

The Proper Designation and Use of Standards by End-users and Suppliers Is Critical to Fastener Quality

Presented by the

Fastener Industry Education Group (FIEG)

A joint effort of the

National Fastener Distributors Association (NFDA)

and the

Industrial Fasteners Institute (IFI)





Forward:

This document was prepared by a working group consisting of members of the National Fastener Distributors Association (NFDA) and the Industrial Fasteners Institute (IFI) to provide a comprehensive view of the importance of taking proper steps to assure that only conforming fasteners make their way into the stream of commerce. This document identifies what the responsibilities are of all parties in the supply chain toward that objective. The name of this working group is the *Fastener Industry Educational Group (FIEG)* and its mission statement is as follows:

The mission of the NFDA-IFI Fastener Industry Education Group (FIEG) is to educate all fastener end-users and suppliers (manufacturers, importers, and distributors) about the importance of understanding and effectively using industry and government fastener standards and how to determine the conformance of the products to those standards.

1. Introduction:

The importance of specifying fasteners thoroughly and correctly.

Standards are the foundation of the fastener industry. Both users and suppliers of standard fasteners are much better served and the cost of doing business is less when fastener standards are understood and adhered to on a consistent basis. When end users require specially-engineered fasteners they should cite the various fastener standards that are applicable to characteristics of their fastener that are not unique to their design.

Fastener users who understand the standards applicable to the fasteners they use experience fewer manufacturing problems resulting in lower total manufacturing costs. Fastener suppliers who understand and assure the adherence to the standards applicable to the products they sell are more valuable to their customers and the suppliers make fewer mistakes resulting in fewer monetary losses and less time invested in problem solving.

Understanding and adhering to fastener standards lowers the cost of doing business making both users and suppliers more efficient and more profitable. The public is also safer when fasteners consistently conform to their applicable standards because the possibility of consumer and industrial product and equipment failures is greatly reduced.





2. What are fastener standards?

- a. *Fastener standards* are documents that have been created by standards bodies to assure that fasteners will fit (proper size) into the applications for which they are designed, and that once in place, those fasteners will provide the desired design function (strength, endurance, corrosion resistance, etc.). Fastener end users and suppliers (manufacturers and resellers) are responsible for understanding and using fastener standards thoroughly and correctly to assure the desired quality of end products is achieved and to avoid errors and confusion during the procurement process.

Fastener standards are documents that contain the dimensional, material, and/or mechanical property requirements for various fasteners. End users consult standards to determine the correct fasteners for their applications. Fastener manufacturers use the standards for guidance in making fasteners and all users and suppliers follow the testing and inspection requirements of the standards to assure product conformance.

- b. Who are the most common fastener standards bodies?
 - i. The American Society of Mechanical Engineers (ASME) predominantly covers the dimensional requirements of fasteners. ASME standards cover fasteners used both in construction and in general industrial assembly.
 - ii. The Society for Testing and Materials (ASTM) predominantly concerns itself with the chemistry of materials and with mechanical testing requirements. ASTM standards cover fasteners used in the construction and commercial industrial industries.
 - iii. The Society of Automotive Engineers (SAE) covers primarily the chemistry of materials and the mechanical properties of automotive, aerospace, and general industrial assembly fasteners.
 - iv. The Industrial Fasteners Institute (IFI) creates standards covering dimensional, material, and mechanical properties of a wide range of fasteners. These are usually intended to eventually become either an ASME, ASTM, or SAE standard after they receive some level of industry acceptance.
 - v. International Organization for Standardization (ISO) covers dimensional, material, and mechanical properties for metric fasteners. This is the most commonly used standard for the production of products that are sold internationally.
 - vi. Deutsches Institut für Normung e. V. (DIN) covers dimensional, material, and mechanical properties of metric fasteners, but most DIN standards for fasteners have been cancelled and superseded by ISO standards. A few DIN standards are still commonly used.





- vii. Japanese Industrial Standards (JIS) covers dimensional, material, and mechanical properties of metric fasteners. Many JIS standards for fasteners have been cancelled and superseded by ISO standards, but a few are still commonly used. JIS standards are still the predominately- used standards in the manufacturing of Japanese automobiles.
- viii. National Aerospace Standards Committee (NASC) of the Aerospace Industries Association (AIA) prepares and maintains National Aerospace Standards (NAS inch based and NA metric based) applicable to fasteners used in the aerospace and defense industries. Additionally, National Aerospace Standards Military (NASM) are former Military Standards (MS) and Army/Navy Standards (AN) that have been transitioned to the NASC for maintenance and updating.
- ix. The European Association of Aerospace Industries – Standardization (AECMA) prepares and publishes European Norm (EN) standards for use in the aerospace and defense industries.
- x. Society of British Aerospace Companies (SBAC) prepares and publishes Aerospace Standards (AS) used in the aerospace and defense industries.

c. Who are the people who create and maintain fastener standards?

Those who write and maintain fastener standards are volunteers, most of whom have technical backgrounds. They consist of fastener end-users, fastener manufacturers, fastener resellers, as well as people who support the fastener industry with a variety of products and services. Their backgrounds and daily jobs vary widely, but their common interest is in fasteners.

