IS 3342 : 1998
(Superseding IS 6023 : 1970, IS 6451 : 1972,
IS 7361 : 1974, IS 9218 : 1979 and IS 9219 : 1993)

भारतीय मानक

जुताई उपस्कर — कल्टिवेटर, पशुचालित — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

SOIL WORKING EQUIPMENT — CULTIVATORS, ANIMAL DRAWN — SPECIFICATION

(Second Revision)

ICS 65.060.20

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110 002

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Price Group 6

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Farm Implements and Machinery Sectional Committee had been approved by the Food and Agriculture Division Council.

Animal drawn cultivators are manufactured and used in large numbers in the country. Though they are primarily meant for intercultivation operations but are being used for seed bed preparation and for sowing with seeding attachment also. The cultivators manufactured in the country vary considerably in dimensions and other requirements.

This standard was first published in 1965 and was revised in 1979 to incorporates the relevant provision of IS 3350:1965 'Three tined cultivation with seeding attachments, animal drawn'. It has been decided to revise the standard again and further enlarging the scope to cover the requirement of IS 6023 : 1970 'Reversible shovels'; IS 6451 : 1972 'Sweep'; IS 7361 : 1974 'Tines for animal drawn cultivators'; IS 9218 : 1979 'Triangular shovels for animal-drawn cultivators'; and IS 9219 : 1993 'Seeding attachment for animal drawn cultivators (*first revision*)'. This standard therefore supersedes these standards.

The figures included in this standard are meant for illustration only and should not be considered as suggestive of any standard design.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SOIL WORKING EQUIPMENT — CULTIVATORS, ANIMAL DRAWN — SPECIFICATION

(Second Revision)

1 SCOPE

This standard prescribes material, dimensions and other requirements of animal drawn cultivators.

2 REFERENCES

The Indian Standards listed in Annex A contain provisions which, through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated there.

3 TERMINOLOGY

3.0 For the purpose of this standard, the following definitions in addition to those given in **4.1** to **4.3** of IS 9818 (Part 2) shall apply.

3.1 Frame

A rigid structure on which different components are attached.

3.2 Contact Angle

The forward angle between the horizontal ground and the line joining the shovel tip touching the ground and its centre when shovel is fitted with tine and placed on its working position (*see* α in Fig. 1).

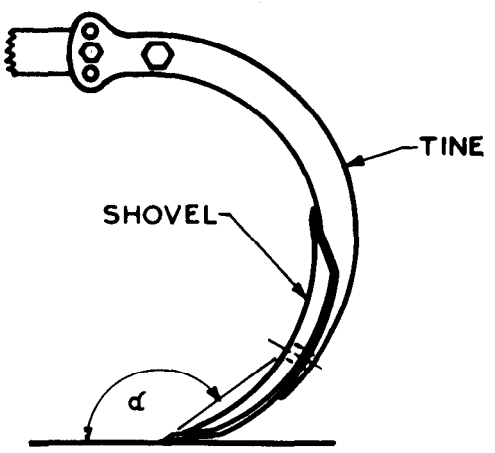


FIG. 1 ILLUSTRATION OF CONTACT ANGLE

3.3 Ground Clearance

The minimum vertical distance between the lower part of the frame and the ground when the cultivator is placed on plain surface at working condition.

3.4 Nominal Size

The width of the cultivator determined by multiplying the number of spaces between the rows and row spacing expressed in mm.

3.5 Working Size

The width of the cultivator determined by multiplying the number of tines and row spacing expressed in mm.

3.6 Sweep

A two winged cutting point which cuts the soil in a horizontal direction (*see* Fig. 2).

3.6.1 *Crown*

The part of the sweep where the tine of cultivator is attached.

3.6.2 *Wing*

Extended portion of the sweep which penetrates in the soil.

3.6.3 *Face*

The curved portion of the sweep between two wings and below the crown.

3.6.4 *Lift Angle*

The inclination of wing in the direction of travel when sweep is placed on flat surface and in working position (*see* ß in Fig. 2).

