

## **Foreword**

The formulation of this National Standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled "Enhancing the Implementation of AFMA Through Improved Agricultural Engineering Standards" which was funded by the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA).

This standard has been technically prepared in accordance PNS 01-4:1998 (ISO/IEC Directives Part 3:1997) – Rules for the Structure and Drafting of International Standards. It provides specifications and proper application of rivets for agricultural machines.

The word “shall” is used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that certain course of action is preferred but not necessarily required.

In the preparation of this standard, the following references were considered:

Baumeister, Theodore (ed.) 1997. Mark’s handbook for mechanical engineers. 10th Edition. Mc Graw Hill Book Company, USA.

Faires, V. M. 1969. Design of machine elements. Macmillan Company, New York USA.

Horton, H. L. (Ed.) 1984. Machinery’s handbook. 23<sup>rd</sup> Edition. Industrial Press Inc, New York.

Hummel, B. L. (Ed.) 1967. Machine design, Fastening and joining, Vol. 39 No. 34. Penton Publishing Co., Cleveland, Ohio.

JIS B 1213:1995, Cold-headed rivets

JIS B 1213:1995, Semi-tubular rivets

**Engineering Materials – Rivets for Agricultural Machines  
– Specifications and Applications**

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**1 Scope**

This standard establishes specifications and provides technical information for the proper application of rivets for agricultural machinery.

**2 Application**

Rivets are used primarily for moderately loaded joints. Unlike screws, rivets are not precision items; its main advantage is its high speed of assembly. For the purpose of this standard, machine member riveted joints will be discussed.

**3 Reference**

The following normative reference contains provisions which, through reference in this text, constitute provisions of this standard:

PAES 314:2002, Engineering Materials – Washers for Agricultural Machines – Specifications

**4 Definitions****4.1****rivet**

a headed pin of metal used for uniting two or more pieces by passing the shank through a hole in each piece and then by beating or pressing down the plain end so as to make a second head

**4.2****nominal diameter**

the diameter of the shank

**4.3****nominal length (rivets other than countersunk or raised countersunk rivets)**

the length from the underside of the head to the end of the shank

**4.4****nominal length (countersunk and raised countersunk head)**

the distance from the periphery of the head to the end of the rivet measured parallel to the axis of the rivet

**4.5**

**lap-joint**

a type of riveted joint wherein the plates overlap each other and are held together by one or more rows of rivets.

**4.6**

**butt-joint**

a type of riveted joint wherein the plates being joined are in the same plane and are joined by means of a cover plate or butt strap which is riveted to both plates by one or more rows of rivets

**4.7**

**pitch**

spacing between rivet centers

**4.8**

**margin**

the distance from the edge of the plate to the centerline of the nearest row of rivets

**4.9**

**clinch allowance**

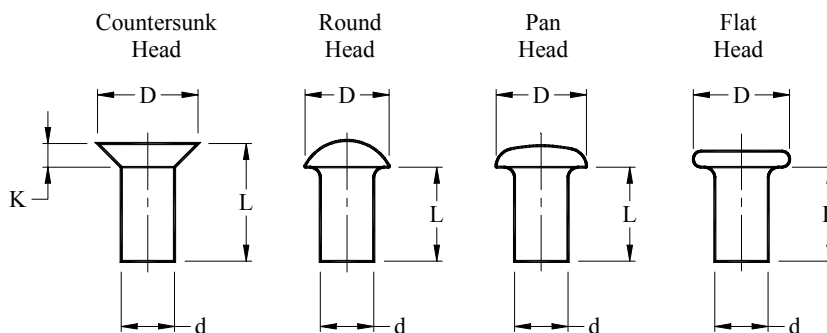
allowance in length of rivet in order to turn over or flatten the protruding end

**5 Types**

Classifications of rivets are specified in Table 1. Figure 1 presents the different types of rivets based on type of head.

**Table 1 – Types of rivets covered in this standard**

Classification	Uses
Cold forged rivets	This type shall be used for general purposes
Semi-tubular rivets	This type shall be used for general purposes
Blind rivets	This type shall be used when the reverse side of the joint is not accessible or is too restricted

