Indian Standard
POWER-OPERATED CHAFF CUTTER — SAFETY REQUIREMENTS

ICS 65.060.50

© BIS 2005

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 2005
FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Agricultural Produce Processing and Milling Machinery and Surface Covered Cultivation Structures Sectional Committee had been approved by the Food and Agriculture Division Council.

Power-operated chaff cutters are very common in use by farmers for cutting of chaff and fodder. As number of reports of farm workers loosing their limbs in power chaff cutters are coming in, the urgency to provide for safety provisions for powered chaff cutters has become more pronounced.

Figures of various components given in this standard are meant for illustration and dimensions of chaff cutters should not be treated as suggestive of any standard design.

In preparation of this standard considerable assistance have been received from Dr Adarsh Kumar of Indian Agriculture Research Institute, New Delhi.

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

POWER-OPERATED CHAFF CUTTER — SAFETY REQUIREMENTS

1 SCOPE

This standard specifies safety requirements for power-operated chaff cutter.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions 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 below:

<table>
<thead>
<tr>
<th>IS No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>210 : 1993</td>
<td>Grey iron castings — Specifications (fourth revision)</td>
</tr>
<tr>
<td>1500 : 1983</td>
<td>Method for Brinell hardness test for metallic materials (second revision)</td>
</tr>
<tr>
<td>1511 : 1979</td>
<td>Blades for manually-operated chaff cutter (second revision)</td>
</tr>
<tr>
<td>2062 : 1999</td>
<td>Steel for general structural purposes — Specification (fifth revision)</td>
</tr>
<tr>
<td>2102 (Part 1) : 1993</td>
<td>General tolerances: Part 1 Tolerances for linear and angular dimensions without individual tolerance indications (third revision)</td>
</tr>
<tr>
<td>4454 (Part 1) : 2001</td>
<td>Specification for Steel wires for mechanical springs: Part 1 Patented and cold drawn steel wires — Unalloyed (third revision)</td>
</tr>
<tr>
<td>7201 (Part 1) : 1987</td>
<td>Methods of sampling for agricultural machinery and equipment: Part 1 Hand tools and hand operated/animal drawn equipment (first revision)</td>
</tr>
<tr>
<td>7897 : 1975</td>
<td>Test code for chaff cutter</td>
</tr>
<tr>
<td>11459 : 1985</td>
<td>Specification for power-operated chaff cutter</td>
</tr>
</tbody>
</table>

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 11459 and IS 7897 shall apply.

4 MATERIAL

4.1 The materials for construction of various components of the chaff cutter, other than blade, shall be selected from those given in col 3 of Table 1. The materials may conform to Indian Standards given in col 4 of Table 1. The manufacturer shall declare materials for components not listed. Flywheel-cum-belt pulley cover shall also be made from mild steel (see IS 2062) material.

4.2 The material for construction of blade shall be as given in 2.1 and 2.1.1 of IS 1511.

Table 1 Material of Construction (Clause 4.1)

<table>
<thead>
<tr>
<th>SI No.</th>
<th>Parts</th>
<th>Material</th>
<th>Applicable Indian Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>i)</td>
<td>Flywheel</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>ii)</td>
<td>Frame</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>iii)</td>
<td>Cover plate</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>iv)</td>
<td>Shear plate</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>v)</td>
<td>Feed rolls</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>vi)</td>
<td>Feed roll shaft</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>vii)</td>
<td>Spring</td>
<td>Spring steel</td>
<td>IS 4454 (Part 1)</td>
</tr>
<tr>
<td>viii)</td>
<td>Tie rod</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>ix)</td>
<td>Worm and worm gear</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>x)</td>
<td>Legs</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xi)</td>
<td>Leg support</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xii)</td>
<td>Shaft and axles</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xiii)</td>
<td>Feeding chute</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xiv)</td>
<td>Blade cover</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xv)</td>
<td>Pulley</td>
<td>Cast iron</td>
<td>IS 210</td>
</tr>
<tr>
<td>xvi)</td>
<td>Blower</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xvii)</td>
<td>Discharge box</td>
<td>Mild steel</td>
<td>IS 2062</td>
</tr>
<tr>
<td>xviii)</td>
<td>Belts</td>
<td>Textile belts</td>
<td>IS 1891 (Part 1)</td>
</tr>
</tbody>
</table>

5 HARDNESS

5.1 All cast iron components shall have a hardness of 160 to 220 HB (see IS 1500).

5.2 The hardness of the blade shall be as given in 3.1 of IS 1511.

6 GENERAL REQUIREMENTS

6.1 Provision shall be made to change the inclination of the plane of the cutting knives to the plane of rotation of flywheel to avoid feed interference.
6.2 Provision to change the direction of rotation of feed rollers should be made.
6.3 All the three sides of shear plate shall be in one plane.
6.4 Each chaff cutter shall be provided with an operator's manual in Hindi or English or any other vernacular language.
6.5 The chaff cutter shall be run idle (without load) for at least 5 min at the specified rpm to check the following:
   a) Presence of knocking or rattling sound;
   b) Frequent slippage of belts;
   c) Non-smooth running of shafts in respective bearings;
   d) Any unusual wear or slackness in any components; and
   e) Any marked rise in bearing temperature.