The requirements for participation in the standards committees are minimal. The primary requirement is having a keen interest in fasteners. The standards bodies are the compilers, facilitators, and publishers of the standards, but they have very little to do with the content in the standards.

3. What are the components in fastener standards that help to assure good-quality fasteners are supplied?

a. How do standards guide purchasers in correct ordering practices?

Most standards contain ordering information and examples of ordering descriptions. ASTM standards in particular have excellent ordering information. Where ordering practices are not referenced within a standard, the information and examples in most ASTM fastener standards can be used as a guideline.





Following is a list of items that should be in a thorough fastener description:

- i. Thread size (inch-nominal diameter and threads per inch, metric – nominal diameter and pitch)
- ii. Length
- iii. Fastener type (screw, bolt, rivet, nut, etc.)
- iv. Drive type, if applicable
- v. Applicable fastener standard
- vi. Grade or property class
- vii. Finish
 1. Type
 2. Thickness or class
 3. Applicable standard

b. What evaluations must be performed on a fastener?

Fastener standards specify requirements for one or more of the following areas: dimensional, chemical, and/or physical performance. For a fastener to be thoroughly evaluated to assure it conforms to all applicable requirements, all three areas must be verified at some point either during or after manufacturing is completed. (See a list of fastener dimensional characteristics from ASME B18.18.2 and a list of physical evaluations from ASTM F1470 in the appendix.)

c. Who can do fastener evaluations?

Anyone in the supply chain (manufacturer, reseller, or end-user) can perform conformance evaluations on fasteners, but the only point at which all evaluations must be performed or verified at least once is at the point of manufacture.

Evaluations may be performed internally by any member of the supply chain or by using competent outside testing sub-contractors. The evaluators must be familiar with the requirements of the standards and have the necessary equipment to perform the required evaluations.

d. What is the significance of using the correct sample size and why should samples be taken randomly?

Most, if not all, fastener standards specify which quality sampling plan should be used to evaluate products related to that standard. Using the correct sample size provides the confidence that a given lot of fasteners meet the requirements of the standards.

The sampling plans usually relate to final inspection. If the manufacturer uses a documented, statistically based in-process inspection system, the in-process evaluation results can generally be accepted in lieu of final inspection data.





It is critical when doing incoming or final inspections that the test samples be selected randomly from the shipping lot. Randomly selecting samples provides for inspection and test results reflective of parts produced at different times during the manufacturing process to assure fastener conformity throughout the shipping lot.

- e. What should be in a fastener evaluation record and who should maintain them?

A record of the evaluation of every lot of fasteners must exist at one or more places within the supply chain. As a minimum, the fastener manufacturer should maintain such records.

When required by the standard or an agreement between the buyer and seller, a copy of those records must be forwarded to the agreed-upon parties. An audit of any lot of fasteners can be conducted by any member within the supply chain when greater assurance of fastener quality is desired or when required by an agreement between a buyer and seller.

Any evaluation record should contain the following as a minimum:

- i. Full description of the fastener
- ii. Identification of the manufacturing lot
- iii. Identification of the shipping lot if different from the manufacturing lot
- iv. A list for the evaluation requirements in the applicable fastener standard
- v. Evaluation results to the requirements
- vi. Date of the evaluation
- vii. Fastener supplier (manufacturer and/or reseller)
- viii. Buyer if the lot is specifically destined for a given buyer when the parts are evaluated.

- f. How long should evaluation results be maintained?

Fastener evaluation records should be maintained and available for not less than one year from the date of the evaluation, unless otherwise required by the standard, the supplier's quality assurance requirements, or an agreement between a buyer and seller.

- g. How should a quality complaint be handled to assure the true "root cause" of the issue is uncovered as quickly as possible?

When a buyer raises a question about the quality of a fastener it is important that a systematic approach be taken to determine first, does a fastener non-conformity exist, or second, if the fastener is conforming then what is the root cause of the customer concern.





At a minimum, the following steps are suggested:

- i. Clearly identify the fastener in question with a:
 1. Complete description
 2. Shipping and or manufacturing lot number
- ii. Make sure the correct supplier of record is named.
- iii. Obtain a clear and thorough description of the problem or perceived non-conformity from the party registering the complaint.
- iv. Determine if the part in question is being used in an old, established application or if this is a new application.
- v. Determine if similar issues have occurred before and if so, what were the conclusions reached on those occasions.
- vi. Obtain any written or otherwise documented materials available from the buyer.
- vii. Obtain samples of both broken and/or suspect parts and unused parts from the same lot if possible.
- viii. Obtain mating parts if possible.
- ix. When the problem is an assembly failure obtain pictures of the failure site and/or observe the application first hand.
- x. Determine the assembly factors present at the time of the failure – e.g. what is the specified assembly torque, what was the actual assembly torque, was the instrument used to measure that torque calibrated, and are there any unusual points of interference with the fastener such as an un-chamfered lead-in to the mating part.
- xi. Review any existing evaluation records from any source within the supply chain to determine if any evidence exists to support the complaint.
- xii. Evaluate the unused samples from the same lot to determine if the reported non-conformity can be duplicated internally or at an outside testing facility.
- xiii. If the non-conformity is confirmed by records or new evaluations, agree upon a corrective action and resolve the issue with the buyer.
- xiv. If the non-conformity cannot be supported by previous records and/or new evaluations then the buyer and seller must cooperate in reviewing the mating components and/or the installation details related to the application to determine the true root cause of the application failure that does not involve the fastener in question.
- xv. Where the root cause of the failure is due to application factors (mating components, assembly techniques or tools, etc) not under the control of the fastener supplier get an acknowledgement from the buyer that the issue is not related to the fastener and the supplier is not required to institute any corrective action.





h. Who is responsible for the understanding and proper use of fastener standards?