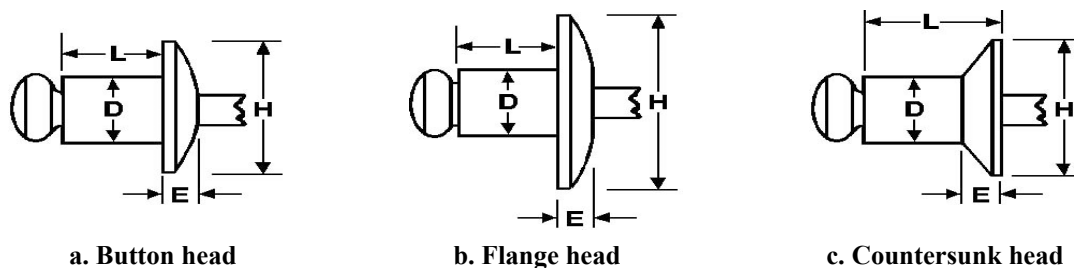


where:  $K$  = Head height  
 $L$  = Rivet length  
 $d$  = Nominal diameter  
 $D$  = Head diameter

**Figure 1 – Types of rivets based on head**

## 6 Nomenclature

The nomenclature of rivets and its designation of dimensions shall conform to Figures 1 and 2.



where: d = Nominal diameter  
 D = Head diameter  
 E = Head height  
 L = Rivet length

**Figure 2 – Nomenclature of blind rivets**

## 7 Dimensions

Table 2 specifies the available sizes of different types of cold-forged rivets and its corresponding head diameter. Table 3 specifies the available lengths for cold-forged rivets. Table 4 specifies the dimensions of semi-tubular. Dimensions of different types of types of blind rivets shall conform to Table 5.

**Table 2 – Dimensions of cold-forged rivets**

Nominal diameter	Head diameter, mm			
	Round head	Countersunk head	Flat head	Pan head
3	5.7	6	6	6
3.5	6.7	7	7	7
4	7.2	8	8	-
4.5	8.1	9	9	8
5	9	10	10	9.5
6	10	12	12	10.8
8	13.3	16	-	-
10	16	16	-	-
12	19	19	-	-
13	21	21	-	-
14	22	22	-	-
16	26	-	-	-

**Table 3 – Available lengths for cold-forged rivets**

Length, mm	Nominal diameter, mm											
	3	3.5	4	4.5	5	6	8	10	12	13	14	16
3	ACD											
4	AAC	ACD	ACD									
5	X	X	ACD	AC	ACD							
6	X	X	X	ABC	ACD	ACD						
7	X	X	X	ABC	ACD	ACD						
8	X	X	X	ABC	X	ACD	A					
9	X	X	X	ABC	X	X	A					
10	X	X	X	ABC	X	X	AB	A				
11	X	X	X	ABC	X	X	AB	A				
12	X	X	X	ABC	X	X	AB	A	A			
13	X	X	X	ABC	X	X	AB	A	A			
14	X	X	X	ABC	X	X	AB	AB	A	A	A	
15	X	X	X	ABC	X	X	AB	AB	A	A	A	
16	X	X	X	ABC	X	X	AB	AB	AB	A	A	
18	X	X	X	ABC	X	X	AB	AB	AB	A	A	A
20	X	X	X	ABC	X	X	AB	AB	AB	AB	A	A
22		X	X	ABC	X	X	AB	AB	AB	AB	AB	A
24			X	ABC	X	X	AB	AB	AB	AB	AB	A
26				ABC	X	X	AB	AB	AB	AB	AB	A
28				ABC	X	X	AB	AB	AB	AB	AB	A
30					X	X	AB	AB	AB	AB	AB	A
32						X	AB	AB	AB	AB	AB	A
34						X	AB	AB	AB	AB	AB	A
36						X	AB	AB	AB	AB	AB	A
38							AB	AB	AB	AB	AB	A
40							AB	AB	AB	AB	AB	A
42								AB	AB	AB	AB	A
45								AB	AB	AB	AB	A
48								AB	AB	AB	AB	A
50								AB	AB	AB	AB	A
52									AB	AB	AB	A
55									AB	AB	AB	A
58									AB	AB	AB	A
60									AB	AB	AB	A
62										AB	AB	A
65										AB	AB	A
68											AB	A
70											AB	A
72												A
75												A
80												A

NOTE X – Signifies all types of cold-forged rivets covered in this standard.  
A – Signifies round head cold-forged rivets.  
B – Signifies countersunk head cold-forged rivets.  
C – Signifies thin flat head cold-forged rivets.  
D – Signifies pan head cold-forged rivets.

**Table 4 – Dimensions of semi-tubular rivets**

Nominal; diameter, mm	Equivalent size in inches	Head diameter, mm			Length, mm
		Round head	Flat head	Countersunk head	
1.2	-	2.2	2.2	-	2-10
1.6	-	3	3	-	2.5-14
2.0	-	3.7	3.7	4	3-14
2.5	-	4.6	4.6	5	3-20
3.0	-	5.4	5.4	6	3.5-22
4.0	5/32	7.2	7.2	8	4.4-28
5.0	-	9	9	10	6-36
6.0	1/4	10.5	10.5	12	8-42
8.0	1/2	13.5	13.5	16	10-56

NOTE The graded difference of the length shall be 0.5 mm between 1.2 4 of the nominal diameter, and 1 mm between 5 and 8.