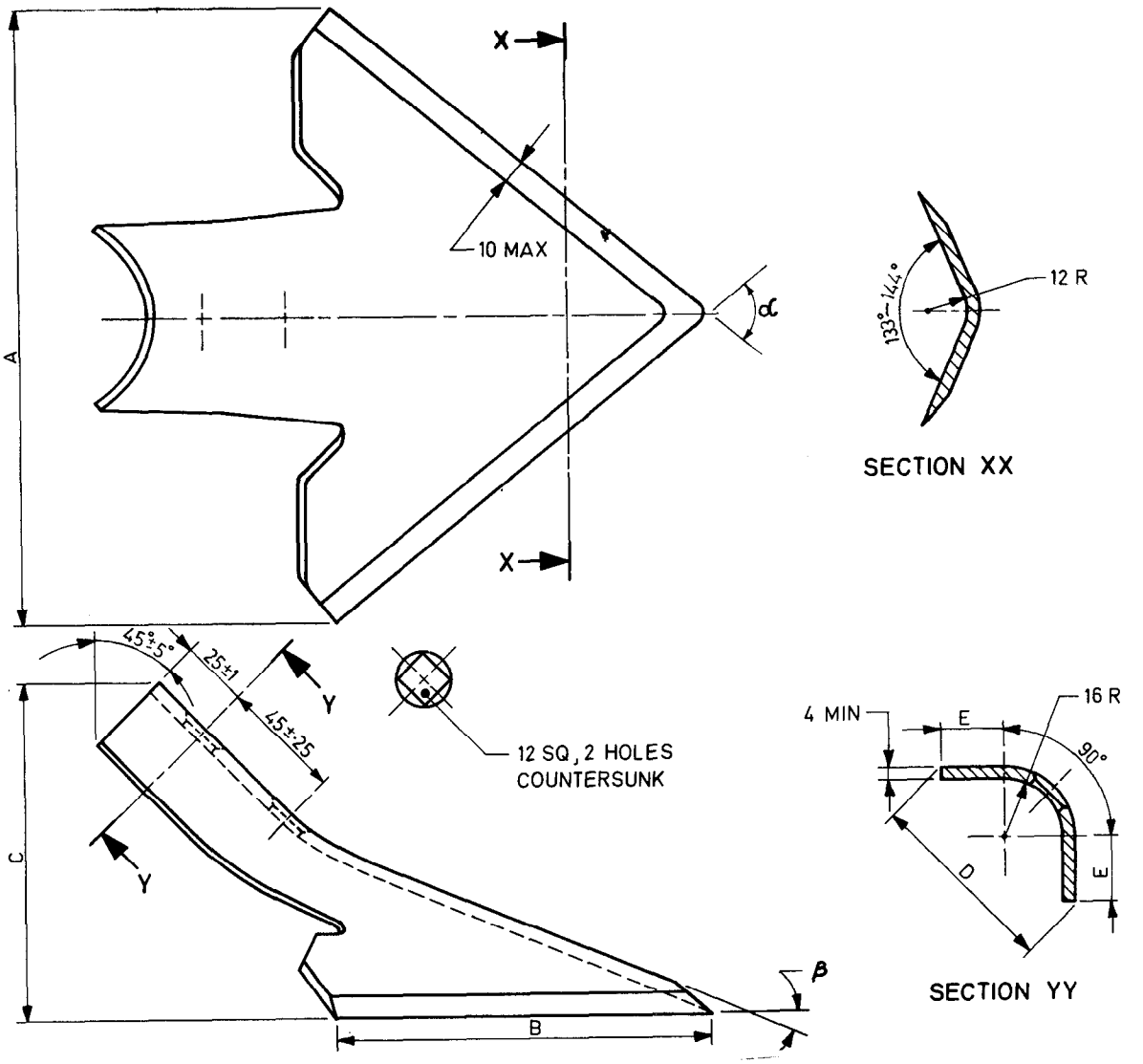
4 TYPES

4.1 For the purpose of this standard, the cultivators shall be of following types:

a) Tool bar type (*see* Fig. 3),

b) Zigzag type (*see* Fig. 4 and 5), and

c) Triphali type (*see* Fig. 6).



All dimensions in millimetres.

FIG. 2 SWEEP

5 MATERIALS

5.1 The material for the manufacture of various components except shovels and sweep of the cultivator shall be as given in col 3 of Table 1. The material should conform to the relevant Indian Standards given in col 4 of Table 1.

5.2 The material for shovel and sweep shall be C 55 of schedule II of IS 1570.

5.3 The material for components not covered under **5.1** and **5.2** shall be specified by the manufacturer.

6 HARDNESS

6.1 The shovel and sweep shall have hardness in the range of 350 to 450 HB (*see* IS 1500) when tested upto a distance of 50 mm from the cutting edge.

7 DIMENSIONAL REQUIREMENTS

7.1 Ground Clearance

The ground clearance of tool bar type, zigzag type and triphali type cultivators shall be minimum of 300 mm, 200 mm and 250 mm respectively.

7.2 Contact Angle

The contact angle shall be declared by the manufacturer. The angle shall not differ by ± 3° from the declared value. The angle may be between 150° to 165°.

7.3 Handle and Handle grip

The cultivators shall be provided with one or two handles. If two handles are provided, the distance

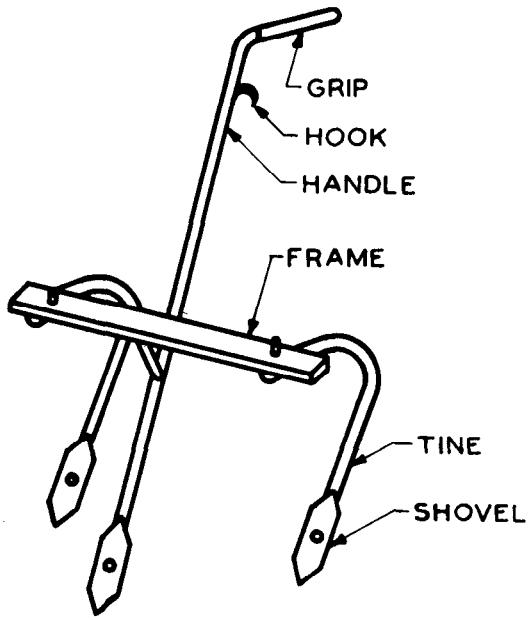


FIG. 3 TYPICAL DRAWING OF TOOL BAR TYPE CULTIVATOR

between handle grips shall be between 550 mm and 650 mm.

7.3.1 The handle grip shall be circular or oval in cross section. The diameter or minor axis shall be between 25 mm and 35 mm. The length of the grip shall be not less than 125 mm. The angle between the grip and handle shall be between 100° and 105°. When the cultivator is set at its working position, the vertical distance between ground and the centre of grip shall be adjustable between 800 and 1 100 mm.

NOTE - Based on anthropometry survey conducted by CIAE Bhopal it is recommended to provide vertical distance between ground and the handle between 650 and 950 mm and the dia of handle from 32 mm to 36 mm.

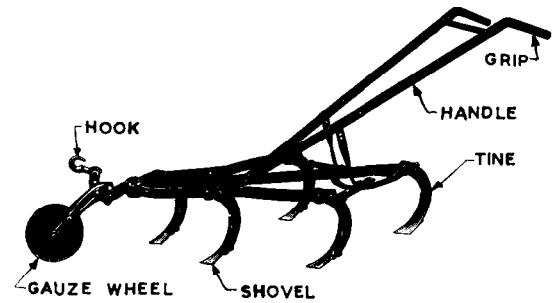


FIG. 4 A TYPICAL ANIMAL DRAWN CULTIVATOR ZIGZAG TYPE WITHOUT LEVER

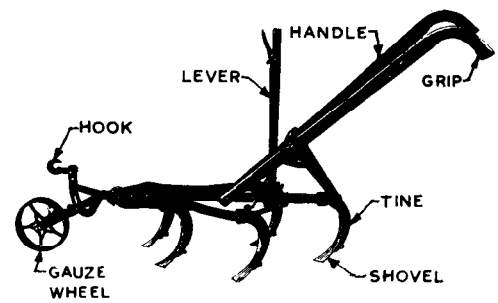


FIG. 5 A TYPICAL ANIMAL DRAWN CULTIVATOR ZIGZAG TYPE WITH LEVER ATTACHMENT

Table 1 Material of Construction of Various Components of Animal Drawn Cultivators

