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[आईएस 5135 (भाग 1) और आईएस 12482 का संयोजन]

Draft Indian Standard

**CROP PROTECTION EQUIPMENT — BELLY-MOUNTED HAND-ROTARY
DUSTER — SPECIFICATION**

[Amalgamation of IS 5135 (Part 1) and IS 12482]

ICS - 65.060.40

Agricultural Machinery and Equipment
Sectional Committee, FAD 11

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FOREWORD

(Formal clause will be added later)

Hand rotary dusters are manually operated tools used to spread powder forms of pesticides uniformly for control of pests and diseases in agriculture and gardening. Hand rotary dusters on the basis of their mounting are mainly of two types: (a) belly-mounted, and (b) shoulder-mounted. The standards covering the requirements of belly-mounted and shoulder mounted rotary dusters were published in two parts IS 5135 (Part 1) : 1994 ‘Specification for hand-rotary duster Part 1: Belly-mounted type (*second revision*)’ and IS 5135 (Part 2) : 1994 ‘Specification for hand-rotary duster Part 2: Shoulder-mounter type (*first revision*)’.

IS 5135 (Part 1) was first published in 1969 and subsequently revised in 1977 and 1994. IS 5135 (Part 2), was first published in 1977, was revised in 1994 but later withdrawn in 2023 due to lack of demand of the product in the market.

This Standard is an amalgamation of IS 5135 (Part 1) : 1994 and IS 12482 : 1988 ‘Methods of test for manually operated dusters’ which covered the methods for testing of performance and durability of manually operated dusters. The standard is being brought out in latest style and format of Indian Standards along with updating of referred Indian Standards.

This standard supersedes both IS 5135 (Part 1) : 1994 (*second revision*) and IS 12482 : 1988.

The figures given in the standard are meant only for illustration. These 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, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

**CROP PROTECTION EQUIPMENT — BELLY-MOUNTED HAND-ROTARY
DUSTER — SPECIFICATION**

1 SCOPE

This standard prescribes material, performance, and other requirements of belly-mounted hand-rotary duster used for dusting pesticides in powder form, along with their method of test.

2 REFERENCES

The standards given below 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 these standards.

<i>IS No.</i>	<i>Title</i>
IS 460 (Part 2): 2020	Test sieves — Specification Part 2 Perforated plate test sieves (<i>fourth revision</i>)
IS 6940: 1982	Methods of test for pesticides and their formulations (<i>first revision</i>)
IS 7201 (Part 1) : 1987	Methods of sampling for agricultural machinery and equipment: Part 1 hand-tools and hand-operated / animal drawn equipment (<i>first revision</i>)
IS 8480 : 2023	Equipment for crop protection — Vocabulary (<i>second revision</i>)
IS 210 : 2009	Grey iron castings — Specification (<i>fifth revision</i>)
IS 277 : 2018	Galvanized steel sheets and strips (plain and corrugated) — Specification (<i>seventh revision</i>)
IS 407 : 1981	Specification for brass tubes for general purposes (<i>third revision</i>)
IS 737 : 2008	Wrought aluminium and aluminium alloys, sheet and strip for general engineering purposes — Specification (<i>fourth revision</i>)
IS 738 : 1994	Wrought aluminium and aluminium alloys, drawn tube for general engineering purposes — Specification (<i>third revision</i>)
IS 2062 : 2011	Hot rolled medium and high tensile structural steel — specification (<i>seventh revision</i>)
IS 4170 : 1967	Specification for brass rods for general engineering purposes
IS 7811 : 2019	Phosphor bronze rods and bars (<i>second revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the following definitions in addition to those given in IS 8480 shall apply (*see also Fig. 1*).