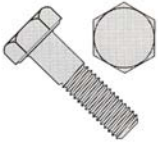
i. End-user Responsibilities:

1. It is the fastener end user's responsibility to design their products so the products will function as intended. Part of the end user's design responsibility is to select fasteners having the size and physical characteristics to assure their products assemble properly and provide the required product longevity.
2. The most efficient way for the end user to select those fasteners is to determine which fastener standards meet their needs instead of designing special fasteners.
3. After the end user selects the dimensional and performance standards that suit their needs it is their responsibility to order those fasteners using complete descriptions thoroughly specifying the fastener size, type, grade or property class, finish, and the applicable fastener standards (1/2-13 X 4 Hex Head Cap Screw, SAE J429, Grade 5, Zinc plated per ASTM F1941, Fe/Zn 3A).
4. End users are responsible for knowing their fastener suppliers and those supplier's capabilities to provide fasteners of verifiable, consistent quality.

ii. Fastener Reseller Responsibilities:

1. Fastener resellers have responsibility to know and understand fastener standards so they can assist purchasers to use of the most appropriate fastener standards. The reseller should require their customers to specify the fasteners they purchase using complete descriptions as described in the applicable standards (Example i.e. (1/2-13 X 4 Hex Head Cap Screw, SAE J429, Grade 5, Zinc plated per ASTM F1941, Fe/Zn 3A)
2. Resellers are responsible for maintaining a library of current fastener standards related to the products they sell so the information they give their customers and suppliers is up to date and accurate.
3. Resellers are responsible for ordering fasteners from their suppliers using complete product descriptions, including proper reference to the applicable fastener standards.





4. Resellers are responsible for knowing their fastener suppliers and somehow knowing those supplier's capabilities to provide fasteners of verifiable, consistent quality.
5. Resellers are responsible for having a quality assurance system in place to assure their customers that the products they ship conform to the applicable standards and/or the customer's purchase order and/or drawing.
6. Resellers are responsible for supplying exactly what the customer ordered without substitution unless substitution is expressly approved by the customer.
7. When resellers modify fasteners they are responsible for knowing when the modifications alter the performance characteristics of the original parts. The reseller should document the alterations and notify the purchaser when the alterations may decrease to performance capabilities of the original parts.

Resellers should be aware that when they alter parts the original manufacturer will no longer stand behind those parts and the reseller-modifier assumes the liability of an original fastener manufacturer.

iii. *Fastener Manufacturer Responsibilities:*

1. Fastener manufacturers have responsibility to know and understand fastener standards so they can assist purchasers to use of the most appropriate fastener standards. The reseller should require their customers to specify the fasteners they purchase using complete descriptions as described in the applicable standards (Example i.e. (1/2-13 X 4 Hex Head Cap Screw, SAE J429, Grade 5, Zinc plated per ASTM F1941, Fe/Zn 3A)
2. Manufacturers are responsible for maintaining a library of current fastener standards related to the products they sell so the information they give their customers and use in manufacturing is up to date and accurate.
3. Manufacturers are responsible for using complete product descriptions, including proper reference to the applicable fastener standards when describing what they are making and shipping to avoid mistakes and misunderstandings.





4. Manufacturers are responsible for having a quality assurance system in place to assure their customers that the products they ship conform to the applicable standards and/or the customer's special requirements.
5. The manufacturer is responsible for testing and/or inspecting (internally or through sub-contractors) all characteristics as required by the applicable standards prior to shipping.
6. Manufacturers are responsible for supplying fasteners that comply with all of the applicable product standard requirements, including marking parts with a unique identification mark traceable to the manufacturer when required.
7. Manufacturers are responsible for supplying exactly what the customer orders without substitution unless expressly approved by the customer.

4. *Who is liable when a fastener failure results in a recall, loss of property, or a death?*

- a. Who gets sued?
Generally everyone within the supply chain ends up being named in a lawsuit when litigation is initiated regardless of the actions or amount of involvement by each party.
- b. Can a reseller escape liability by blaming the manufacturer?
No. The reseller cannot simply escape by claiming, "All I did was buy it and resell it. The manufacturer is solely to blame." Resellers are responsible for taking reasonable care to assure that the products they sell are what they are claimed to be both in description and in the quality levels required by the applicable fastener standards.
- c. Does an importer of fasteners take on any additional liability over a domestic reseller?

Yes. Under US law an importer of products is considered the same as the manufacturer regarding product quality and the associated liability.
- d. Can fastener failures be considered both "civil" and "criminal"? What is the difference between a "civil" lawsuit and a "criminal" lawsuit?
 - i. A civil lawsuit is a legal action initiated by one party against another seeking monetary compensation for damages allegedly resulting from actions on the part of the defendant.





