before a standard can be released. Thus, they are called "Consensus Standards" as the process is designed to get the experts to hash out and resolve any differences they may have.

Q: What are the primary Consensus Standards Organizations for fasteners?

A: Many countries have their own national standards organizations. There are also many smaller, more specialized organizations that, in addition to standards centered on their primary focus, may maintain several fastener standards. Therefore, the list would be quite long. Internationally, however, the organizations that are very well known for their fastener standards are:

- International Organization for Standardization (ISO Standards)
- American Society of Mechanical Engineers (ASME Standards)
- American Society of Testing and Materials (ASTM Standards)
- Japanese Industrial Standards Committee (JIS Standards)
- Deutsches Institut für Normung (DIN Standards – Note: Many of the DIN fastener standards have been withdrawn and replaced with ISO standards, but DIN is still very much recognized for fastener and raw material standards.)
- SAE International (SAE and AMS Standards)
- National Aerospace Standards Committee (NAS, NASM, NA, and NAM Standards)





Q: What is a Non-Consensus Standard?

A: A Non-Consensus Standard is one that is not developed with a process that requires consensus. Generally any standard created by a user or an organization that is developing the standard for their exclusive benefit would be considered a Non-Consensus Standard. A couple of notable examples include Boeing fastener standards, Automotive OEM standards such as GM, Ford, and Toyota, and US military standards (MS Standards).

Q: Which is better, a Consensus or Non-Consensus Standard?

A: It all depends. One could make an excellent argument that Consensus Standards are better because they were developed by a broad group of experts that have come to agreement. As such, Consensus Standards usually represent a broader, industry-wide understanding of the topic. On the other hand, if you are a user and have unique requirements, a Non-Consensus Standard customized to your needs is better. Sometimes, however, because they may not reflect limitations or specific knowledge of the industry, they are much more difficult to meet.

Q: How often do Standards get updated?

A: Again, it depends. Some Non-Consensus Standards rarely get reviewed or revised. Consensus Standards Organizations, however, have rules in-place to make sure that their standards are regularly reviewed and updated as needed. Although ISO is somewhat of an exception because of the longer time frame needed to get international agreement, most organizations have rules to review and update their standards at least every five years. Often a standard needs no updating, in which case it receives a review and is “Re-Issued” or “Re-Affirmed”.

Q: Does this process of updating create any problems?

A: Let’s not call it a problem, but it does create challenges. The primary challenge is for user organizations to have a process that assures they are using the right revision level. To complicate matters, although most of the time an organization wants to be using the latest revision, there are cases where providing a part to an old revision is necessary. In this case, the supplying organization must make sure they are using the right revision. A second challenge that updating can create is with slow moving inventory. What does an organization do when it has a large amount of inventory of parts made to older revisions? This depends on each individual situation, although many updated standards have provisions for either selling or using up old stock first.

Q: What does it mean that Consensus Standards “lead the way”?

A: Since Consensus Standards are developed by a broad group of industry experts and they get routinely updated, they usually reflect the “state-of-the-art” understanding in the industry. As such, when a new practice or idea is introduced to the industry, it gets traction first in Consensus Standards. As it is accepted in the industry through Consensus Standards, Non-Consensus Standards usually follow.

Q: Have there been any significant problems in recent years with standards?

