

Bennett Bolt Works, Inc.

Technical Data Sheet: ASTM F436

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This specification covers the chemical, mechanical and dimensional requirements for hardened steel washers for use with fasteners having nominal thread diameters of 1/4" through 4" and are intended for general purpose mechanical and structural use with bolts, nuts, studs and other internally threaded and externally threaded fasteners. These washers are suitable for use with fasteners covered in Specifications A325, A354, A449 and A490.

F436 Types	
Type I	Carbon Steel
Type II	Weathering Steel

F436 Styles		
Styles	Sizes/Thickness	Use
Circular	Nominal bolt sizes 1/4 through 4 in	Suitable for applications where sufficient space exists and angularity permits
Beveled	Nominal sizes 1/2 through 1-1/2 in	Beveled washers are square or rectangular with a beveled 1 to 6 ratio surface for use with American standard beams and channels
Clipped	Nominal sizes 1/2" through 1-1/2" beveled, 1/4" through 4" circular	Clipped washers are circular or beveled for use where space limitations necessitate that one side be clipped
Extra Thick	Nominal sizes 1/2 through 1-1/2 in with a nominal thickness of 5/16 in	Extra thick washers are circular washers suitable for structural applications with over-sized holes

Table 1: Chemical Requirements ^A		
Element	Type 1 Composition %	Type3 ^B Composition %
Phosphorus Max - Heat	0.04	0.04
Phosphorus Max - Product	0.05	0.045
Sulfur Max - Heat	0.05	0.05
Sulfur Max - Product	0.06	0.055
Silicon - Heat	-	0.15 - 0.35
Silicon - Product	-	0.13 - 0.37
Chromium - Heat		0.45 - 0.65
Chromium - Product		0.42 - 0.68
Nickel - Heat	-	0.25 - 0.45
Nickel - Product	-	0.22 - 0.48
Copper - Heat	-	0.25 - 0.45
Copper - Product	-	0.22 - 0.48

Table 2: Hardened Circular, Clipped Circular and Extra-Thick Washers							
Circular and Extra Thick					Clipped Circular		
Nominal	Circular, Clipped Circular & Extra Thick		Circular & Clipped (T)		Extra Thick (T)		Clipped Min Edge
Size	Outside Dia (OD)	Inside Dia (ID)	min	max	min	max	Distance (E) ^A, in
1/4	0.625	0.281	0.051	0.08	-	-	0.219
5/16	0.688	0.344	0.051	0.08	-	-	0.281
3/8	0.813	0.406	0.051	0.08	-	-	0.344
7/16	0.922	0.469	0.051	0.08	-	-	0.406
1/2	1.063	0.531	0.097	0.18	0.31	0.38	0.438
9/16	1.188	0.625	0.11	0.18	0.31	0.38	0.5
5/8	1.313	0.688	0.122	0.18	0.31	0.38	0.563
3/4	1.468	0.813	0.122	0.18	0.31	0.38	0.656
7/8	1.75	0.938	0.136	0.18	0.31	0.38	0.781
1	2	1.063	0.136	0.18	0.31	0.38	0.875
1-1/8	2.25	1.188	0.136	0.18	0.31	0.38	1
1-1/4	2.5	1.375	0.136	0.18	0.31	0.38	1.094
1-3/8	2.75	1.5	0.136	0.18	0.31	0.38	1.219
1-1/2	3	1.625	0.136	0.18	0.31	0.38	1.313
1-3/4	3.25	1.875	0.178 ^B	0.28 ^B	0.31	0.38	1.531
2	3.75	2.125	0.178 ^B	0.28 ^B	0.31	0.38	1.75
2-1/4	4	2.375	0.34 ^c	0.34 ^c	0.31	0.38	2
2-1/2	4.5	2.625	0.34 ^c	0.34 ^c	0.31	0.38	2.188
2-3/4	5	2.875	0.34 ^c	0.34 ^c	0.31	0.38	2.406
3	5.5	3.125	0.34 ^c	0.34 ^c	0.31	0.38	2.625
3-1/4	6	3.375	0.34 ^c	0.34 ^c	0.31	0.38	2.875
3-1/2	6.5	3.625	0.34 ^c	0.34 ^c	0.31	0.38	3.063
3-3/4	7	3.975	0.34 ^c	0.34 ^c	0.31	0.38	3.313
4	7.5	4.125	0.34 ^c	0.34 ^c	0.31	0.38	3.5

Dimensional Characteristics	<1" Nominal Size	1 Through 1-1/2" Nominal Size	>1-1/1" through 3" Nominal Size	>3" Nominal Size
Nominal diameter of hole, in	-0, +0.032	-0, 0.063	-0, 0.063	-0, +0.125
Nominal outside diameter, in	+/-0.032	+/- 0.063	+/- 0.063	+/- 0.125
Flatness: max deviation from straightedge placed on cut side shall not exceed, in	0.01	0.015	0.02	0.032
Concentricity, in: center of hole to O.D.	0.030 FIR ^A	0.060 FIR ^A	0.090 FIR ^A	0.250 FIR ^A
Burr shall not project above immediately adjacent washer surface more than, in	0.01	0.015	0.02	0.025

Table 4: Hardened Beveled Washers					
Bolt Diameter	Square Beveled & Clipped Square Beveled ^A				Clipped
	Minimum Side Dimension (A)	Nominal ID	Mean Thickness (T)	Slope or Taper Thickness	Nominal Edge Distance (E) ^B
1/2"	1-3/4"	17/32"	5/16"	1:06	7/16"
5/8"	1-3/4"	11/16"	5/16"	1:06	9/16"
3/4"	1-3/4"	13/16"	5/16"	1:06	21/32"
7/8"	1-3/4"	15/16"	5/16"	1:06	25/32"
1"	1-3/4"	1-1/8"	5/16"	1:06	7/8"
1-1/8"	2-1/4"	1-1/4"	5/16"	1:06	1"
1-1/4"	2-1/4"	1-3/8"	5/16"	1:06	1-3/32"
1-3/8"	2-1/4"	1-1/2"	5/16"	1:06	1-7/32"
1-1/2"	2-1/4"	1-5/8"	5/16"	1:06	1-5/16"