7 FEEDING SYSTEMS
7.1 The feeding system in a chaff cutter shall be one of the following types and shall conform to the requirements given in 7.2 and 7.3:
   a) Feeding chute type (see Fig. 1), and
   b) Conveyor type (see Fig. 2).

7.2 Feeding Chute
A rectangular or trapezoidal trough shall be attached on the rear side of the shear plate. The trough shall be detachable. Provision for changing the angle of placement of trough shall be made. At the rear side of the trough a support shall be made. The total length of the trough shall be minimum of 900 mm. The chute shall be made of mild steel sheet (see IS 2062) having thickness of not less than 1.6 mm. Each chute-fed chaff cutter shall also be provided with the following safety provisions.

7.2.1 Flywheel Locking Pin
Chaff cutter shall be provided with a linch pin with chain to lock the chaff cutter flywheel when it is not required to be operated. This shall be fixed on the flywheel main gear shaft at the end so as to restrict the movement of the system. This is specially needed to lock the movement of the chaff cutter blades in order to avoid injuries due to accidental rotation when chaff cutter is not in use. The linch pin shall be fastened to the body of chaff cutter with the help of the chain (see Fig. 3). A bolt shall also be fitted in both the holes (hole of leg and hole of flywheel rim) and tightened with a nut (see Fig. 4).

7.2.2 Front Safety Guard
A front safety guard shall be tightly fitted on each knife blade of the chaff cutter. It shall be made of mild steel rod which shall be given a curvature as of chaff cutter blade and have two holes at two ends for fitment in the chaff cutter with the blade mounting bolts (see Fig. 5). This device stands a little away from the blades and prevents injuries to the limbs as it pushes the limbs away and acts as a warning signal before the blades hit the limb.

7.2.3 Feeding Chute Cover
The trough on the shear plate side shall be covered up to a length of 450 mm Min. The thickness of the chute cover shall not be less than 1.6 mm.
FIG. 2 CONVEYOR-FED CHAFF-CUTTER

FIG. 3 FLYWHEEL LOCKING DEVICE
FIG. 4 A TYPICAL LockING ARRANGEMENT FOR CHAFF CUTTER

FIG. 5 FRONT SAFETY GUARD
7.2.4 Warning Roller

A warning roller which is a sort of idler roller with spring (see Fig. 6) may be fitted just before the feeding rollers to warn the operator while feeding the fodder crop into the chaff cutter. It may be a conduit GI pipe roller closed at both ends. The upward movement of warning roller shall be controlled by the cam, which lifts the roller when the straw is pushed into the mouth of the chaff cutter. When the chute is empty, the roller shall come down with the help of springs provided for the purpose. The minimum diameter of the roller shall be 40 mm. Warning roller can be used as an alternate to cover chute (see 7.2.3). Centre shaft and cam lever should be made of mild steel (see IS 2062) and pivot axle/adjusting rod should be made of GI pipe.

7.2.5 Blade Cover

Cutting edge of each blade shall be covered with a cover. A typical shape and dimension of the blade cover is given in Fig. 7. To hold cover with blade, it shall be welded or riveted.

7.2.6 Height of Feeding Chute

The height of the feeding chute of the chaff cutter should be between 750 mm and 1100 mm.

7.3 Conveyor System

Conveyor-fed chaff cutter shall also be provided with the following safety provisions:

a) **Cover** — The minimum length of conveyor shall be 1200 mm and it shall be covered up to a minimum length of 450 mm near the feed roll side. The thickness of the cover shall not be less than 1.6 mm.

b) **Feed reversing mechanism** — It shall conform to the requirements given in Annex A.

c) **Blower** — If provided, and all other moving parts shall be guarded with mild steel (see IS 2062) sheet of minimum thickness of 1.6 mm.

8 Guarding of Transmission System

8.1 Worm and pinion assembly shall be covered from all the sides by a mild steel sheet of minimum 1.6 mm thickness (see Fig. 8). Gear-cum-oil cover can be fitted with the help of two nuts to the body of chaff cutter. On the sides, the plates shall be bent to cover the gears.
from sides. At the top, a center hole shall be provided for facilitating the lubrication of gears.

**Fig. 8 Gear Cover**

8.2 The bearings shall be completely enclosed and shall have a provision for lubrication.

8.3 Guards shall be provided on all moving parts of the chaff cutter to prevent accident. In case of PTO driven chaff cutters guards shall be provided on the PTO shaft. The guards shall be made of blind sheets of mild steel (see IS 2062) having a minimum thickness of 1.6 mm.