(*Clause* 5.1)

Sl No.	Component	Material	Applicable IS
(1)	(2)	(3)	(4)
i)	Frame	Mild steel	IS 2062
ii)	Handle	do	do
iii)	Braces	do	do
iv)	Grip	Steel tube	IS 3601
		or Timber	Annex D of IS 620
v)	Hook	Mild steel	IS 2062
vi)	Beam	Timber	Annex D of IS 620
vii)	Gauge wheel	Cast iron	Grade 200 of IS 210
viii)	Lever	Mild steel	IS 2062
ix)	Tines	do	do
x)	Seeding attachment		
	a) Seed funnel	M.S sheet	IS 513
		G.S. Sheet	IS 277
	b) Seed tube	M.S.Pipe	IS 3601
		PVC Pipe	IS 4985

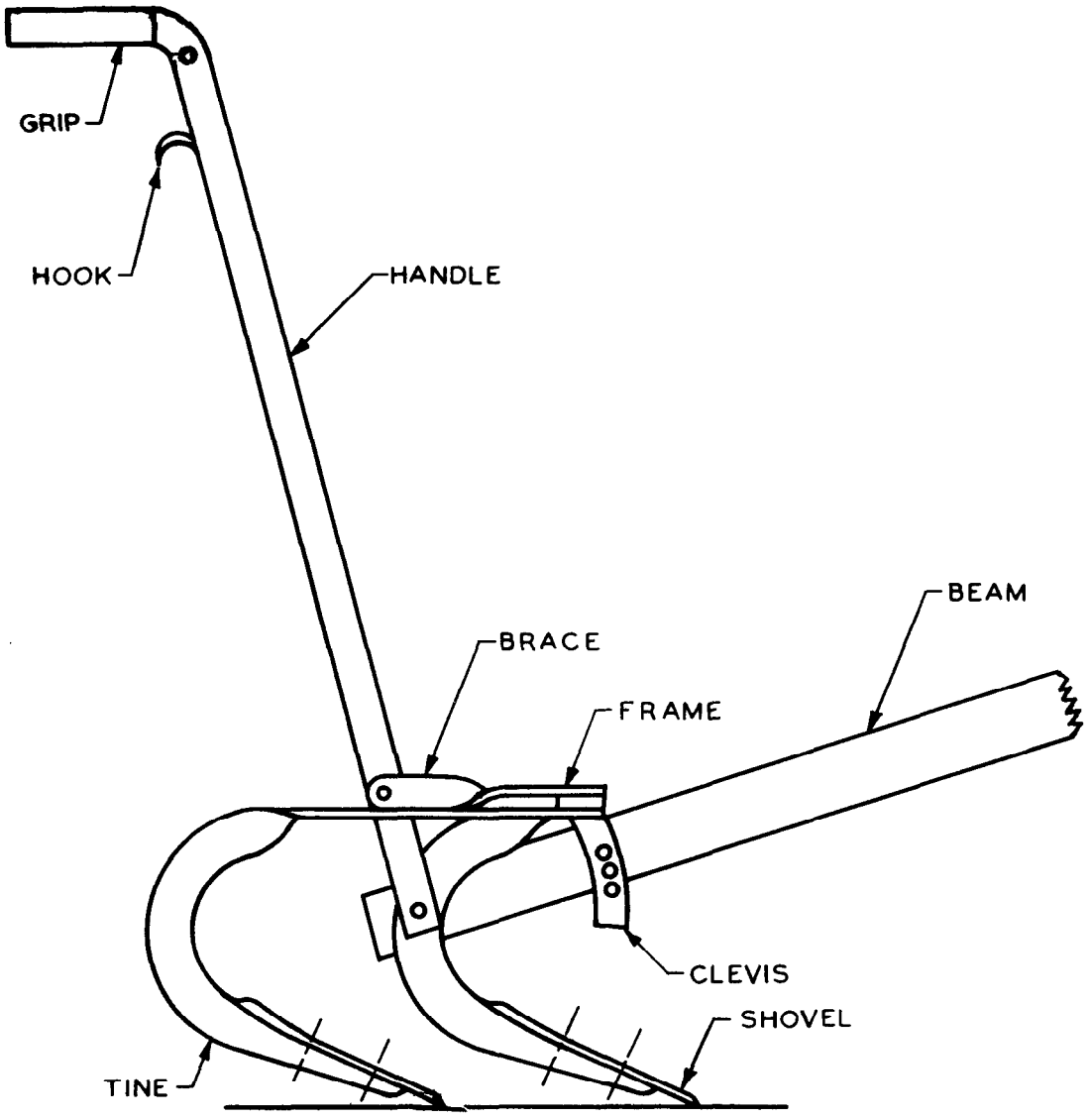


FIG. 6 A TYPICAL ANIMAL DRAWN CULTIVATOR TRIPHALI TYPE

7.4 Gauge Wheel

The gauge wheel, if fitted, shall be not less than 150 mm in diameter with face width not less than 50 mm.

7.5 Width Adjustment

In case the holes are provided for width adjustment, the centre to centre distance from one hole to other shall be 25 ± 1 mm. In case lever is provided for width adjustment each step should be able to change the width by 50 ± 2 mm (25 ± 1 mm each side from centre of the cultivator).

