

## **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 with PNS 01-4:1998 (ISO/IEC Directives Part 3:1997) – Rules for the Structure and Drafting of International Standards. In compliance with metrication law “Batas Pambansa Bilang 8” enacted on January 1, 1983, some data are converted to International System of Units (SI).

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 documents/publications were considered:

Indian Standard (IS) 6635:1972 – Specification for Tractor-Operated Disc Harrows

American Society of Agricultural Engineers (ASAE) S290.1:1981 – Determining Cutting Width and Designated Mass of Disk Harrows

American Society of Agricultural Engineers (ASAE) EP 399.1:1985 – Preferred Metric Dimensions for Agricultural Implement Disk Blades.

A web page document on *Disc Harrows* by Albert Boers. Last updated: July 4, 2001. Wageningen University.

Stevens G.N. *Equipment Testing and Evaluation*. Overall Division, National Institute of Agricultural Engineering (NIAE), Wrest Park, Silsoe Bedford England. 1982.

Regional Network for Agricultural Machinery (RNAM) Test Codes And Procedures for Farm Machinery. Technical Series No. 12 :1983.

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**Agricultural Machinery – Disc Harrow – Specifications**

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**1 Scope**

This standard specifies the requirements for disc harrows used for four-wheel tractor.

**2 References**

The following normative document contains provisions, which, through reference in this text, constitute provisions of this National Standard:

ISO 730-1:1994/Cor 1:1995, Agricultural Wheeled Tractors – Rear-mounted three-point linkage – Categories 1, 2, 3 and 4

**3 Definitions**

For the purpose of this standard, the following definitions shall apply:

**3.1****concave disc**

circular concave steel plate used for cutting and inverting the soil

**3.2****disc spacing**

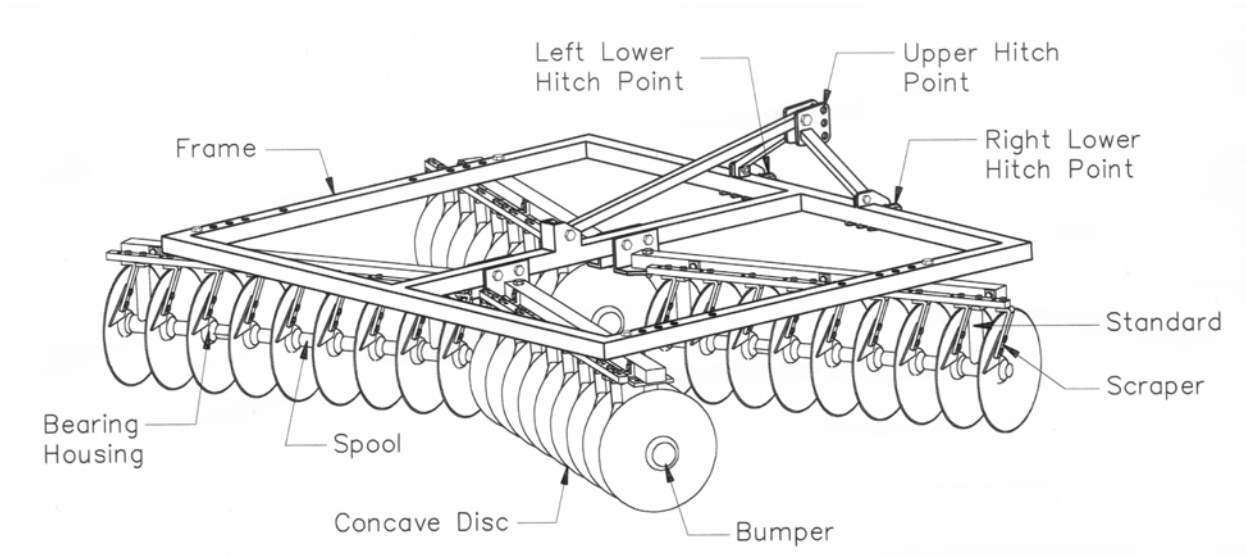
transverse distance between two adjacent disc edges

NOTE This can be obtained by adding thickness of one disc and length of spool.