8.4 The guards shall be so designed as not to hinder in easy adjustment, servicing and operation of the chaff cutter.

8.5 All guards shall be either permanently attached or firmly secured to prevent their removal without the aid of tools. The servicing and adjustments should be possible without complete removal of the guards.

**9 CAUTIONARY NOTICE**

9.1 A minimum cautionary notice as follows shall be written in vernacular language legibly on a label preferably fixed on the main body of the chaff cutter:

a) **DO NOT WEAR LOOSE DRESS, BANGLES, WATCH, ETC, WHILE WORKING;**

b) **DO NOT SMOKE AND LIGHT FIRE NEAR DRY FODDER BEING CUT;**

c) **DO NOT WORK UNDER THE INFLUENCE OF INTOXICANTS LIKE LIQUOR, OPIUM, ETC;**

d) **CHILDREN AND AGED PERSONS SHOULD BE DISCOURAGED FROM WORKING;**

- e) **USE PUSHING DEVICE FOR FEEDING;**

- f) **PUT THE COVER ON BLADE AND LOCK THE FLYWHEEL AFTER COMPLETING THE WORK;**

- g) **NEVER BRING HAND NEAR FEED ROLLS AND OPEN BLADE; AND**

- h) **DO NOT TOUCH BELT WHILE PULLEY IS RUNNING.**

9.2 A plate having a ‘Danger Signal’ shall be rigidly fixed near the blades of the chaff cutter.

9.3 Each chaff cutter shall be provided with an operator’s manual (see 6.4) in which all safety aspects are also to be highlighted along with the precautions to be taken for safe operation of chaff cutter.

**10 WORKMANSHIP AND FINISH**

10.1 All the components of the chaff cutter shall be free from cracks.

10.2 The cast iron components shall not be porous. Welding, if done, shall also not be porous.

10.3 All exposed metallic surfaces shall be free from rust and may be painted, if required.

10.4 Sharp corners and protruding fasteners shall be avoided.

**11 MARKING**

11.1 Each chaff cutter shall be marked with the following particulars:

- a) Manufacturer’s name or registered trademark;

- b) Code and batch number;

- c) Model number;

- d) Power rating, kW;

- e) Rated input capacity; and

- f) Recommended rpm of fly wheel or cylinder.

11.2 BIS Certification Marking

11.2.1 Each chaff cutter may also be marked with the Standard Mark.

11.2.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and 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.

**12 SAMPLING FOR LOT ACCEPTANCE**

Unless otherwise agreed to between the purchaser and the supplier, the criteria for sampling for lot acceptance shall be in accordance with IS 7201 (Part 1).
A-1 CONSTRUCTION

It comprises a feed pressing roller, two corrugated feed rollers and conveyor with power transmission system. For this type of chaff cutters with power ratings of 15 kW or more, a feed reversing mechanism is recommended. It comprises of a gear box, a clutch lever and two joining shafts with universal joints (see Fig. 9). In some chaff cutters fast and loose pulleys to cut-off the drive to the upper and lower feed rollers are also used. In the feeding system with feed reversing mechanism, if the hand of an operator gets entrapped, the clutch lever is pressed by his hand or shoulder and the drive to the feed roller is cut-off in the neutral position or the direction of the upper and lower feed rollers is reversed.

A-2 MATERIAL

A-2.1 Conveyor — Canvas or rubber [see IS 1891 (Part 1)] or steel slats (see IS 2062).

A-2.2 Driving Roller — Cast iron (see IS 210).

A-2.3 Pressing Roller — Cast iron (see IS 210).

A-2.4 Feed Rollers — Cast iron (see IS 210).

A-2.5 Tension Spring — Spring steel [see IS 4454 (Part 1)].

A-2.6 Clutch Lever — Mild steel (see IS 2062).

A-2.7 Gears — Cast iron (see IS 210).

A-2.8 Gear Box — Cast iron (see IS 210) or mild steel (see IS 2062).

A-2.9 Gear Shaft — Mild steel (see IS 2062).

A-2.10 Stand — Mild steel (see IS 2062).

A-3 DIMENSIONS

The length of center-to-center distance of conveyor rollers (see A in Fig. 9) shall be a minimum of 1200 mm. Minimum of 450 mm of length of conveyor at feed inlet side shall be covered.

A-4 FEED REVERSING DEVICE

A-4.1 Functioning of Device (see Fig. 10)

Pinion ‘A’ receives the drive from the main shaft of the chaff cutter by means of chain and sprocket. Pinion ‘A’ meshes with bevel gear ‘B’ which is mounted on a counter shaft. On the same shaft a spur pinion ‘G’ is mounted which slides on splines with the help of a hand lever. When pinion ‘G’ meshes with the gear ‘F’ on the lower feed shaft, the lower feed roller revolves in clockwise direction and the upper feed roller in anti-clockwise direction. This is the feed-in position.