7.6 Tines

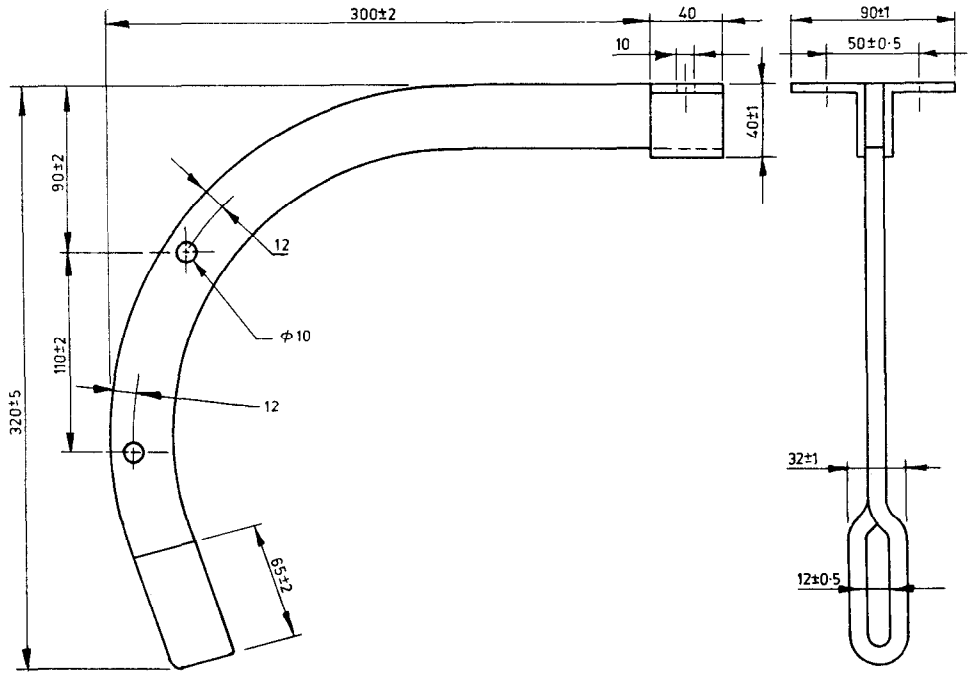
The tines shall be of five types namely A, B, C, D and E depending upon the part of their fixation. The dimensions of the tine of type A, B, C, D and E shall be as given in Fig. 7 to Fig. 11.

7.7 Reversible Shovel

The dimensions of reversible shovel shall be selected from Fig. 12.

7.7.1 The reversible shovel for cultivators shall be curved across the width to have a proper grip with tine (*see* Fig. 12 section XX). The shovel for spring tine harrow shall be kept flat across the width.

7.7.2 The holes shall be punched in a manner guaranteeing interchangeability of the reversible



All dimensions in millimetres.

FIG. 7 TYPE A TINE

shovel. The corners of the square holes shall be slightly rounded. If two holes are required to be punched, they should be 45.0 ± 0.5 mm apart from each other.

7.7.3 For fastening of reversible shovel to tine the countersunk bolt, of 10 mm size up to 240 mm length of shovels and 12 mm size of above 240 mm length of shovels should be used. As far as possible, the bolts should conform to Grades M 10 and M 12 of Table II of IS 2609.

7.7.4 The cutting edges of the reversible shovel shall be beveled to a distance not more than 10 mm.

7.7.5 The thickness of sheet used in manufacture of reversible shovel should be 4 mm, 5 mm, or 6 mm. The tolerance for nominal thickness shall be ± 10 percent.

7.8 Triangular Shovel

The dimensions of triangular shovel shall be as given in Fig. 13.

7.8.1 The triangular shovel shall be flat across its width and length.

7.8.2 The corners of the square holes shall be slightly rounded. The deviation from the centre line of shovel to the centre of holes shall be not more than 1 mm.

7.8.3 For fastening of triangular shovel to tine, the countersunk bolt of 10 mm size shall be provided. The bolts may conform to M10 of IS 2609.

7.9 Seeding Attachment

The dimension of seeding attachment, if provided, shall be as given in **7.9.1** to **7.9.4** (*see* Fig. 14).