This is usually the type of lawsuit that occurs when a fastener is alleged to have been non-conforming to its requirements and its failure caused a significant loss of property or a loss of life.

ii. What is a “criminal” lawsuit?

A criminal lawsuit is a legal action brought against a defendant by a government agency (city, county, state, federal, etc.) for the alleged commission of a crime.

Possible criminal actions involving fasteners could be:

1. Violating the TREAD ACT (The Transportation Recall, Enhancement, Accountability, and Documentation Act):
 - a. Knowingly selling non-conforming products which created a potential public safety problem in any market
 - b. Knowingly or not knowingly selling non-conforming products used in transportation vehicles that cause potential safety issues
 - c. Penalties: Civil penalties for violating the TREAD Act include a \$5K penalty per violation (or per day) with a maximum civil penalty of \$15 million. Any person who misleads the Secretary about safety defects that have caused death or injury may face criminal penalties of up to 15 years in jail.
2. Knowingly misrepresenting a fastener’s grade, property class, or performance capability.

5. What are "Intellectual Property Rights" and what is their relevance to fastener suppliers?

a. What is a patent and what rights does it give the patent holder?

A utility patent is a grant of right to an inventor (or subsequently to an assignee) by the U.S. Patent and Trademark Office for an invention that is unique and not obvious to one skilled in the art. The patent right prevents others from making, using or selling the invention in the U.S. or importing it into the U.S.

If a party makes or sells a product that infringes on the patent of another party, the patent holder has the right to bring a civil lawsuit against the infringing party. It is the patent holder's responsibility to enforce the patent by bringing suit, as no government agency will initiate an action against an infringer.





b. How long is a patent in force?

Those awarded a U.S. patent are granted exclusive rights to make, use and sell the patented invention or product for a period of 20 years from the date they filed their patent application, provided that all relevant fees have been paid. Patent holders have several options in regard to the manufacture and sale of their product.

Patent holders may (1) manufacture and sell the product themselves, (2) assign the patent rights to manufacture and sell the product to another party, or (3) enter into a license agreement whereby the licensed party generally pays the patent holder a fee and a royalty for the right to manufacture and sell the licensed product for the term of the patent license agreement.

c. What is a trademark and what are the rights of the trademark holder?

A U.S. trademark is usually a word, name or symbol used in trade that identifies the source of the goods of one party and distinguishes the goods from those of others. The U.S. Patent and Trademark office issues a trademark document to acknowledge that the trademark holder has legally registered the unique mark to designate its product. The trademark registration gives the trademark holder the exclusive rights to use the mark in the course of its business. A trademark holder has the option of (1) using the mark exclusively, (2) assigning the mark to another party, or (3) licensing the mark to others.

d. How long is a trademark in force?

Unlike patents, trademarks do not have a finite duration. A trademark remains in force for an indefinite period, provided the trademark owner:

- (1) Pays all periodic maintenance fees
- (2) Continues to use the mark in commerce
- (3) Actively assures its proper usage and prevents against, misappropriation by others.

Like patent holders, a trademark holder has the right to bring a civil suit against parties that infringe the registered mark.

e. What are some of the best known trademarks currently in use in the fasteners industry?

TORX®, Phillips®, TAPTITE®, Mathread®, and PT® screw (see a more extensive list in the Appendix of this document).





- f. What are trade secrets and what benefit do they afford their owner?

A trade secret, another type of intellectual property, is any form of information or knowledge that a person or company keeps secret, which gives them some advantage over their competition. A trade secret has an indefinite life provided the secretive information is not disclosed to any person or company with which the secret holder does not have an agreement of confidentiality. Those found guilty of stealing or misappropriating trade secrets may be civilly prosecuted in a court of law.

6. What are the penalties for infringing a patent or trademark holder's rights?

- a. For U.S.-based manufacturers and resellers that furnish domestically-produced product, those found guilty of infringing a U.S. patent and/or a U.S. trademark may be forced to reimburse the patent and/or trademark holder an amount up to three times their loss of income resulting from the infringement.
- b. For foreign-based exporters shipping into the U.S. products that infringe a U.S. patent and /or a U.S. trademark, the exported product may be seized and destroyed by U.S. Customs and the exporter may be banned from making future shipments into the U.S.
- c. For domestic-based importers bringing into the U.S. products that infringe a U.S. patent and/or a U.S. trademark, the imported products, whether in transit or in inventory may be seized and destroyed by U.S. Customs and the importer may be criminally prosecuted for fraud in a federal court.

7. Conclusion:

Fastener end-users and suppliers are responsible for understanding and properly using fastener standards to assure that only conforming fasteners make it into commerce. Properly acknowledging and honoring the intellectual property rights of patent and/or trademark holders is also critical in maintaining the integrity of the fastener industry.