**3.3****disc harrow**

implement used to pulverize the soil to attain a better soil tilth for the seed germination and growth

NOTE It consists of two or four gangs of concave steel disc. (see Figure 1)



**Figure 1 – Disc Harrow and its Components**

### 3.3.1

#### **single-action disc harrow**

consists of two gangs of discs, placed end-to-end at an angle, which throw the soil in opposite directions

### 3.3.2

#### **tandem disc harrow**

consists of two or more gangs, in which a set of two gangs follows behind the front gangs and is arranged in such a way that the discs on the front gangs throw the soil in one direction (usually outward) and the discs on the rear gangs throw the soil in the opposite direction

### 3.3.3

#### **offset disc harrow**

consists of two gangs wherein one gang is located behind the other at an angle and the harrow is operated in an offset position in relation to the tractor centerline

### 3.4

#### **frame**

structure on which the gangs are fitted (see Figure 1)

### 3.5

#### **gang**

set of concave discs, which is mounted on a common shaft and separated by a spool

### 3.6

#### **gang angle**

angle between the axis of gang and the line perpendicular to the direction of motion

### 3.7

**gang angling mechanism**

mechanism by which the gang angles are adjusted

**3.8**

**gang axle**

shaft on which a set of concave discs are fitted

**3.9**

**ground clearance**

vertical distance between the ground and the lowest edge of the disc when the trailed harrow is supported on transport wheels

**3.10**

**hitch**

portion of an implement designed to connect the implement to the power source (see Figure 1)

**3.11**

**included angle**

angle between the axes of two adjacent gangs

**3.12**

**scraper**

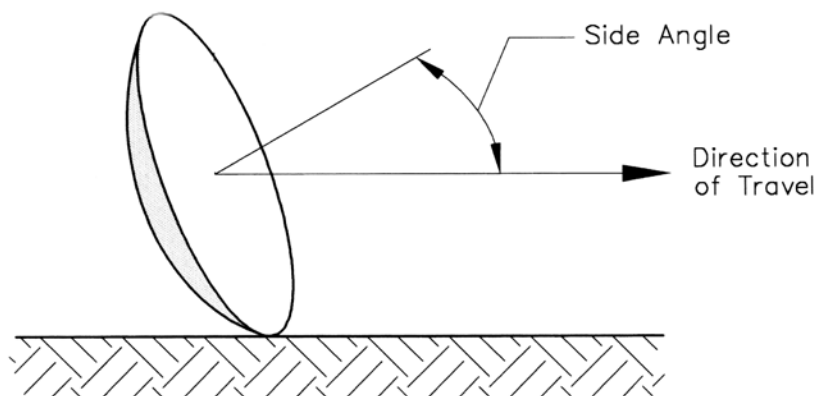
component which scrapes the soil adhering to the concave side of the disc (see Figure 1)

**3.13**

**side angle**

disc angle

angle, in the soil surface plane, between a tool axis and a line, which is perpendicular to the direction of travel (see Figure 2)



**Figure 2 – Side Angle**

**3.14**

**spool**

flanged tube mounted on gang axle and placed between two discs to prevent the lateral movement of the discs on the shaft (see Figure 1)

**3.15**

**width of cut**

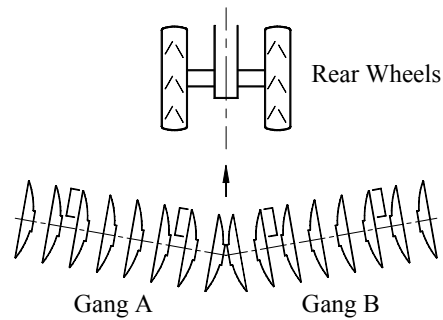
transverse distance between the top or bottom cutting edges of the end discs

**4 Classification**

The disc harrow shall be classified according to:

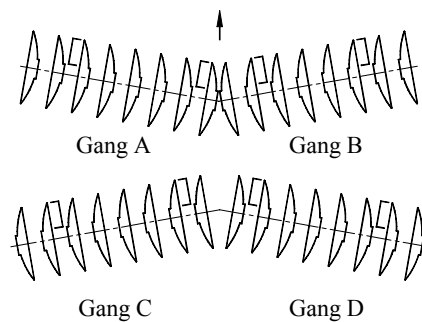
**4.1 gang orientation (see Figures 3, 4 and 5)**