7.9.1 The thickness of sheet for funnel and boot shall be 0.8 mm, *Min*.

7.9.2 The diameter of seed tube shall be 18 to 22 mm. The thickness of seed tube shall be 2.5 mm, *Min*.

7.9.3 The diameter of the funnel at the top shall be not less than 150 mm.

7.9.4 The diameter of top and bottom of the boot shall be in the range of 50 to 80 mm and 25 to 40 mm respectively.

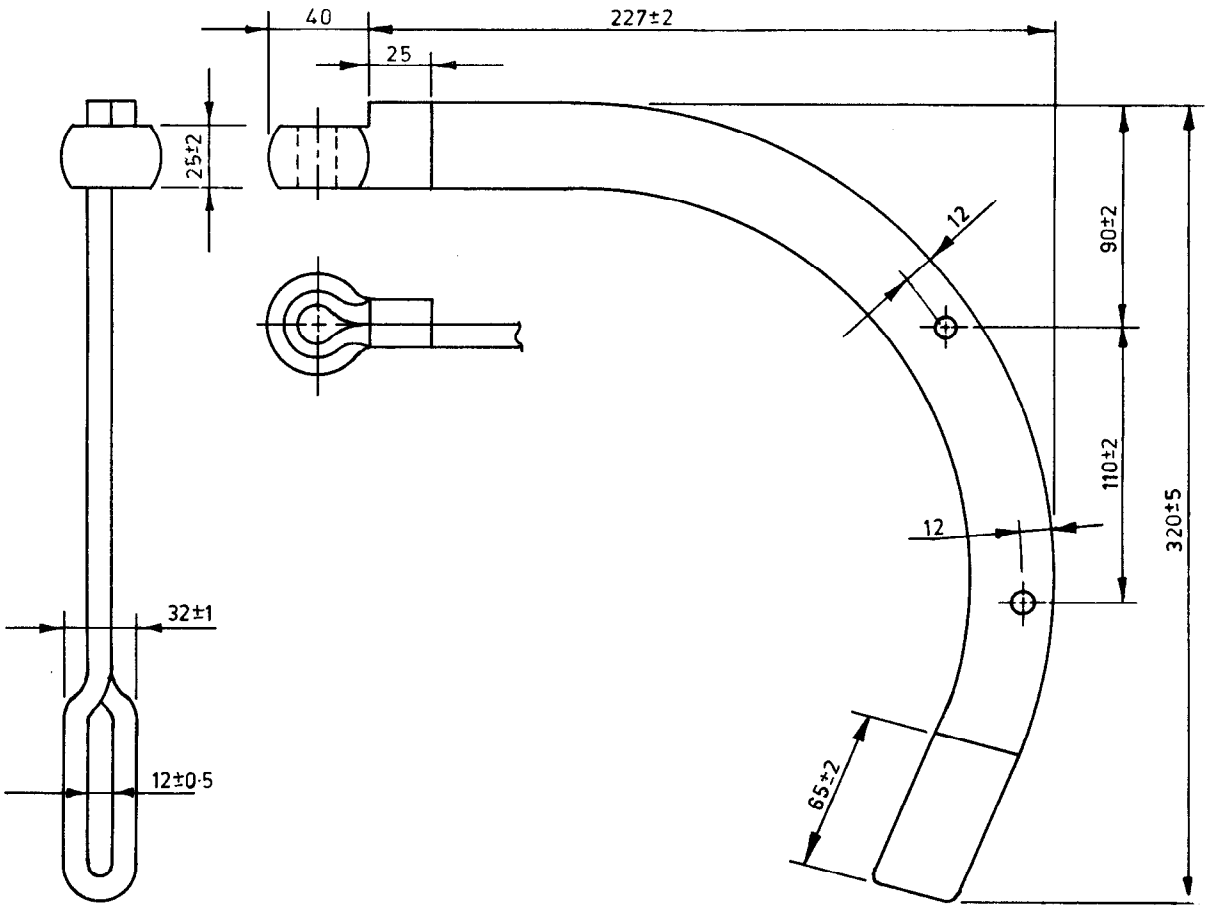
7.10 Sweep

The essential dimensions of the sweep if provided shall be as given in Table 2 (*see* Fig. 2).

8 OTHER REQUIREMENTS

8.1 The number of tines shall be 3, 5 or 7. Tool bar type cultivators shall have tines of Types A and B, Zigzag type cultivators shall have tines of Types C and D and Triphali type cultivators shall have tines of Type E.

8.2 If the tine is set at its working position and a force of 80 kgf is applied for 2 min at the shovel fixing position in case of single hole and at the centre of fixing position in case of two holes or oval hole fixing



All dimensions in millimetres.

FIG. 8 TYPE B TINE

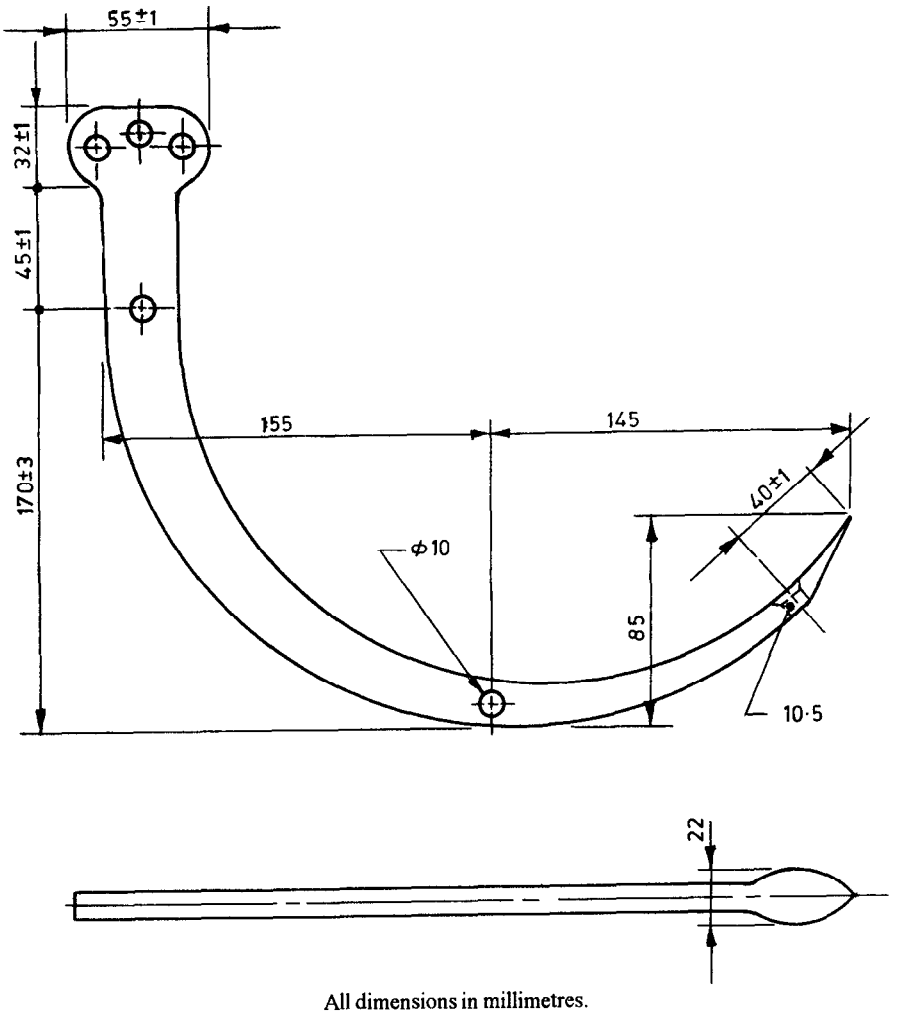
Table 2 Dimensions of Sweep

(*Clause* 7.10)

A	*B**	*C*	*D*	*E*	*α*	*β* †
(1)	(2)	(3)	(4)	(5)	(6)	(7)
mm	mm	mm	mm	mm	degrees	degrees
			(±1)	(± 0.5)		± 1°
100 ± 2	93	80 ± 1.5	47	15	65 ± 2	18-25
125 ± 2	116	80 ± 1.5	47	15	65 ± 2	18-25
150 ± 3	123	90 ± 2	50	16.5	75 ± 3	18-25
175 ± 3	144	90 ± 2	50	16.5	75 ± 3	18-25
200 ± 4	164	90 ± 2	50	16.5	75 ± 3	18-25
225 ± 4	185	100 ± 2	50	16.5	75 ± 3	18-25
250 ± 4	205	100 ± 2	50	16.5	75 ± 3	18-25