National Fastener Distributor Association (NFDA)

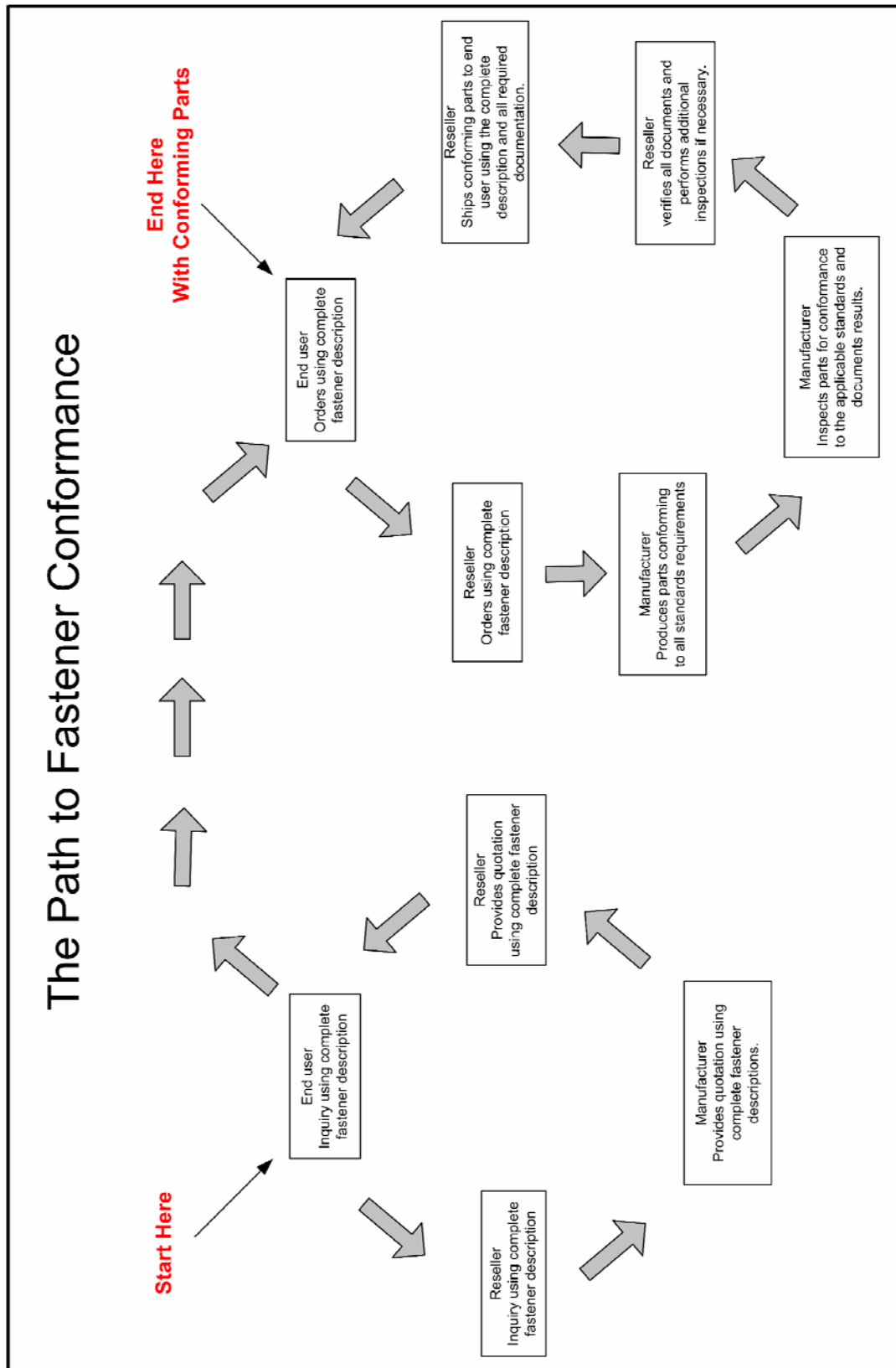
www.nfda-fastener.org

Industrial Fasteners Institute (IFI)

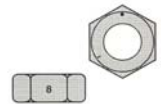
www.indfast.org



Appendix I



FIEG
November 2007



Appendix II

Example of a thorough reseller purchase order:

XYZ Company
1234 Fifth Avenue
Anytown, XX 55555

PURCHASE ORDER **NUMBER: 17042507**

Reference: 17042507
Purchase Order Date: 04/25/07
Page: 1

To: **ABC Fastener Company**

Vendor ID
0913100

Ship
To:

China

CONTACT VENDOR FAX

Ship By 08/06/07

Shipping Method Overseas Container
Payment Terms T/T 30 Days

Buyer
Phone No.
E-Mail
FAX

Packaging and Labeling Requirements

part numbers must appear on all packing lists, invoices, and certs. The country of origin shall be clearly indicated on each carton or keg. If specifications below require mill test reports be furnished, such reports must be signed, must reference the applicable specification numbers, and must reference the P.O. number. Ozone depleting substances - If any class I or class II substances are contained in your products, or used in the manufacture of the items placed on this P.O., such substances must be disclosed on the carton label. Unless otherwise specified below, or specified in the applicable product specifications, the minimum inspection and test sampling plan shall be per ANSI/ASME B18.18.2M. ASTM F1470 is acceptable for destructive tests. All manufacture and processing, including steel manufacture shall be performed in a mercury free environment. If product is not mercury free, this shall be clearly disclosed on the carton labels, on the packing slips, and on the product certification. Unless otherwise specified, zinc plating shall be per ASTM F1941, Classification Fe/Zn3A or C (3 microns) with clear or yellow chromate as required. Flat washers may have a thickness of 2.5 microns (0.00010"). Mechanical galvanize shall be per ASTM B695 Class 50. Hot dip galvanize shall be per ASTM A153. When checked, the following requirements apply to this purchase order: ☐ Production Part Approval Process (PPAP) Level_____. ☐ Manufacturers I.D. marking. ☐ Plating certification, including baking and plating specification. ☐ Preproduction samples required for approval prior to production. Proceeding with production before sample approval is at vendors own risk!! PFC will not be responsible for production prior to approval. ☐ Shipping samples are required for PFC Q.A. inspection. Please send_____ pieces to PFC Q.A. Shipment of production parts does not require PFC Q.A. approval. ☐ A copy of all test reports shall be included with the shipment (send originals to PFC-Carson).