A: Yes. Two notable examples come to mind. The Consensus Standards Organizations often have many different technical committees. Sometimes these committees overlap interest. One such example occurred recently within ASTM and another within ISO. Essentially the problem was identical. Within ASTM there is a technical committee for fasteners and one for plating and coating. The Plating and Coating Committee has a general purpose standard, meaning it is meant to apply to many different industries and products, for zinc electroplating. This standard is ASTM B633. This standard was meant for general purpose usage so that it does not have any special provisions for threaded fasteners, such as the unique requirements for thread gauging. This committee was in existence for many years before the fastener committee was formed. Therefore, if a user needed to reference an ASTM zinc plating standard for a threaded fastener, this was their only option. Unfortunately, because it was not written for fasteners, it often created problems. To address these issues the ASTM Fastener Committee created their own zinc electroplating document, ASTM F1941/F1941M. The two standards do not agree on all points, most notably the conditions that trigger a hydrogen embrittlement relief bake. Although this might seem like a trivial difference, in fact, it created a great deal of confusion and led to a couple of very high profile bolt recalls and legal actions. It became imperative to get this fixed. After several grueling years, the discrepancy in the standards was resolved and a revised B633 released in 2019. However, there is still confusion over which standard to use, and the fastener industry needs to continue to educate its customers that they should always use a fastener standard for fasteners when one exists. At ISO there was an identical issue with potential confusion between the fastener specific electroplating standard, ISO 4042, and its general purpose counterpart.



Q. Have there been any notable revisions in the last few years or any coming up?

A: To reiterate, Consensus Standards are always being updated and revised, so an answer to this question could be a long list. However, a couple of the most notable examples in the last few years include:

- ISO 4042 - This fastener electroplating standard has received several updates that included the addition of a comprehensive Appendix providing guidance on a number of thorny issues related to electroplating fasteners and updating the hydrogen embrittlement relief requirements and actions.
- ASTM F3125/F3125M - This is a new standard that combined six different structural bolt types into a single standard. What were formerly six different standards, A325, A325M, A490, A490M, F1852, and F2280, is now one.
- ISO 898- 2 - This metric strength standard for nuts was revised in 2022.
- ISO898-12 - This primary metric strength standard for bolts and screws is currently being revised.
- SAE J12372 - This metric tapping screw standard was revised in 2021.
- SAE J4292 - This primary inch strength standard for bolts and screws is currently under revision and will probably be released with some significant revisions within the next year or so.

Q. Can you certify a product made to one standard with a different standard, such as taking raw material certified to a JIS standard and recertifying it to an SAE standard?

A: In general, no. Although things may appear “equal”, standards between organizations are not the same. Even if some of the information overlaps, it may not all overlap. If there is even a slight difference between standards, it is not appropriate to replace the existing standard with the other one. Therefore, although there may be instances where this is possible, in general, it is not good practice.

Q. How do I keep my standards library up-to-date?

A: This is an important question and one all suppliers must wrestle with. Any organization that is registered with a modern Quality Management System, like ISO9001, must address this question head-on. The challenge for many organizations is the sheer number of standards they must have access to and the high cost associated with purchasing new versions every time they are revised. Although every organization must assess this subject and decide what is best for them, here are a couple of tips:

- If you supply inch fasteners- purchase a yearly subscription to the online IFI Book of Standards (www.indfast.org). This is a collection offered by the Industrial Fasteners Institute of most of the ASME, ASTM, SAE, and IFI standards related, primarily, to inch standards. Alternately, this collection is available in a printed book, but the advantage of the on-line version is that the accompanying standards will always be up-to-date.
- If you supply metric fasteners- check with your national standards body to see if they offer an on-line compilation of ISO fastener standards. If not, the Standards Council of Canada (www.scc.isolutions.iso.org) offers a compilation of ISO fastener standards in an on-line format.
- There are also organizations that provide standards management services for you. You provide them a list of all the standards you need to keep up-to-date and they will either notify you or automatically supply you an updated version when it is released. Of course, there is fee on top of the cost of the standard for this service.



Dr. Fastener:

The subject of standards is a very important one. Fastener suppliers should know which standards are important to them and be sure to stay updated every time one of these gets revised. Beyond keeping them up-to-date, suppliers should have individuals that are “students” of these standards and know what is in them and how to read them. Organizations that don’t have such individuals should make a very concerted and intentional effort to get individuals educated on these documents. Finally, fastener suppliers and users, alike, should consider investing back into the industry by supporting experts from their organization to participate in their national standards committee work. ■