**4.1.1 single-action**



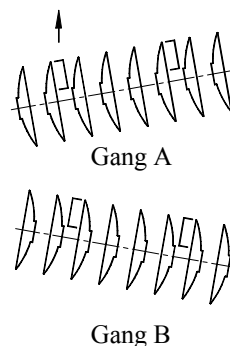
**Figure 3 – Single-action**

**4.1.2 tandem**



**Figure 4 – Tandem**

**4.1.3 offset**



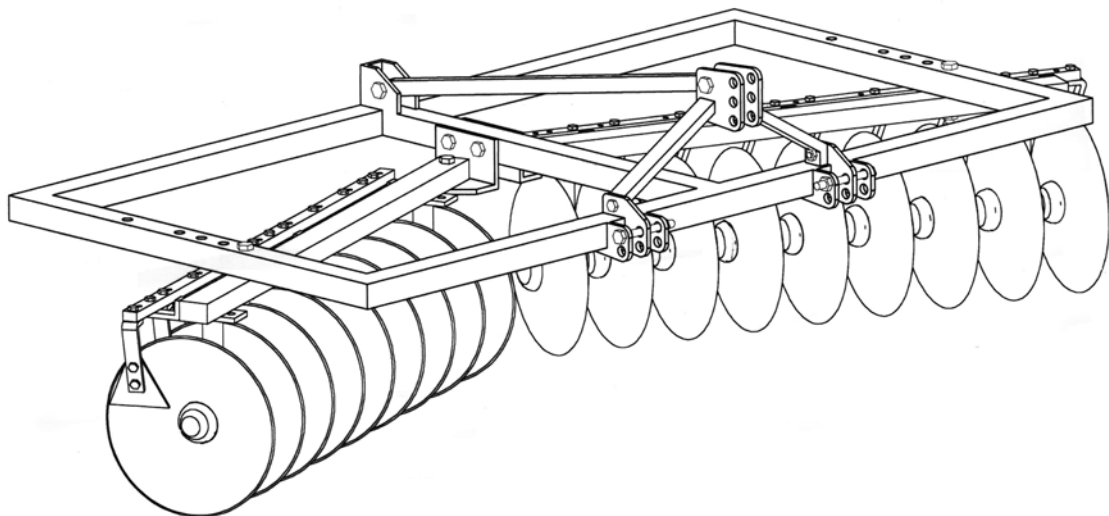
**Figure 5 – offset**

**4.2** manner of hitching to the tractor

**4.2.1** Tractor-mounted disc harrows

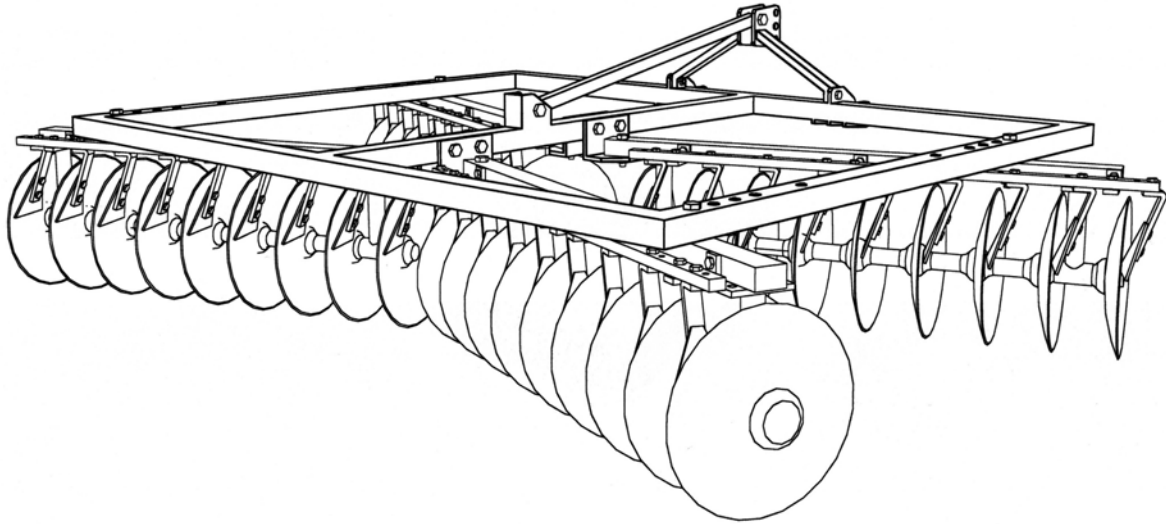
These are designed for tractors equipped with hydraulic three-point hitch lift systems (see Figures 6, 7 and 8).

