BLIND RIVETS

STRUCTURAL SELF-PLUGGING PULL MANDREL BLIND RIVETS

IFI 116 1986

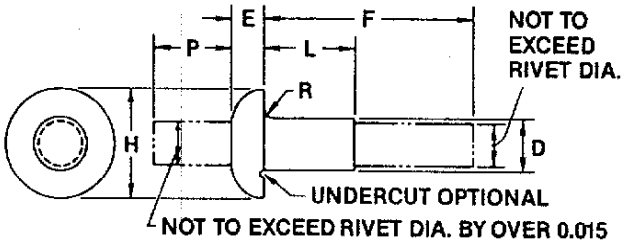
1. Scope.

1.1 Scope. This standard establishes the dimensional, mechanical and performance requirements for structural self-plugging pull mandrel blind rivets suitable for use in engineering assemblies where load transmitting capability by the rivet is a design requirement.

1.2 Definitions.

1.2.1 *Blind Rivet.* A blind rivet is a blind fastener which has a self-contained mechanical or other feature which permits the formation of an upset on the blind end of the rivet during rivet setting to join the component parts of an assembly.

1.2.2 A structural self-plugging pull mandrel blind rivet is a two piece assembly consisting of a rivet body and a mandrel. During the set-



Note: Mandrel design and configuration at both ends is optional with the manufacturer providing mandrel conforms to specified max diameter and protrusion limits.

Table 1 Dimensions of Protruding Head Structural Self-Plugging Pull Mandrel Blind Rivets.

Rivet Series No.	Nom Rivet Size	D		H		E		R		P	F	L
		Body Diameter		Head Diameter		Head Height		Radius of Fillet Max		Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length
		Max	Min	Max	Min	Max	Min	For Grades 13, 14,	For Grades 30, 41	Min	Max	Max
4	1/8 0.1250	0.128	0.124	0.262	0.238	0.064	0.054	0.01	0.02	1.00	2L + .170	See Table 2
5	5/32 0.1562	.159	.155	.328	.296	.077	.067	.01	.02	1.00	2L + .205	
6	3/16 0.1875	.190	.186	.394	.356	.090	.080	.01	.02	1.00	2L + .239	
8	1/4 0.2500	.253	.249	.525	.475	.117	.107	.01	.02	1.00	2L + .200	
See Note 3		4, 5									6	

NOTES:

1. All dimensions are in inches.
2. For application data see Table 2.
3. Rivet series numbers represent the nominal size in 1/32 inch.
4. Maximum body diameter may be increased by 0.001 inch within 0.100 inch of underside of head.
5. Maximum body diameter of Grade 30 rivets may be increased by 0.001 inch when rivets are plated or coated.
6. When computing the blind side protrusion (F), the maximum length of rivet body (L) as given in Table 2 for the applicable grip shall be used. Minimum blind side clearance may be calculated by subtracting the actual grip (G), (i.e., total thickness of the material to be joined), from the specified blind side protrusion (F). (Example: To join two plates, each .100 inch thick, with a 5/32 inch rivet, a No. 54 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be 2L + .205 − G, which is 2 x .379 + .205 − .200, and equals .763 inch.)

STRUCTURAL SELF-PLUGGING PULL MANDREL BLIND RIVETS

Table 2 Application Data for Protruding Head Structural Self-Plugging Pull Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Body Length L
			Max	Min			Max
4	1/8 0.1250	#30	0.133	0.129	41	To .062	.170
					42	.063 - .125	.232
					43	.126 - .187	.295
					44	.188 - .250	.357
					45	.251 - .312	.420
					46	.313 - .375	.482
					47	.376 - .437	.545
					48	.438 - .500	.607
5	5/32 0.1562	#20	0.164	0.160	51	To .062	.192
					52	.063 - .125	.254
					53	.126 - .187	.317
					54	.188 - .250	.379
					55	.251 - .312	.441
					56	.313 - .375	.503
					57	.376 - .437	.567
					58	.438 - .500	.629
6	3/16 0.1875	#11	0.196	0.192	61	To .062	.215
					62	.063 - .125	.277
					63	.126 - .187	.340
					64	.188 - .250	.402
					65	.251 - .312	.465
					66	.313 - .375	.527
					67	.376 - .437	.590
					68	.438 - .500	.652
					69	.501 - .562	.715
					610	.563 - .625	.777
					611	.626 - .687	.840
					612	.688 - .750	.902
8	1/4 0.2500	F	0.261	0.257	83	.125 - .187	.385
					84	.188 - .250	.447
					85	.251 - .312	.510
					86	.313 - .375	.572
					87	.376 - .437	.635
					88	.438 - .500	.697
					89	.501 - .562	.760
					810	.563 - .625	.832
					811	.626 - .687	.885
					812	.688 - .750	.947
					813	.751 - .812	1.010
					814	.813 - .875	1.072
See Note		3			2		

NOTES:

1. All dimensions are in inches.
2. The first numeral in the rivet number designates the rivet series number, the last one or two numerals give the maximum grip in 1/16 inch which the rivet is capable of joining.
3. Recommended drill sizes are those which normally produce holes within the specified hole size limits.