3.1 Agitator — A device which mechanically initiates the movement of the dust within the hopper (*see 3.9*).

3.2 Rest Plate — A component to rest the duster comfortably on the chest or belly of the operator.

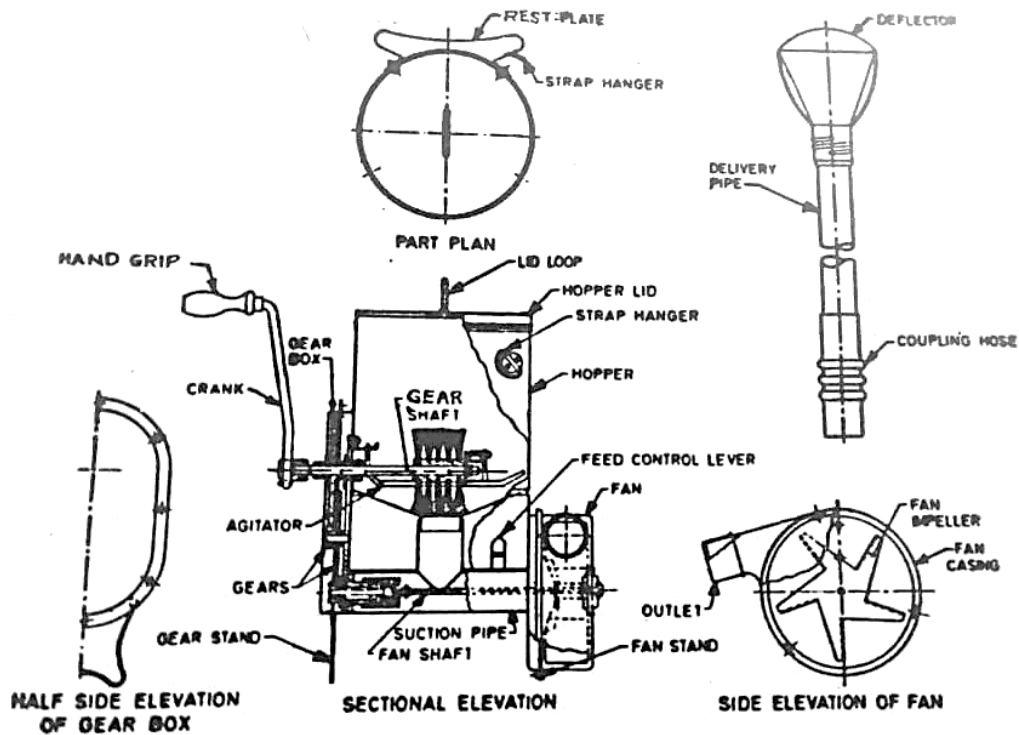


FIG 1 A TYPICAL BELLY-MOUNTED TYPE HAND ROTARY DUSTER

3.3 Casing — The stationary part of the fan (*see 3.6*) which guides air to and from the impeller outlet.

3.4 Crank — A component to help in rotating the gear train.

3.5 Dust Deflector — A component to direct the powder towards the target.

3.6 Fan — A rotary device which propels air continuously.

3.7 Feed Control — A device to control the feed of the powder.

3.8 Feeder — A device to feed the powder to the aperture.

3.9 Hopper — A container for holding the dust

3.10 Impeller — The part of the fan (*see 3.6*) which imparts movement to the air by virtue of rotation.

3.11 Suction Pipe — The pipe through which the fan sucks the dust.

3.12 Total Mass — The mass of the duster with all its mountings and attachments but without any dust in hopper.

4 MATERIALS

4.1 The material of construction of various components of the duster shall be selected from *col 3* of Table 1 and should conform to corresponding Indian Standards given in *col 4* of Table 1.

4.2 All the metallic parts coming in contact with the pesticide should preferably be of the same material to minimize electrolytic deterioration.