**4.2.1.1** Tractor-mounted single-action disc harrow



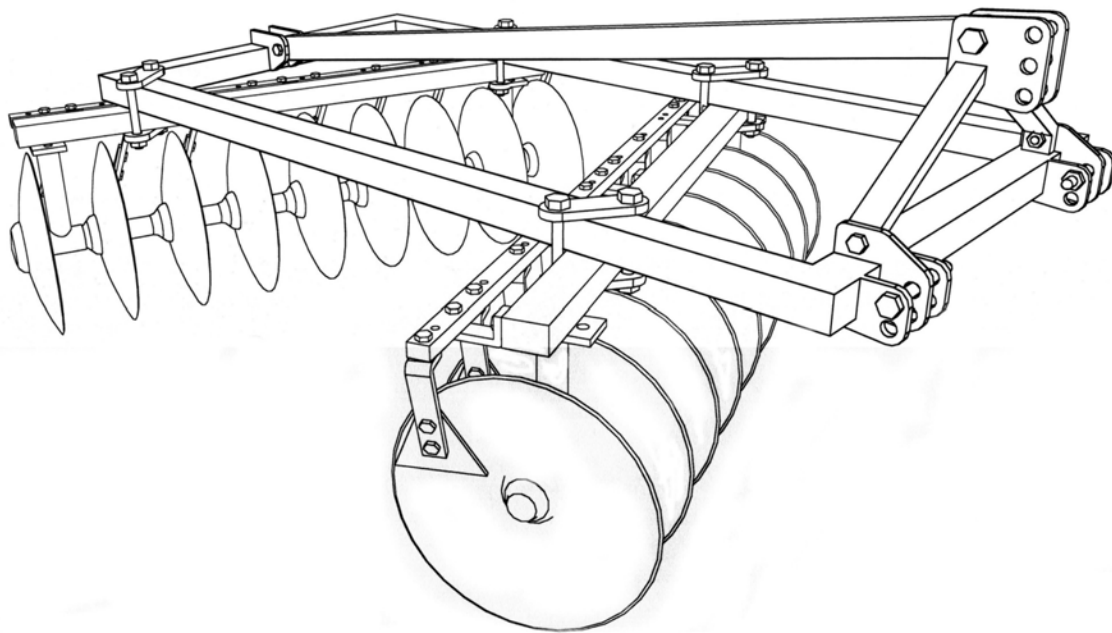
**Figure 6 – Tractor-mounted Single-action Disc Harrow**