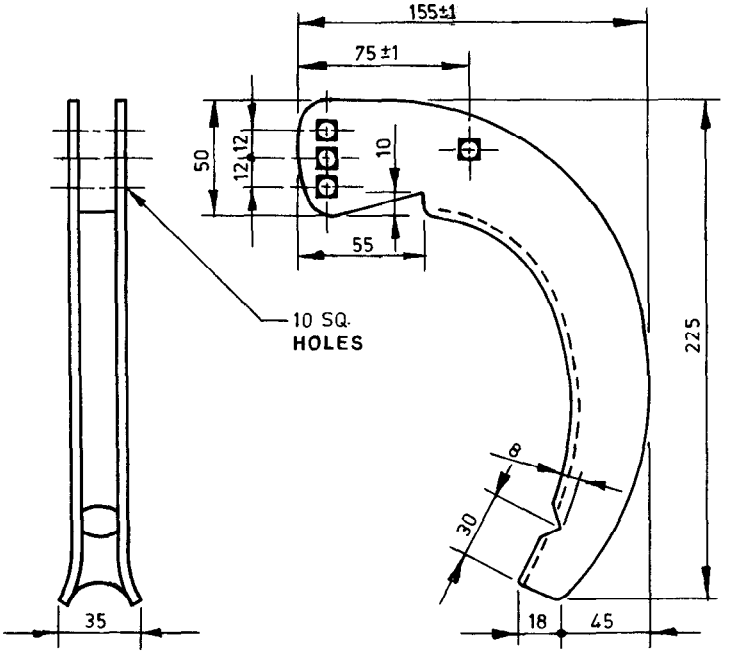
* Calculated on the basis of nominal value of *A* and *α*.

† ß should be declared by the manufacture between 18 to 25°.



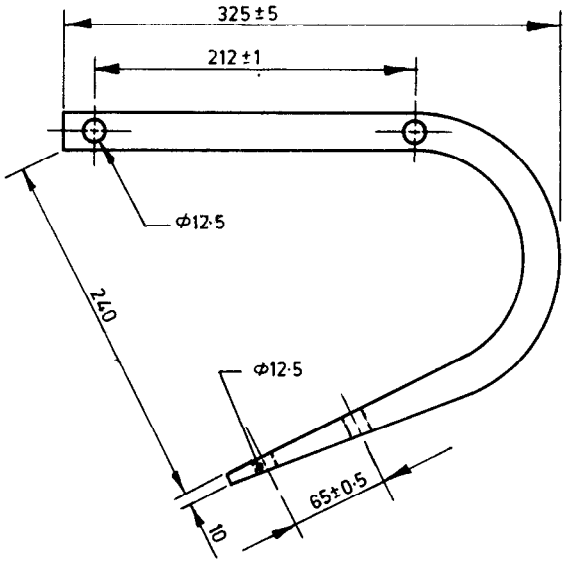
All dimensions in millimetres.

FIG. 9 TYPE C TINE



All dimensions in millimetres.

FIG. 10 TYPE D TINE



All dimensions in millimetres.

FIG. 11 TYPE E TINE

position, the tine shall not bend or lose its shape.

8.3 The tines along with shovels when fitted to the frame at the fixation points opposite to the direction of travel of cultivator, the frame shall not bend or lose its shape.

8.4 When a force of 800 N per tine is applied to the frame at tine fixation points opposite to the direction of travel of cultivator, the frame shall not bend or lose its shape.

8.5 The handle(s) shall be attached firmly to the frame and shall be provided with a hook for tying the reins of the animals.

8.6 Provision for fixing the beam or chain shall be provided.

8.7 The gauge wheel, if provided, shall roll smoothly on its axis. The height of the wheel should be adjustable.

8.8 Provision for width adjustment shall be provided. It shall be of hole type, clamp type or lever type. The lever when set should not change the position without application of manual effort.

8.9 Provision for depth adjustment should be provided.

8.10 Provisions for fixing the seed funnel to the handle and boot to the tines shall be provided in the cultivators.

8.11 When desired by the purchaser, the three tined cultivator shall be provided with the seeding attachment. The attachment shall conform to **8.11.1** to **8.11.7**.

8.11.1 A metallic prism-like or of other shape structure shall be provided in the bottom portion of funnel. The seed funnel shall be double walled and the top one shall have small mild steel pipe at the bottom extending close to the prism in order to have uniform distribution of seeds. The co-efficient of variation of distribution of seeds shall be less than 10 percent.

8.11.2 Three seed spouts of equal size shall be attached to the bottom of the funnel.

8.11.3 The top edge of the funnel shall be rolled to avoid the sharp edges. Provision shall be made for attaching the funnel with handle of the cultivator so that the angle of the funnel could be adjusted for keeping it vertical.

8.11.4 The seeds when placed in the funnel should come out from spouts and should not be retained on the bottom of funnel.

8.11.5 Attachment of seed tube and funnel spout shall be such that the tubes shall not come out of spouts.

8.11.6 The boot shall be conical in shape. The holes in boot shall be such that it confirms to the holes provided in the cultivator for its attachment with tines.

8.11.7 The seeding attachment shall be attached to the cultivator in such a way that the angle of the outer seed tubes provides free flow of seeds.

8.12 All the components should preferably be detachable.

8.13 The head of the fasteners, coming in contact with soil, shall be flush with the working surface.

8.14 When the cultivator is set at its working position and is placed on a plane surface, the cutting edges of all the cultivating tools (shovels or sweep) shall touch the ground and the cultivator shall be well balanced.