4.3 The material used for different components shall be declared by the manufacturer in the manual (see 5.14).

Table 1 Material of Construction of Various Component
(Clause 4.1)

SI No.	Component	Material	Indian Standard
(1)	(2)	(3)	(4)
i)	Hopper	Aluminum alloys	IS 737
		Engineering Plastic	-
ii)	Hopper lid	Aluminum alloy	IS 737
		Engineering Plastic	-
iii)	Lid loop	Steel	IS 2062
		Galvanized steel	IS 277
		Aluminum alloys	IS 737
		Engineering Plastic	-
iv)	Rest plate	Steel	IS 2062
		Engineering Plastic	-
v)	Gear housing	Cast iron	IS 210
		Galvanized steel	IS 277
		Aluminum alloys	IS 737
		Engineering Plastic	-
vi)	Gear	Steel	IS 2062
		Bronze	IS 7811
		Gun metal	-
		Nylon	-
vii)	Agitator	Steel	IS 2062
		Aluminum alloys	IS 738
		Engineering Plastic	-
		Brass	IS 4170, IS 407
viii)	Gear shaft	Steel	IS 2062
ix)	Crank	Steel	IS 2062
x)	Fan shaft	Steel	IS 2062
xi)	Feed control lever	Galvanized steel	IS 277
		Brass	IS 407
xii)	Handle grip	Wood	-
		Engineering Plastic	-
xiii)	Fan casing	Galvanized steel	IS 277
		Aluminum alloys	IS 737
		Engineering Plastic	-
xiv)	Fan impeller	Galvanized steel	IS 277
		Aluminum alloy	IS 737
		Engineering Plastic	-
xv)	Gear stand	Galvanized steel	IS 277
		Aluminium alloys	IS 737
		Steel	IS 2062
xvi)	Fan stand	Galvanized steel	IS 277
		Aluminium alloys	IS 737

		Steel	IS 2062
xvii)	Coupling hose	Braided rubber	-
		Engineering Plastic	-
xviii)	Strap	Woven web cotton	-
		Synthetic yarn	-
xix)	Gasket	Synthetic rubber	-
		Fibre	-
		PVC	-
xx)	Hose clamp	Steel	IS 2062
		Galvanized steel	IS 277
xxi)	Cushion	Foam rubber	-
		Foam plastic	-
xxii)	Deliver pipe	Engineering Plastic	-
xxiii)	Dust deflector	Engineering Plastic	-
xxiv)	Hopper casing	Galvanized steel	IS 277
		Aluminium alloys	IS 737
		Steel	IS 2062

5 CONSTRUCTIONAL REQUIREMENTS

5.1 Hopper

The hopper shall have a concave shaped or conical bottom so that the dust contained in it moves towards the feeding aperture. On top of the hopper, a filler hole of at least 130 mm in diameter shall be provided. The hole shall be covered with a lid. On the centre of the lid, a loop or other arrangement shall be provided to lift the lid. An easily operating locking device may be provided to hold the lid securely in place during operation.

5.2 Feed Control Device

A feed control device with locking arrangement shall be provided to control the flow of dust through the aperture. The mechanism shall be controlled by a lever from outside of the hopper and shall not require any tool for the operation. Provision of an index pointer with marking for the aperture opening of hopper at positions closed 1/4, 1/2, 3/4 and full shall be provided.

5.3 Agitator

An agitator shall be incorporated within the hopper to keep the dust agitated and to avoid the clogging of the aperture and for feeding the dust to the aperture.

5.3.1 The agitator shall withstand the test prescribed in **12.2.1**.

5.4 Gear Box and Gears

The gear box shall be so designed as to allow easy access to gears. A suitable gasket may be provided to make the housing dust-proof. A stand may be provided at bottom of the box to prevent its denting. The gears shall mate correctly and shall move smoothly.

5.5 Crank

A crank shall be fitted with the gear shaft which should function in a clockwise motion. The crank shall be fitted with a hand grip of sufficient size. The hand grip shall be in easy reach of the operator.

5.6 Rest Plate

A rest plate shall be fitted on the duster.

5.7 Fan

The fan impeller shall be covered with a leak-proof fan casing. A gasket may be used to make the casing leak proof. The fan impeller shall be statically balanced. A stand may be provided at the bottom of the casing.

5.8 Coupling Hose

A flexible coupling hose shall be provided to connect the fan casing outlet with the delivery pipe in case delivery pipe itself is non-flexible. It shall be connected with fan casing outlet and the delivery pipe with hose clips.