**4.2.1.2** Tractor-mounted tandem disc harrow



**Figure 7 – Tractor-mounted Tandem Disc Harrow**

**4.2.1.3 Tractor-mounted offset disc harrow**

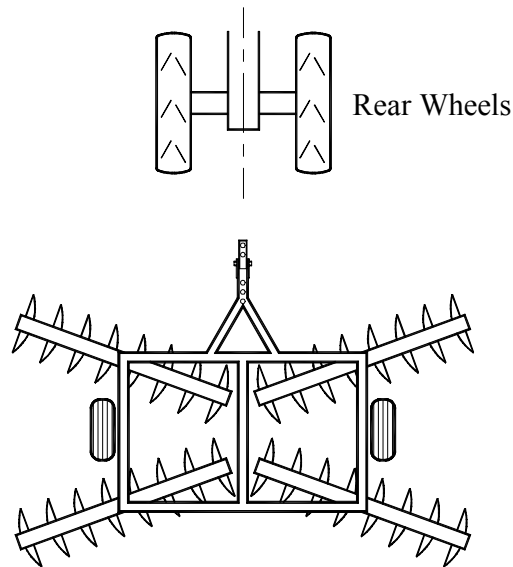


**Figure 8 – Tractor-mounted Offset Disc Harrow**

**4.2.2 Trailing disc harrows**

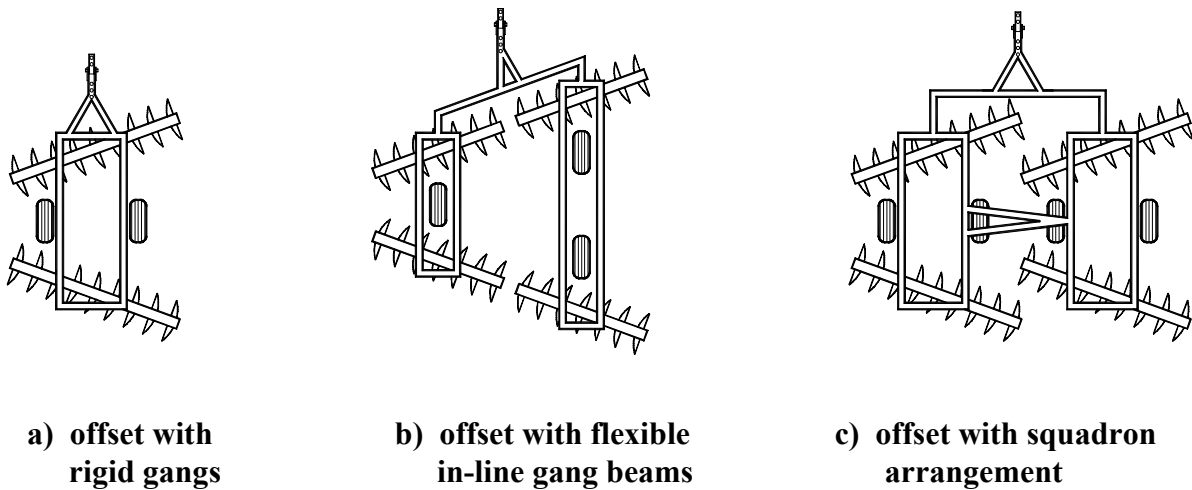
These are hitched to the drawbar of the tractor and pulled by the tractor (see Figure 9 and Figure 10). Transport wheels can be mechanically or hydraulically actuated.

**4.2.2.1** trailing tandem disc harrow



**Figure 9 – Trailing Tandem Disc Harrows**

**4.2.2.2** trailing offset disc harrows



**Figure 10 – Trailing Offset Disc Harrows**

**5** Size



The size of the harrow shall be determined by the number and diameter of the discs and the width of cut. For size determination, width of cut shall be calculated by the following formula:

- a) For single-action :

$$W = \frac{0.95 NS + 0.3 D}{1000}$$

- b) For tandem type :

$$W = \frac{0.95 NS + 1.2 D}{1000}$$

- c) For offset type:

$$W = \frac{0.95 NS + 0.6 D}{1000}$$

where :         $W$  is the width of cut, m  
                    $N$  is the number of discs  
                    $S$  is the disc spacing, mm  
                    $D$  is the diameter of the disc, mm

NOTE For measuring the width of cut, gang angle shall be set at 18° (in case of the offset disc harrow, included angle shall be set at 36°).

## 6 Materials of Construction

**6.1** Mild steel shall be used in the manufacture of the frame, gang axle, scraper, gang angling mechanism, and hitch.

**6.2** Cast iron shall be used in the manufacture of spool.

**6.3** Carbon steel shall be used in the manufacture of hitch pin.

**6.4** Carbon steel with at least 80% carbon content (e.g. AISI 1080) or alloy steel with at least 0.0005% boron content shall be used in the manufacture of the disc blades.