8.15 In case sweeps are provided, they shall conform to **8.15.1** to **8.15.5**.

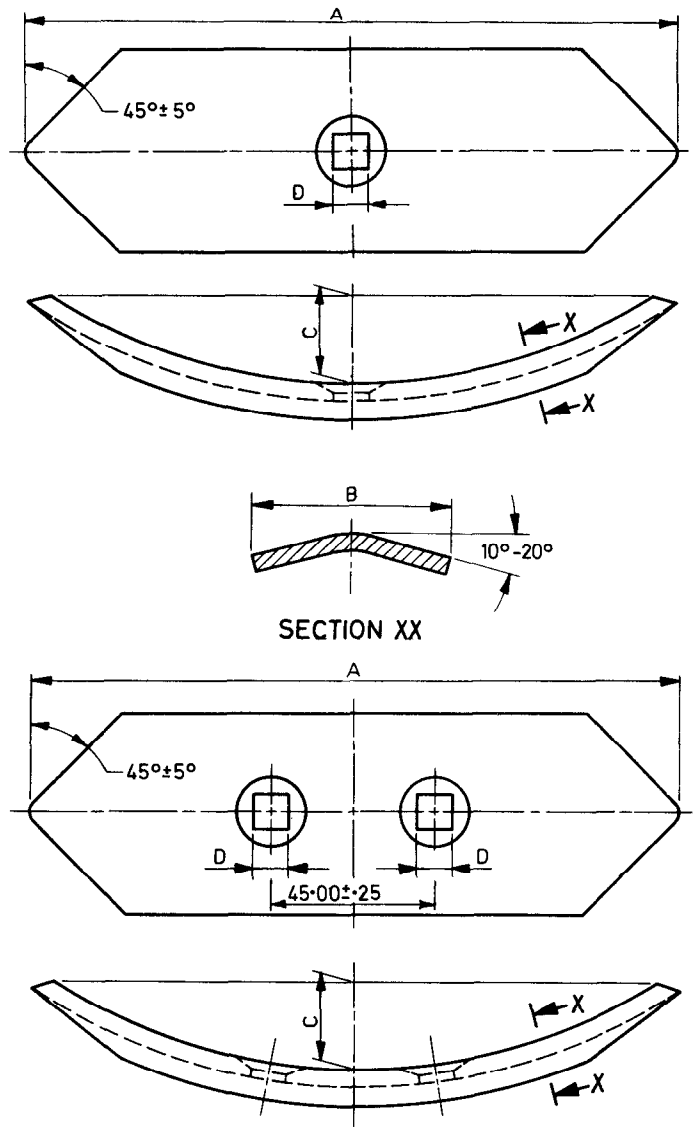
8.15.1 The crown (*see* **3.6.1**) of sweep shall be curved across the width to have a proper grip with the tine of cultivator (*see* Fig 2, Section *YY*). The sweep shall also be curved across its working face (*see* Fig 2, Section *XX*) for proper working in the fields.

8.15.2 The crown of the sweep shall form an angle of 45° ± 5° at a point 70 mm apart from its top.

8.15.3 The cutting edges of the sweep shall be beveled on the top face to a distance not more than 10 mm.

8.15.4 The minimum thickness of sheet used in manufacture of sweep shall be 4 mm. The tolerance for nominal thickness in finished sweep shall be ± 5 percent.

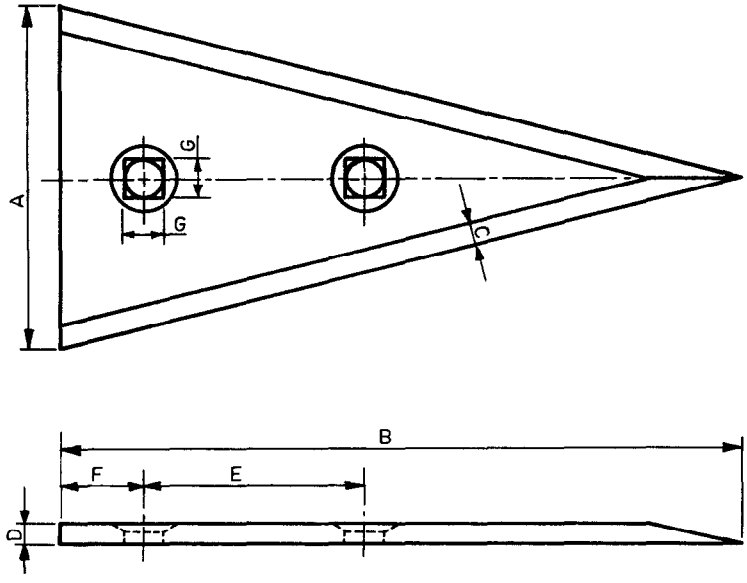
8.15.5 Preferably, two holes should be punched, 45.00 ± 0.25 mm apart from centre to centre. The first hole shall be punched at a distance 25 ± 1 mm from the top of crown at the centre position. The lateral



Sl No.	*A*	*B*	*C*	*D*
(1)	(2)	(3)	(4)	(5)
1	180 ± 2	55 ± 2	25 ± 1.6	12
2	190 ± 2	45 ± 2	30 ± 1.6	12
3	200 ± 2	45 ± 2	35 ± 1.6	12
4	200 ± 2	70 ± 2	35 ± 1.6	12
5	200 ± 2	75 ± 2	35 ± 1.6	12
6	210 ± 2	60 ± 2	25 ± 1.6	12
7	225 ± 2	50 ± 2	30 ± 1.6	12
8	235 ± 2	45 ± 2	20 ± 1.6	12
9	240 ± 2	70 ± 2	30 ± 1.6	12
10	250 ± 4	65 ± 2	45 ± 2	15

All dimensions in millimetres.

FIG. 12 REVERSIBLE SHOVEL



A = 75, 100 or 125 ± 5
B = 200 ± 5
C = 5 to 10
D = 6.0, *Min*
E = 65.0 ± 0.5
F = 25 ± 1
$G = 12.5^{+1.0}_{-0}$

All dimensions in millimetres.

FIG. 13 DIMENSIONS OF TRIANGULAR SHOVELS

deviation of the hole should not be more than 1 mm from the centre position of crown.