Grade 5 Carriage Bolt

All NC Grade 5 Carriage Bolts furnished against this purchase order must conform to the following specifications: ASME B18.5 (Round Head Square Neck) and SAE J429 Grade 5. Chemical and physical mill test reports are required on all items. Headmark requirements: Manufacturers I.D. and Grade Identification. All bolts shall be fully threaded to 6 inches in length. Bolts over 6 inches in length shall have 6 inches of threads and body diameter shall be full size body per Table 4 of ASME B18.2.1. **The use of medium carbon boron steel is NOT permitted.**

Corner radius of bolts shall meet ASME B18.5 requirements.

Quantity	Ctn/Qty	Equivalent	Product No	Description	Price	Extension	Line
12	3,000/CT	36000 Piece	00105-2416-020	1/4-20 X 1 PL			1
12	250/CT	3000 Piece	00105-2830-020	1/2-13 X 3 PL			2
12	150/CT	1800 Piece	00105-2842-020	1/2-13 X 4 1/2 PL			3

36 CARTON

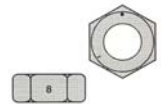
1645 LBS

Total:

BY: _____

Report 50059





Appendix III

List of fastener dimensional characteristics from ASME B18.18.2:

**TABLE 1 FINAL INSPECTION — MACHINE ASSEMBLED AND OTHER
SPECIAL PURPOSE FASTENERS — NONDESTRUCTIVE TESTS**

Characteristic	Inspection Level	Internally Threaded Parts	Externally Threaded Parts
1 Body diameter	C	NA	WA
2 Length	B	NA	WA
3 Width across flats	B	WA	WA
4 Width across corners	C	WA	WA
5 Head or nut thickness	C	WA	WA
6 Wrenching height	B	WA	WA
7 Angularity of bearing surface	C	WA	WA
8 Bearing surface diameter	C	WA	WA
9 Head diameter	C	NA	WA
10 Flange diameter	C	WA	WA
11 Flange thickness	C	WA	WA
12 Recess penetration	A	NA	WA
13 Point diameter	B	NA	WA
14 Countersink diameter and depth	C	WA	WA
15 Thread acceptability [Note (1)]	B/C	WA	WA
16 Total thread length	B	NA	WA
17 Grip length	B	NA	WA
18 Slot width	A	WA	WA
19 Slot depth	A	WA	WA
20 Slot alignments and location	B	WA	NA
21 Diameter of undercut	C	NA	WA
22 Depth of undercut	C	NA	WA
23 Washer O.D.	C	WA	WA
24 Washer thickness	C	WA	WA
25 Visual inspection [Note (2)]	A	WA	WA

GENERAL NOTES:

(a) Legend: WA — when applicable

NA — not applicable

(b) Refer to para. 2.8.2 for acceptance criteria. Refer to Table 3 for sample size.

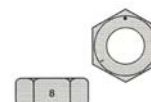
NOTES:

(1) ANSI/ASME B1.3M or other applicable standards and at the appropriate inspection level (B or C).

(2) Visual inspection for grade and source identification, presence of finish, duds, surface discontinuities, head and/or flange eccentricity, flange flatness, radius under head, type of washer, presence of locking feature, closeness of thread to head, and general workmanship.

Lot Size	Level of Inspection	Nondestructive Testing
5,001–250,000	A	100
	B	32
	C	8
1,000–5,000	A	50
	B	16
	C	4
Up to 1,000 (where sample size exceeds lot size, 100% inspection to be applied)	A	25
	B	8
	C	2





Appendix IV

List of fastener physical tests and examinations from ASTM F1470:

TABLE 1 Sampling Level for the Detection Process

NOTE 1—Legend: WA—Where Applicable.
NA—Not Applicable.

