Hot Galvanized Dipped Structural Bolts and Nuts Require Special Thread Gage Sizes

Users order many structural bolts and nuts with heavy coatings on them to increase their resistance to corrosion. The applicable American Society for Testing and Materials (ASTM) standards provide special thread allowances to accommodate the heavy coatings. These heavy coatings can be a major source of assembly problems if the special thread size allowances are not understood and used by bolt and nut suppliers.

ASTM publishes the requirements for inch and metric structural bolts and nuts used in the United States. The structural bolt standards are ASTM A307, A325, A325M, A490, and A490M. The structural nut specifications are ASTM A563 and A563M. The specification numbers ending in "M" cover metric bolts and nuts and those without the "M" cover inch bolts and nuts.

Within these standards, the thread class specified for uncoated inch bolts is 2A, and it is 6g for metric bolts. The thread classes specified for nuts to be used with uncoated bolts are 2B for inch nuts and 6H for metric nuts.

When A307, A325, and A325M structural bolts are ordered coated the most commonly specified coatings are hot dipped galvanized coating per ASTM A153 or mechanical zinc coating per ASTM B695. When bolts are ordered coated, it is a good practice to order the ASTM A563 or A563M nuts that go with those bolts with the same type finish. ASTM standards A490 and A490M do not allow any coating to be applied to these bolts as a precaution against hydrogen embrittlement.

Galvanizing and mechanical zinc coating deposits alter the sizes of the thread characteristics such as the pitch diameter, major diameter, and minor diameter by several thousandths of an inch. To prevent possible thread interference between the bolts and nuts at the time of assembly, the ASTM standards provide a clearance allowance for both bolt and nut threads to accommodate the size changes resulting from coating.

These coating allowances are provided in a table in each standard, but only ASTM A563 provides the exact thread size limits when the allowances are added. In all other standards the supplier or user must calculate these special thread sizes if they wish to order thread gages to inspect their coated bolts and nuts. To make thread gage ordering easier and more consistent for those wanting to inspect coated structural bolts and nuts, the following two charts are provided:

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Thread specifications for galvanized ASTM A307 & A325 bolts and A-563 nuts						
Thread	Bolt		Nut			ASTM Allowance
	GO Size Max. Pitch Dia.	Maximum Major Dia.	GO Size Min. Pitch Dia.	No Go Size Max. Pitch Dia.	Minimum Minor Dia.	
1/2-13	0.4665	0.5165	0.4680	0.4745	0.4350	0.0180
5/8-11	0.5844	0.6434	0.5860	0.5932	0.5470	0.0200
3/4-10	0.7032	0.7682	0.7050	0.7127	0.6440	0.0200
7/8-9	0.8229	0.8951	0.8248	0.8330	0.7770	0.0220
1-8	0.9408	1.0220	0.9428	0.9516	0.8890	0.0240
1 1/8-8	1.0657	1.1469	1.0678	1.0768	1.0140	0.0240
1 1/4-8	1.1907	1.2719	1.1928	1.2020	1.1390	0.0240
1 3/8-8	1.3186	1.3998	1.3208	1.3301	1.2670	0.0270
1 1/2-8	1.4436	1.5248	1.4458	1.4553	1.3920	0.0270
Dimensions in inches.						

Thread specifications for galvanized ASTM A325M bolts and A-563M nuts						
Thread	Bolt		Nut			ASTM Allowance
	GO Size Max. Pitch Dia.	Maximum Major Dia.	GO Size Min. Pitch Dia.	No Go Size Max. Pitch Dia.	Minimum Minor Dia.	
M16X2.0	15.083	16.382	15.121	15.333	14.255	0.420
M20X2.5	18.864	20.498	18.906	19.130	17.824	0.530
M22X2.5	20.864	22.488	20.906	21.130	19.824	0.530
M24X3.0	22.643	24.592	22.691	22.956	21.392	0.640
M27X3.0	25.640	27.592	25.691	25.956	24.392	0.640
M30X3.5	28.424	30.697	28.477	28.757	26.961	0.750
M36X4.0	34.202	36.800	34.262	34.562	32.530	0.860
Dimensions in millimeters.						

Coated nuts must be tapped after coating to achieve the special nut thread sizes indicated above. To be acceptable, coated nut threads must be within both these maximum and minimum size limits. For coated structural bolt threads to be acceptable they must not exceed the maximum allowable sizes shown above. Thread inspection is to be performed using thread gages made to the sizes in these charts.

When using thread gages to inspect for thread acceptability it is permissible to apply a light machine oil film to the thread gages to prevent galling and excessive gage wear.

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For the part threads to be acceptable the GO thread ring gage must assemble on the bolts and the nuts must assemble on the threaded GO work plug gage using only hand effort.

For more details on inspecting coated structural bolts and nuts, the author can be contacted by phone at 817-870-8888, by facsimile at 817-870-9199, or via e-mail at sales@greensladeandcompany.com.

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