8.15.5.1 The corners of the square holes shall be slightly rounded.

8.15.5.2 The countersunk bolt of 10 mm size should be provided with sweep. As far as possible, the bolts should conform to IS 2609.

9 WORKMANSHIP AND FINISH

9.1 The components should be free from pits, burrs and other visual defects. Welded joints shall not be porous. The castings, if used, shall be free from blow holes.

9.2 The surface of the parts of cultivators shall be evenly dressed and shall have a protective coating to prevent surface deterioration.

10 MARKING AND PACKING

10.1 Marking

Each cultivator and its components (sweep, tine, shovels and seeding attachments) shall be marked on non-wearing surface with the following particulars:

a) Manufacturer name and recognized trade-mark;

b) Size;

c) Batch or code number; and

d) Year of manufacture.

10.2 BIS Standard Mark

The cultivator may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

10.3 Packing

The cultivator and its components shall be packed as agreed to between the purchaser and the supplier.

11 SAMPLING FOR LOT ACCEPTANCE

11.1 Unless otherwise agreed to between the purchaser and the supplier, the sampling of cultivator and its components for lot acceptance shall be done in accordance with 3 of IS 7201 (Part 1).

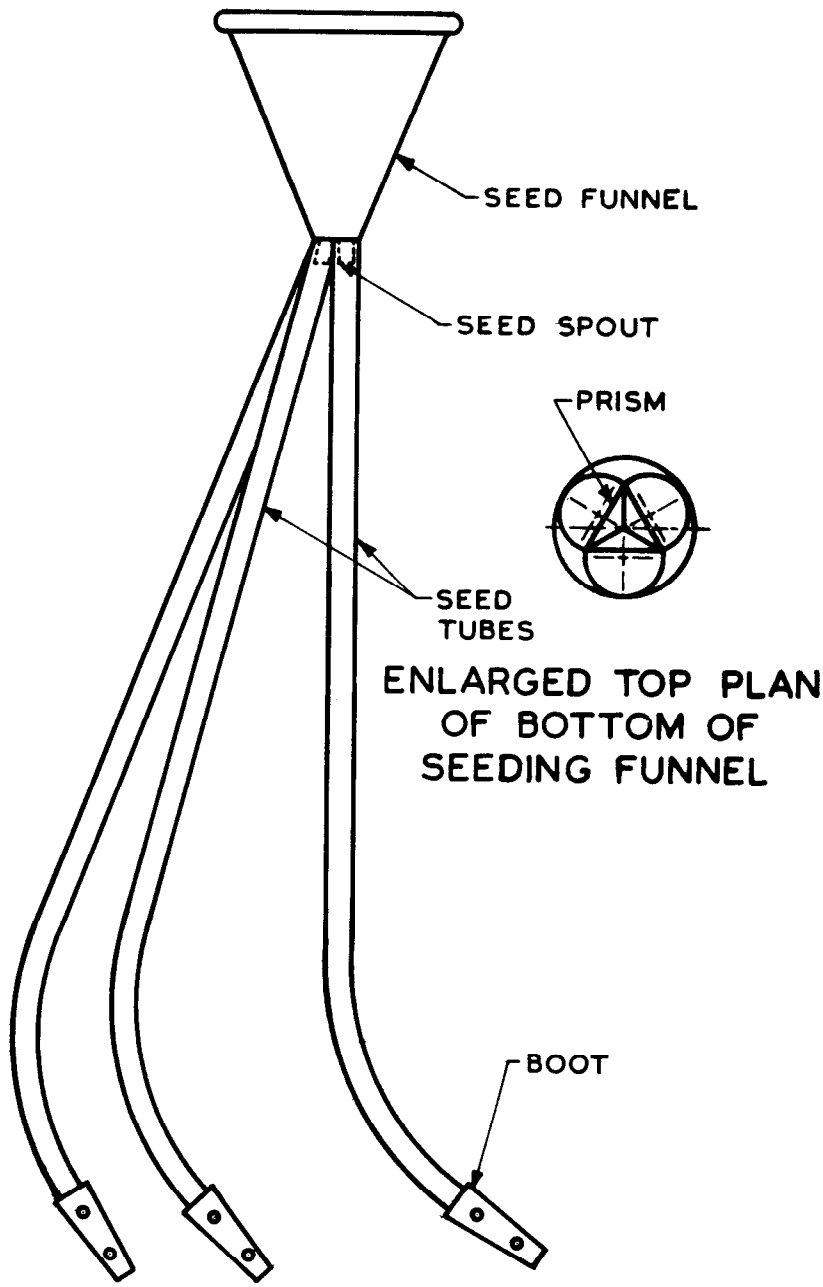


FIG. 14 SEEDING ATTACHMENT FOR ANIMAL DRIVEN CULTIVATORS

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
210 : 1993	Grey iron castings (*fourth revision*)	2609 : 1972	Coach bolts (*first revision*)
277 : 1992	Galvanized steel sheet (plain and corrugated) (*fifth revision*)	3601 : 1984	Steel tubes for mechanical and general engineering purposes (*first revision*)
513 : 1994	Cold rolled low carbon steel sheets and strips (*fourth revision*)	4985 : 1988	Unplasticised PVC pipes for potable water supplies (*second revision*)
620 : 1985	Wooden tool handles general requirements (*fourth revision*)	7201 (Part 1) : 1987	Method of sampling for agricultural machinery and equipment : Part 1 Hand tools and hand operated/animal-drawn equipment (*first revision*)
1500 : 1983	Method for Brinell hardness test for metallic materials (*second revision*)	9818 (Part 2) : 1981	Glossary of terms relating to tillage and intercultivation equipment : Part 2 Terms relating to equipment
1570 : 1961	Schedules for wrought steels for general engineering purposes		
2062 : 1992	Steel for general structural purposes (*fourth revision*)		

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 94 02, 323 33 75

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17, 323 38 41
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	337 84 99, 337 85 61, 337 86 26, 337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43, 60 20 25
Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113	235 02 16, 235 04 42, 235 15 19, 235 23 15
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