STRUCTURAL SELF-PLUGGING PULL MANDREL BLIND RIVETS

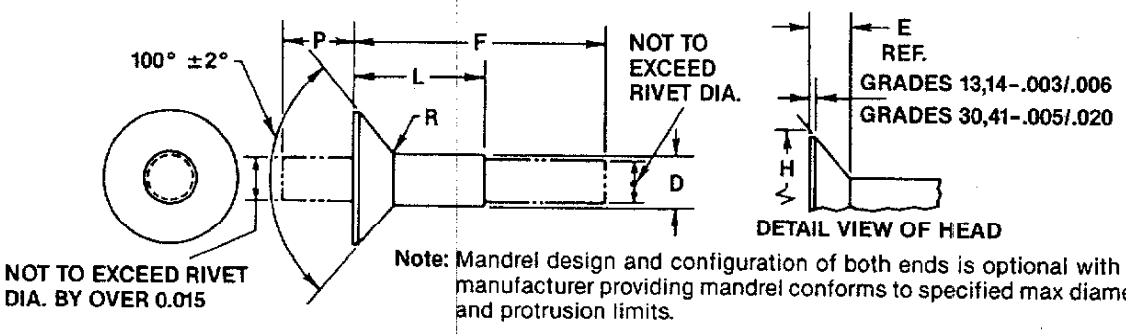
ting operation the mandrel is pulled into or against the rivet body and breaks at a point within or above the rivet head with the entrapped length of the mandrel being retained in the rivet body.

1.2.3 Definitions of other terms used in this standard are given in IFI-110, "Glossary of Terms Relating to Blind Rivets," page K-40.

2. Designations.

2.1 **Styles.** The two styles of rivets are designated as protruding head and 100 deg flush head.

2.2 **Grades.** The material combinations of rivets are designated as grades with each grade representing a different combination of



Note: Mandrel design and configuration of both ends is optional with the manufacturer providing mandrel conforms to specified max diameter and protrusion limits.

Table 3 Dimensions of 100 Deg Flush Head Structural Self-Plugging Pull Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	D		H		E	R		P	F	L
		Body Diameter		Head Diameter		Head Height	Radius of Fillet Max		Mandrel Protrusion	Blind Side Protrusion	Rivet Body Length
							For Grades 13, 14	For Grades 30, 41			
		Max	Min	Max	Min	Ref			Min	Max	Max
4	1/8 0.1250	0.128	0.124	0.229	0.206	0.042	.01	0.02	1.00	2L + .170	See Table 4
5	5/32 0.1562	.159	.155	.290	.265	.055	.01	.02	1.00	2L + .205	
6	3/16 0.1875	.190	.186	.357	.329	.070	.01	.02	1.00	2L + .239	
8	1/4 0.2500	.253	.249	.480	.447	.095	.01	.02	1.00	2L + .200	
See Note 3		6		4		5				7	

NOTES:

1. All dimensions are in inches.
2. For application data see Table 4.
3. Rivet series numbers represent the nominal size of rivets in 1/32 inch.
4. Maximum head diameter is calculated on nominal rivet diameter and nominal head angle extended to sharp corner. Minimum head diameter is absolute.
5. Head height is given for reference purposes only. Variations in this dimension are controlled by the diameters (H) and (D) and the included angle of the head.
6. Maximum body diameter of Grade 30 rivets may be increased by 0.001 inch when rivets are plated or coated.
7. When computing the blind side protrusion (F), the maximum length of rivet body (L) as given in Table 4 for the applicable grip shall be used. Minimum blind side clearance may be calculated by subracting the actual grip (G), (i.e., total thickness of the material to be joined), from the specified blind side protrusion (F). (Example: To join two plates, each .187 inch thick with a 3/16 inch rivet, a No. 66 rivet would be used. Minimum blind side clearance necessary to permit proper rivet setting would be 2L + .239 − G, which is 2 × .527 + .239 − .374 which equals .919 inch.)

STRUCTURAL SELF-PLUGGING PULL MANDREL BLIND RIVETS

Table 4 Application Data for 100 Deg Flush Head Structural Self-Plugging Pull Mandrel Blind Rivets

Rivet Series No.	Nom Rivet Size	Recommended Drill Size	Recommended Hole Size		Rivet No.	Grip Range	Rivet Body Length L
			Max	Min			Max
4	1/8 0.1250	#30	0.133	0.129	41	To .062	.170
					42	.063 - .125	.232
					43	.126 - .187	.295
					44	.188 - .250	.357
					45	.251 - .312	.420
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6	3/16 0.1875	#11	0.196	0.192	62	.080 - .125	.277
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					611	.626 - .687	.840
					612	.688 - .750	.902
8	1/4 0.2500	F	0.261	0.257	83	.125 - .187	.385
					84	.188 - .250	.447
					85	.251 - .312	.510
					86	.313 - .375	.572
					87	.376 - .437	.635
					88	.438 - .500	.697
					89	.501 - .562	.760
					810	.563 - .625	.822
					811	.626 - .687	.885
					812	.688 - .750	.947
					813	.751 - .812	1.010
					814	.813 - .875	1.072
See Note		3			2		

NOTES:

1. All dimensions are in inches.
2. The first numeral in the rivet number designates the rivet series number, the last one or two numerals give the maximum grip in 1/16 inch which the rivet is capable of joining.
3. Recommended drill sizes are those which normally produce holes within the specified hole size limits.