A-4.1.1 When pinion ‘G’ is meshed with gear ‘C’, the direction of rotation of the upper and lower rollers is reversed. In other words, the upper roller rotates in clockwise and the lower roller in anti-clockwise direction. This is the reversed or feedback position and the material being fed moves out instead of moving into the cutting zone chamber.

A-4.1.2 The third position is when pinion ‘G’ does not mesh either with gear ‘F’ or ‘C’. This is the neutral position. The lever to slide pinion ‘G’ can be actuated by hand or foot or shoulder.

A-4.1.3 The details of gears in this system shall be as given in Table 2.

Table 2 Details of Gears in the Feed Reversing Mechanism

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Type of Gear/ Pinion</th>
<th>Designation</th>
<th>Shaft on Which Mounted</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>i)</td>
<td>Bevel gear A</td>
<td>Splined shaft on main shaft</td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td>Bevel gear B</td>
<td>Counter shaft</td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>Spur pinion C</td>
<td>Counter shaft</td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td>Spur gear D</td>
<td>Upper feed roller shaft</td>
<td></td>
</tr>
<tr>
<td>v)</td>
<td>Spur gear E</td>
<td>Upper feed roller shaft</td>
<td></td>
</tr>
<tr>
<td>vi)</td>
<td>Spur gear F</td>
<td>Lower feed roller shaft</td>
<td></td>
</tr>
<tr>
<td>vii)</td>
<td>Bevel gear G</td>
<td>Splined shaft on main shaft</td>
<td></td>
</tr>
</tbody>
</table>

A-4.2 Functioning of Device (see Fig. 11)

A-4.2.1 If the roller handle is put in backward direction, bevel gear ‘A’ which is mounted on splined shaft receives the drive from main shaft. The main shaft moving in anti-clockwise direction will rotate bevel gear ‘A’ also in anti-clockwise direction. Bevel gear ‘A’ meshes with bevel gear ‘B’ which is mounted on a counter shaft, having at other end a pinion ‘C’. This will rotate bevel gear ‘B’ counter shaft and pinion ‘C’ in clockwise direction. Gear ‘D’ meshes with pinion ‘C’ and rotates in anti-clockwise direction. Gears ‘D’ and ‘E’ are on the same shaft, hence the direction of rotation of ‘E’ would also be the same. Gears ‘E’ and ‘F’ mounted on upper and lower feed roller shafts, respectively, mesh with each other; therefore, the gear ‘F’ rotates in clockwise direction. The direction of rotation of upper and lower feed rollers would be the same as that of gears ‘E’ and ‘F’. This is the feed-in position.
A-4.2.2 If the roller handle is put in forward direction, bevel gear ‘G’, which is mounted on splined shaft, receives the drive from main shaft and moves in anti-clockwise direction. Bevel gear ‘G’ meshes with bevel gear ‘B’. The bevel gear ‘B’, counter shaft and pinion ‘C’ will rotate in anti-clockwise direction. This will ultimately lead to the rotation of lower feed roller in anti-clockwise direction. This is the reversed or feedback position and the material being fed moves out instead of moving into the threshing chamber.

A-4.2.3 In case the roller handle is kept in central position, feed-reversing mechanism will not operate. This is the neutral position.

**Fig. 9 Feed Reversing Mechanism for Conveyor-Fed Chaff Cutter**
Fig. 10 Power Transmission Through Feed-Reversing System for Conveyor-Fed Chaff Cutters

Path of travel of the power rotation of gears and shafts.

UPPER SHAFT COUNTER SHAFT LOWER SHAFT

FORWARD SPEED

REVERSE SPEED

DRIVE SHAFT
Fig. 11 Functioning of Feed-Reversing Mechanism for Conveyor Fed Chaff Cutter
**Bureau of Indian Standards**

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

**Copyright**

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

**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 Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc. No. FAD 20 (1275).

**Amendments Issued Since Publication**

<table>
<thead>
<tr>
<th>Amend No.</th>
<th>Date of Issue</th>
<th>Text Affected</th>
</tr>
</thead>
</table>

**BUREAU OF INDIAN STANDARDS**

**Headquarters:**

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
*Telephones*: 2323 0131, 2323 3375, 2323 9402  
*Website*: www.bis.org.in

**Regional Offices:**

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI 110002  
*Telephones*: 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi  
KOLKATA 700054  
*Telephones*: 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022  
*Telephones*: 260 3843, 260 9285

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113  
*Telephones*: 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)  
MUMBAI 400093  
*Telephones*: 2832 9295, 2832 7858, 2832 7891, 2832 7892

Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.

Printed at Simco Printing Press, Delhi