

Ballot Item 5: (S07-011)

(a) **1.3 Referenced Standards and Specifications****American Society for Testing and Materials***{Add to the existing list}*ASTM F1136-04 Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners*{Add to the existing list}***IFI: Industrial Fastener Institute**IFI 144 Test Evaluation Procedures for Coating Qualification Intended for Use on High-Strength Structural Bolts(b) *{Modify Table 2.1 as shown}***Table 2.1 Acceptable ASTM A563 Nut Grade and Finish and ASTM F436 Washer Type and Finish**

ASTM Desig.	Bolt Type	Bolt Finish ^d	ASTM A563 nut grade and finish ^d	ASTM F436 washer type and finish ^{a,d}
A325	1	Plain (uncoated)	C, C3, D, DH ^c and DH3; plain	1; plain
		Galvanized	DH ^c ; galvanized And lubricated	1; galvanized
		<u>Zn/Al Inorganic, per ASTM F1136 Grade 3</u>	<u>DH; Zn/Al Inorganic, per ASTM F1136 Grade 5</u>	<u>1; Zn/Al Inorganic, per ASTM F1136 Grade 3</u>
	3	Plain	C3 and DH3; plain	3; plain
F1852	1	Plain (uncoated)	C, C3, DH ^c and DH3; plain	1; plain ^b
		Mechanically Galvanized	DH ^c ; mechanically galvanized and lubricated	1; mechanically galvanized ^b
		<u>Zn/Al Inorganic, per ASTM F1136 Grade 3</u>	<u>DH ^c; Zn/Al Inorganic, per ASTM F1136 Grade 5</u>	<u>1; Zn/Al Inorganic, per ASTM F1136 Grade 3 ^b</u>
	3	Plain	C3 and DH3; plain	3; plain ^b
A490	1	Plain	DH ^c and DH3; plain	1; plain
		<u>Zn/Al Inorganic, per ASTM F1136 Grade 3</u>	<u>DH; Zn/Al Inorganic, per ASTM F1136 Grade 5</u>	<u>1; Zn/Al Inorganic, per ASTM F1136 Grade 3</u>
	3	Plain	DH3; plain	3; plain

^a Applicable only if washer is required in Section 6.
^b Required in all cases under nut per Section 6.
^c The substitution of ASTM A194 Grade 2H nuts in place of ASTM A563 grade DH nuts is permitted.
^d "Galvanized" as used in this table refers to hot-dip galvanizing in accordance with **ASTM A513** or mechanical galvanizing in accordance with ASTM B695.
^e "Zn/Al Inorganic" as used in this table refers to application of Zn/Al Corrosion Protective Coating in accordance with ASTM F1136 and which have met all the requirements of IFI-144.

- (1) The effect of the hot-dip galvanizing process on the mechanical properties of high-strength steels;
- (2) The effect of over-tapping for hot-dip galvanized coatings on the nut stripping strength;
- (3) The effect of galvanizing and lubrication on the torque required for pretensioning; and,
- (4) Shipping requirements.

Birkemoe and Herrschaft (1970) showed that, in the as-galvanized condition, galvanizing increases the friction between the bolt and nut threads as well as the variability of the torque-induced pretension. A lower required torque and more consistent results are obtained if the nuts are lubricated. Thus, it is required in ASTM A325 that a galvanized bolt and lubricated galvanized nut be assembled in a steel *joint* with a galvanized washer and tested by the *supplier* prior to shipment. This testing must show that the galvanized or Zn/Al Inorganic coated nut with the lubricant provided may be rotated from the snug-tight condition well in excess of the rotation required for pretensioned installation without stripping. This requirement applies to ~~both~~ hot-dip galvanized, and mechanically galvanized, and Zn/Al Inorganic coated fasteners. The above requirements clearly indicate that:

- (1) Galvanized and Zn/Al Inorganic coated high-strength bolts and nuts must be treated as a fastener assembly;
- (2) The supplier must supply nuts that have been lubricated and tested with the supplied high-strength bolts;
- (3) Nuts and high-strength bolts must be shipped together in the same shipping container; and,
- (4) The purchase of galvanized high-strength bolts and galvanized nuts from separate suppliers is not in accordance with the intent of the ASTM Specifications because the control of over-tapping, the testing and application of lubricant and the supplier responsibility for the performance of the assembly would clearly not have been provided as required.

Because some of the lubricants used to meet the requirements of ASTM Specifications are water soluble, it is advisable that galvanized *high-strength bolts* and nuts be shipped and stored in plastic bags or in sealed wood or metal containers. Containers of fasteners with hot-wax-type lubricants should not be subjected to heat that would cause depletion or change in the properties of the lubricant.

Both the hot-dip galvanizing process (ASTM A153) and the mechanical galvanizing process (ASTM B695) are recognized in ASTM A325. The effects of the two processes upon the performance characteristics and requirements for proper installation are distinctly different. Therefore, distinction between the two must be noted in the comments that follow. In accordance with ASTM A325, all threaded components of the *fastener assembly* must be galvanized by the same process and the *supplier's* option is limited to one process per item with no mixed processes in a *lot*. Mixing *high-strength bolts* that are galvanized by one process with nuts that are galvanized by the other may result in an unworkable assembly.