## 7 Construction Requirements

The disc harrow shall conform to the following requirements:

Items	Requirements
Length, m	2 to 8
Width, m	1 to 10
Height, m	1 to 1.5
Number of gangs	minimum of 2 for offset and single-action disc harrow minimum of 4 for tandem disc harrow
Type of disc	plain or notched
Number of disc	minimum of 4 in each gang
Diameter of discs, mm	400 to 650 (600 maximum for four disc gang)
Thickness of disc, mm	4 to 6
Concavity (depth), mm	100 to 300
Disc angle, °	24 maximum
Length of spool, mm	175 or 225 ± 2
Ground clearance, mm	125
Weight per disc*, kg	25 to 70
Drawbar power requirement per disc, kW	1 to 2.5

\* It is the total weight of the harrow divided by the number of discs.

## 8 Performance Requirements

**8.1** The maximum depth of cut of the harrow specified by the manufacturer shall be attained.

**8.2** During operation, the harrow shall produce good quality of work such as: the ability to harrow throughout the complete implement width and capacity to cut and incorporate plant residues in the soil at minimum blockages.

## 9 Other Requirements

**9.1** The frame shall be rigid and durable.

**9.2** Gangs

The gangs shall be so attached that their angles can be easily changed to desired position with gang angling mechanism.

**9.2.1** The rear gang(s) in offset and tandem disc harrows shall be so arranged that the disc(s) of rear gang(s) shall not make the same path formed by front gang(s).

**9.2.2** Bumpers may be provided in the inside end of the front gangs of the single-action and tandem disc harrows to prevent the inside discs from rubbing each other at any gang angle in which the gangs are set.

**9.2.3** The discs in each gang shall be firmly fixed by spools and there shall not be any relative movement between the disc and the axle.

**9.3** The scrapers shall be set in such a way that they shall not touch the face of disc and shall be able to scrape the soil effectively. Arrangement for adjusting the scrapers shall be provided.

**9.4** Adequate arrangement for lubrication of bearings shall be provided. The bearings shall be reasonably dust-proof and shall be properly aligned.

**9.5** Ball or tapered roller bearings with special dirt seals shall be used.

**9.6** Both faces of spool coming in contact with the disc face shall be finished for proper gripping.

**9.7** The hitch of disc harrow shall be compatible with the hydraulic system and the three-point hitch of the tractor specified in PAES 118.

**9.8** In single-action disc harrow, provision may be made for attaching a shovel or a sweep to cut and uncut the soil between two gangs.

**9.9** The harrow shall be easy to operate such as:

- a. hitching to and unhitching from tractor;
- b. adjusting the depth of cut;
- c. changing the position of the harrow with respect to the line of pull of the tractor;
- d. moving the standards laterally on the frame;
- e. varying the angle between the bodies;
- f. maneuverability during operation;
- g. clearing blockages;
- h. changing from transport to work position and vice versa; and
- i. adjustment of the scrapers.

## **10 Workmanship and Finish**

**10.1** The disc harrow shall be free from manufacturing defects that may be detrimental to its operation.

**10.2** Except for disc blades, other uncoated metallic surfaces shall be free from rust and shall be painted properly.

**10.3** The disc harrow, except for disc blades, shall be free from sharp edges and surfaces that may injure the operator.

## **11 Warranty for Construction and Durability**

**11.1** Warranty against defective materials and workmanship shall be provided for parts and services except for consumable maintenance parts such as discs, bearings and seals, within six (6) months from the purchase of the disc harrow.

**11.2** The construction shall be rigid and durable without breakdown of its major components within six (6) months from purchase by the first buyer.

## **12 Maintenance and Operation**

**12.1** A set of tools required for adjustment during field operations shall be provided.

**12.2** An operator's manual which conforms to PAES 102 shall be provided.

## **13 Marking and Labeling**

Each harrow shall be marked in English language with the following information using a plate, stencil or by directly punching it at the most conspicuous place:

- 13.1** Registered trademark of the manufacturer
- 13.2** Brand
- 13.3** Model
- 13.4** Type and size
- 13.5** Serial number
- 13.6** Production date (optional)
- 13.7** Name and address of manufacturer
- 13.8** Name and address of the importer, if imported (optional)
- 13.9** Country of manufacture (if imported) / “Made in the Philippines” (if manufactured in the Philippines)
- 13.10** Safety/precautionary markings