**Table 5 – Dimensions of blind rivets**

Dimensions in millimeters

Nominal diameter	Equivalent size in inches	Head diameter	Head height.	Length (max)	Grip range
<b>Button head</b>					
2.4	3/32	4.78	0.81	6.4	0.8-3.2
3.2	1/8	6.35	1.02	10.25	4.9-6.4
4.0	5/32	7.92	1.27	10.8	4.9-6.4
4.8	3/16	9.53	1.52	17.8	9.6-12.7
6.4	1/4	12.7	2.03	19.1	9.6-12.7
<b>Large flange</b>					
3.2	1/8	9.53	1.65	10.2	4.9-6.4
4.0	5/32	11.9	1.77	14.0	6.5-9.5
4.8	3/16	15.62	2.28	17.8	9.6-12.7
<b>120° countersunk</b>					
3.2	1/8	5.59	1.14	10.2	4.9-6.4
4.0	5/32	7.20	1.20	10.8	1.6-6.4
4.8	3/16	8.89	1.27	11.4	3.3-6.4

## 8 Materials

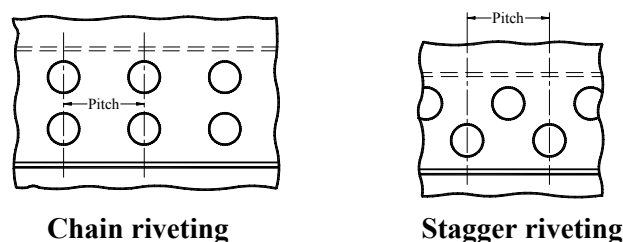
Rivet materials shall be made of wrought iron or soft steel as steel designation AISI 1010, but for applications where light weight or resistance to corrosion is important, copper, aluminum alloy, Monel, Inconel may be used.

## 9 Designation

Rivets shall be designated by its type, nominal diameter, and its nominal length.

## 10 Types of joint

Riveted joints shall be classified according to plate arrangement and by rivet arrangement. Types of rivet joints according to rivet arrangements are chain and stagger (Figure 3).



**Figure 3 – Types of riveting**

## 11 Size of rivets

The rivet diameter,  $d$ , commonly falls between  $d = 1.2\sqrt{t}$  and  $d = 1.4\sqrt{t}$ , where  $t$  is the thickness of the plate.

## 12 Hole diameter

Hole diameters for different types of rivets shall conform to Table 5.

**Table 5 – Hole diameters for different rivet types**

Nominal diameter (mm)	Hole diameter (mm)		
	Cold-forged rivets-	Semi-tubular rivets	Blind rivets
1.2		1.3	
1.6		1.7	
2		2.1	
2.4			2.5
2.5		2.6	
3	3.2	3.2	3.28
3.2			
3.5	3.7		4.1
4	4.2	4.2	
4.5	4.7		4.9
4.8			
5	5.3	5.3	
6	6.3	6.3	6.5
6.4			
8	8.4	8.4	
10	10.6		
12	12.8		
13	13.8		
14	15		
16	17		

## 13 Spacing

**13.1** The pitch shall not be less than three times the diameter of the rivets to allow for proper clearance for the use of a riveting tool during driving.

**13.2** With the usual proportions of riveted joints, the margin shall equal to 1 ½ times the rivet diameter is sufficient to prevent tearing or shearing.

**13.3** Maximum recommended margin should be 12 times the thickness of the plate but should not exceed 152 mm.

## 14 Clinch allowance

Rivets should be long enough to insure adequate holding. Recommended clinch allowance shall be 50% to 70% of the rivet diameter. Clinch allowances for semi-tubular rivets are specified in Table 6.

**Table 6 – Clinch allowance for semi-tubular rivets**

<b>Nominal diameter (mm)</b>	1.2	1.6	2	2.5	3	4	5	6	8
<b>Clinch allowance (mm)</b>	0.7	1	1.2	1.5	1.8	2.4	3	3.6	5

**15 Washers**

Washers shall be used when the materials to be joined are soft or collapsible (e.g. belt, canvas) to prevent crushing and defacement of the material. Dimensions of washers shall conform to PAES 314:2002.

**16 Markings**

The following information shall be marked on the packaging:

- a) Manufacturer's name, trademark and address
- b) Rivet designation
- c) Quantity

**17 Appearance**

Rivets shall be smooth on the surface and free from defects, such as fissures, burrs, cracks, flakes, and flashes.