STRUCTURAL SELF-PLUGGING PULL MANDREL BLIND RIVETS

Table 5 Grade of Structural Self-Plugging Pull Mandrel Blind Rivets

Grade Designation	Rivet Body Material	Mandrel Material
13	Aluminum Alloy 5056	Aluminum Alloy 2017
14	Aluminum Alloy 2117	Aluminum Alloy 2017
30	Low Carbon Steel	Carbon Steel
41	Nickel-Copper Alloy	Nickel-Copper Alloy

rivet body material and mandrel material as given in Table 5.

2.3 Design. The design of rivets shall be in accordance with the practice of the manufacturer.

3. Requirements.

3.1 Materials and Processes.

3.1.1 *Materials.* Rivet bodies and mandrels shall be made of the material specified for the grade in Table 5.

3.1.2 *Heat Treatment.* Rivet components shall be heat treated as necessary to meet the mechanical and performance requirements specified for the grade. Heat treatment shall be in accordance with good commercial practice.

3.1.3 *Finish.* Unless otherwise specified, rivet bodies and mandrels of Grades 13 and 14 shall be anodized in accordance with the requirements of MIL-A-8625, or chemically surface treated in accordance with the requirements of MIL-C-5541.

Unless otherwise specified, Grade 30 rivet bodies shall be either zinc or cadmium plated with a minimum plating thickness of 0.00015 in. Grade 30 mandrels may be furnished plain or with a protective coating at the option of the manufacturer.

Unless otherwise specified, Grade 41 rivet bodies and mandrels shall be furnished plain (non-coated and/or unplated).

3.2 Dimensional Requirements.

3.2.1 *Rivet Dimensions.* Protruding and 100 deg flush head rivets shall conform to the dimensions given in Tables 1 and 3, respectively.

3.2.2 *Application Data.* Recommendations on the selection and application of protruding and 100 deg flush head rivets are given in Tables 2 and 4, respectively.

3.3 Mechanical and Performance Requirements.

3.3.1 *Shear Strength.* Rivets, except those described in 3.3.3, shall have ultimate shear strengths not less than the minimum specified for the applicable size and grade given in Table 6 when tested in accordance with 2.1 of IFI-135.

3.3.2 *Tensile Strength.* Rivets, except those described in 3.3.3, shall have ultimate tensile strengths not less than the minimum specified for the applicable size and grade given in Table 6 when tested in accordance with 2.2 of IFI-135.

3.3.3 Protruding head rivets with specified maximum grip lengths shorter than 1.5 times the nominal rivet diameter, and flush head rivets with specified maximum grip lengths shorter than 2.0 times the nominal rivet diameter shall not be subject to either shear or tensile testing.

3.3.4 *Mandrel Retention.* Mandrels of properly set rivets shall withstand, without apparent movement of the mandrel in the rivet body, the axial pushout loads specified for the applicable size and grip length in Table 7 when tested in accordance with 2.5 of IFI-135.

Table 6 Ultimate Shear and Tensile Strengths of Structural Self-Plugging Break Mandrel Blind Rivets.

Nom Rivet Size In.	Ultimate Shear Strength min lbs				Ultimate Tensile Strength min lbs			
	GRADE 13	GRADE 14	GRADE 30	GRADE 41	GRADE 13	GRADE 14	GRADE 30	GRADE 41
1/8 0.1250	340	350	490	630	230	240	280	540
5/32 0.1562	550	570	750	970	375	390	490	860
3/16 0.1875	760	790	1090	1400	540	570	700	1240
1/4 0.2500	1380	1440	1970	2500	980	1030	1250	2300

Table 7 Mandrel Retention Loads of Structural Self-Plugging Break Mandrel Blind Rivets

Nom Rivet Size in.		Mandrel Retention Load, lbs min		
		For Rivets With Specified Min Grip Length, In.		
		.124 and less	.125 to .187	.188 and longer
1/8	0.1250	10	15	15
5/32	0.1562	15	20	25
3/16	0.1875	20	25	35
1/4	0.2500	30	35	50

3.3.5 *Expansion.* Any axial separation(s) occurring in the rivet body due to expansion caused by rivet setting shall not extend beyond the blind side surface of the joined material into the gripped length.

4. Test Methods.

Tests shall be conducted in accordance with the test methods specified in IFI-135, page K-89.

5. Inspection.

Rivets shall be inspected to determine conformance with dimensional, mechanical, and performance requirements. Inspection shall be as agreed upon between manufacturer and purchaser.

In case of dispute following shipment of rivets, acceptability shall be determined in accordance with the procedures given in IFI-137, page K-93.