Characteristic	Description of Control				
	Sample Level ^A	Internally Threaded Parts	Externally Threaded Parts	Non-threaded	Washers
Adhesion (coating)	C	WA	WA	WA	WA
Assembly tension test	B	NA	WA	NA	NA
Bend, body (nails)	A	NA	NA	WA	NA
Bend, notched (bolts)	B	NA	WA	NA	NA
Bend, body (track spikes)	C	NA	NA	WA	NA
Breaking strength (eyebolts)	C	WA	WA	NA	NA
Carbide precipitation	C	NA	WA	WA	WA
Case depth/decarburization	C	WA	WA	WA	WA
Chemistry ^B	—	WA	WA	WA	WA
Compression (washer direct tension)	A	NA	NA	NA	WA
Cone proof	C	WA	NA	NA	NA
Drive test	A	WA	WA	NA	NA
Elongation—Machined specimen	C	NA	WA	WA	NA
Extension at failure	C	NA	WA	WA	NA
Grain size ^C	—	WA	WA	WA	WA
Hardness ^D	B	WA	WA	WA	WA
Bend, head (track spikes)	C	NA	NA	WA	NA
Humidity	B	WA	WA	WA	WA
Hydrogen embrittlement	B	WA	WA	WA	WA
Impact	C	NA	WA	WA	NA
Lubrication	B	WA	WA	WA	WA
Magnetic permeability	B	WA	WA	WA	WA
Packaging ^E	—	WA	WA	WA	WA
Plating/coating thickness (weight)	A	WA	WA	WA	WA
Product identification marking ^F	—	WA	WA	WA	WA
Proof load—Full size	C	WA	WA	NA	NA
Reduction of area—Machined specimen	C	NA	WA	WA	NA
Bend, rivet	B	NA	NA	WA	NA
Flattening, rivet	B	NA	NA	WA	NA
Rotational capacity	C	WA	WA	NA	WA
Salt spray ^G	B	WA	WA	WA	WA
Shear strength	C	NA	WA	WA	NA
Stress corrosion	B	WA	WA	WA	WA
Surface discontinuities	B	WA	WA	WA	WA
Surface roughness	B	WA	WA	WA	WA
Tensile strength—Full size ^H	C	NA	WA	WA	NA
Tensile strength—Machined specimen	C	NA	WA	WA	NA
Torque ^I (prevailing)	C	WA	WA	NA	NA
Torque (torsional strength)	C	WA	WA	NA	NA
Yield strength—Full size	C	NA	WA	NA	NA
Yield strength—Machined specimen	C	NA	WA	NA	NA

^A Quantity of samples is in Table 3, Sample Size.

^B A certified copy of the material's chemical or product analysis shall be furnished with each shipping lot, and the shipping lot shall have documentation providing traceability to this chemical analysis. It is required that the purchaser of the raw material (used to manufacture) shall verify that the material is the material specified on the purchase order.

^C The steel producer shall provide the steel making practice (course or fine grain) on their certification. The steel producer may specify grain size at their option.

^D Surface or core, or both, as applicable.

^E All packaging requirements shall be in conformance with the applicable packaging standard.

^F Visual inspection for conformance.

^G Continuous monitoring of salt spray performance in accordance with the recommendation of Table B in Appendix 1 of ASME B18.18.2M constitutes compliance with the requirements for salt spray testing outlined in this table.

^H Wedge angle or axial test as applicable.

^I Prevailing torque test includes thread start, all specified torque requirements, and retention of locking feature, when applicable.

TABLE 3 Sample Size

NOTE 1—The acceptance number in all cases is zero defects.

Lot Size	Sample Size			
	A	B	C	D
1 to 2	2	1	1	^A
3 to 15	3	2	1	^A
16 to 25	4	3	1	^A
26 to 50	5	4	1	^A
51 to 90	6	5	2	1
91 to 150	7	6	2	1
151 to 280	10	7	2	1
281 to 500	11	9	3	2
501 to 1200	15	11	3	2
1201 to 3200	18	13	3	2
3201 to 10 000	22	15	4	3
10 001 to 35 000	29	15	4	3
35 001 to 150 000	29	15	5	3
150 001 to 500 000	29	15	6	4
500 001 and over	29	15	7	5

^A Suppliers shall furnish certified test results from which the shipping lots originated. If certified test reports are not available, then the supplier must default to Sample Size C and conduct the tests required.





Appendix V

A list of links to helpful web sites:

Aerospace Industries Associations (AIA) – for NASC standards
www.aia-aerospace.org

American National Standards Institute (ANSI) – for ISO Standards
www.ansi.org

American Society of Mechanical Engineers (ASME)
www.asme.org

American Society for Materials and Testing (ASTM)
www.astm.org

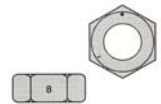
Industrial Fasteners Institute (IFI)
www.indfast.org

National Fastener Distributors Association (NFDA)
www.nfda-fastener.org

Society for American Engineers (SAE)
www.sae.org

US Office of Patents and Trademarks (USPTO)
www.uspto.gov

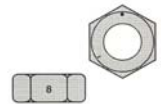




Appendix VI Fastener Trade Names

1/4-Turn Fasteners	Dec-King	HTZ
A7	Delron®	Huck
ABC	Delta PT Screw	Huckbolt
Accu-Lok™	Delta-S PT Screw	Huck-Clinch®
Acp	Deutsch	Huckcomp®
ACR Phillips II	DG Screw	HuckLok
ACR Phillips Tri-Wing	Dodge	HuckMAX™
Acres	Dril-Flex	Huckrimp®
Acument	Dril-Kwick	Huck-Spin
Acupoint	Duro-PT Screw	Hucktainer
Aero-Flush™	Dynabolt	HUCKTITE®
Aero-Lite®	Eagle	Innyvation
Aero-Tip	Eccentrix™ Adjustable Shear Alignment Pins	It It'S New, It'S Nylok
ALtracs	Eddie-Bolt®	Jack Nut
Anyseal	Elco	Kaynar
ASP®	EM Stud® Electrical-Mechanical Stud	Keenserts®
Atlas®	Epcon	Kelox®
Autoset	Ergo-Tech™	Keyhole®
Avdel	Eslok	KEYSERT
Avdelok	Euro Hexsert	K-FAST™ Nuts
Avex	Eurosert	Kwikset
Avibulb	EZ Acor	LD Avdelok
Avinox	E-Z Anchor	LDT
Avseal II	F Series	LED-LOK
Backer-On	Fab-Lok	LGP®
Blakbolt	Fastite 2000	LHP™
BLUE DEVIL	Flatbeam™ Locknuts	Live Lock™ Panel Fasteners
Bolt Design 360 Deg Ext White Class 40	Flex	Lockbolt
Bolt Design 360 Deg Ext White Class 6	Flexbond	Maf
Bolt Design External Blue 160 Deg	FloorTight	Mag-Form
Bolt Design External Blue 360 Deg	Foilgard®	Magna-Bulb
Bolt Design External Blue Patch	Frame-Bolt	Magna-Lok
Bolt Design External Blue Spot	G5	Mairoll
Boltmod	Genesis	Mark IV™ Panel Fasteners
BOM	GP®	Marson
B-Prime	Gridmate	Master Driller
Briv	CaptiForm	Master Gripper
Bulbex	CBX	Master Gripper MDP
C50L HuckBolt	Chobert	Master One-Steppers
C6	Click Bond	Master Tapper
C6L HuckBolt	Click Patch	MAThread
Camcar	Gripco	MATPoint
CAMLOC	Grovit	Maxiseal
Capsulok	Hammer-Set	Maxlok
Climaocat	HangerMate	MaxTite®
Climaseal	Heli-Coil	Mecaero
Climashield	Heli-Nut	Microdot
Color Blue	Hemlok	Milson® Panel Fasteners
Color White	Hexsert	Monobolt
Composi-Lok ®	Hill-Lock	Mortorq
Condrive	Hi-Lo	MultiSet II
ConFlex	Hi-Lok®	Nfc & Design
Con-Kwick	Hi-Tigue®	Nk
Crete-Flex	Holemod	Nk Design
Crimp Ring™ Captive Screws	Holly	Nut Design 360 Deg Int White
Crimptite	HR	Nut Design 360 Deg Int White





Appendix VI (continued) Fastener Trade Names

CTP	HS Hexsert (HSH)	Nut Design Internal Blue 160
Nut Design Internal Blue 360 Deg	Proset	Titan
Nut Design Internal Blue Patch	PSD	Torq-Patch
Nybolt	PSD2	Torq-Strip
Nycote	PT Screw	Torx
Nylo	QR™ Panel Fasteners	Torx Plus
Nylok	Quadrex	Torx Plus Autosert
Nylok & Logo	Radial-Lok ®	Torxstem
Nylok Design	RAM	TRIDAIR
Nylok Wording	R'ANGLE®	TRI-DENT®
Nynut	RapidSet	TriForm
Nypatch	Redi-drive	TriMil™ Panel Fasteners
Nyplas	ReelFast®	Trubolt
Nyplate	Ring Screw	True Blue
Nyring	Ring-Locked Inserts & Studs	Tru-Tension®
Nyscrew	Rivscrew	Tuflok
Nyseal	Rivscrew PL	Turks-Head
Nysoft	Rivtex	TurnaSure
Nystay	Rock-On	Turn-Loc® Panel Fasteners
Nystrip	Rolok	Twinert
Nytab	Rosan	TY-D®
Nytek	S-12	TYE ®
Nytemp	SAF-LOK	TYE-Pins™
Nytorq	Sammys	UAB™
OSI-Bolt ®	Sav-A-Stud	UltraCon
Pandor	Sav-A-Thread	Ultra-Grip
PanelMate	Scots	Ultraseal
Parabolt	Screw-Corp	Ultraset
Parker Kalon (P-K)	Semplex Square Dome	Unimatic®
PEM 300®	Sharperize	U-Spin
PEM®	SI®	Veri-Lite®
PEMFLEX®	Simfast™	Versa-Nut
PEMHEX®	Simmonds	Visu-Lok ®
PEMSERT®	Slimsert®	VOI-SHAN
Phillips Square-Driv	Snap-Top®	VSI
Pinchmount	SNEP	Wedgelock
Plastifast	Spex	Wedg-Tite®
Plasti-Fast	Spindle-Saver	Weldfast
Plasti-Kwick	Spin-Lok™	Well-Nut
Plastilok	SpinTite®	XPL®
Plastite	Spline-Lok™	
Plasto-Driv	Splitfast	
PlasTORX	SpotFast™	
Point&Set	Squaresert	
Polyfast	Stavex	
Poly-Set	StickScrew®	
Pop	Strux	
Pop Nut	Supersert	
Poplok	Swageform	
Pop-Lok	Tangleless	
Popmatic	Tapcon	
Popsert	Tapertuff	
Powergrip	Tapmate	
Powerlink	Taptite	
Powerlink 30	Taptite 2000	
Pozidriv	Teks	
Press Nut	Thin Sheet Nutsert	