5.9 Delivery Pipe

It may be flexible or rigid type. If of flexible type, it shall be directly connected through hose clip with fan casing outlet. If of rigid type, it shall be connected with coupling hose. The delivery pipe may be either in a single piece or in two pieces.

5.10 Deflector

A dust deflector integral with the delivery pipe or permanently fixed or tightly fitted with the delivery pipe shall be provided.

5.11 Straps

Two straps of suitable length and of 3.8 cm minimum width shall be provided in order to help easy carriage of the duster. The provision for easy adjustment of the length of each strap shall be provided. At the option of the purchaser a cushion of minimum of 4 cm wide and 2 cm thickness shall be provided with each strap at least on that portion which rests on the shoulder of the operator. The cushion, if provided, shall be covered with cotton, canvas, rexin, PVC or plastic-coated fabrics.

5.11.1 The straps and their assembly shall withstand the test prescribed in **12.2.3**.

5.12 Bearing

The gear shaft and fan shaft shall be provided with bush bearings and shall be dust-proof.

5.13 Total Mass

The total mass of the duster shall not exceed 6 kg.

5.14 Manual

The manual shall include technical specifications of the duster, material of construction of various components shown in the exploded view of the duster, instruction for operations and maintenance, common faults and their remedies and safety precautions.

6 CAPACITY

6.1 The total capacity of the hopper shall be from 0.004 to 0.006 m³. The capacity shall be declared by the manufacturer. The tolerance on the declared capacity shall be ± 5 percent.

7 PERFORMANCE REQUIREMENTS

7.1 The fan shall be able to deliver not less than 0.3 m³ of air per minute when tested in accordance with the method given in **12.1.1**.

7.2 Dust delivery rate shall be adjustable. Dust delivery shall be continuous. The delivery rate at maximum discharge setting shall be not less than 150 g per minute when tested in accordance with method given in **12.1.2**.

7.3 When tested in accordance with method given in **12.1.3**, the duster shall be able to throw the dust up to a minimum distance of one metre.

7.4 When tested in accordance with the method given in **12.1.4**, no leakage of dust shall occur:

- a) at any place if suction pipe is provided, or
- b) at the joint of casing and its cover if no suction pipe is provided.

8 WORKMANSHIP AND FINISH

8.1 The components of the duster shall have a smooth finish and shall be free from pits, burrs, sharp edges and other defects that may be detrimental for their use.

8.2 The exposed metallic parts shall have a protective coating to prevent surface deterioration. Steel used for the components coming in contact with the pesticides shall be plated with cadmium, zinc or nickel.

9 MARKING AND PACKING

9.1 Marking

Each duster shall be marked with the following particulars:

- a) Manufacturer's name or recognized trademark, if any;
- b) Batch and code number; and
- c) Hopper nominal capacity.

9.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

9.3 Packing

Each duster shall be packed, as agreed to between the purchaser and the supplier, for safe handling in transit.

10 SAMPLING FOR LOT ACCEPTANCE

10.1 Unless otherwise agreed to between the purchaser and the supplier, sampling of the duster for lot acceptance shall be done in accordance with 3 of IS 7201 (Part 1). The classification of different requirements of this specification for the purpose of lot acceptance is given below for guidance:

- a) Dimensional and Visual Requirements — *see* 5 (except 5.3.1, 5.11.1, 5.13) and 8.
- b) Other than Visual and Dimensional Requirements — *see* 5.3.1, 5.11.1, 5.13, 6 and 7.

11 SAMPLING AND RUNNING-IN

11.1 Sampling — The dusters for certification or for commercial test report shall be selected by the certifying or testing authorities from the production lot. The duster shall be new and shall be in a condition generally offered for sale. For confidential test report, the manufacturers may submit the sample to testing authority. The manufacturer shall supply all the relevant necessary information for conducting the test.

11.2 Running-in — In order to overcome the variation in initial performance, the duster may be run-in before the start of the actual test. The lubrication and adjustment of components shall be done in accordance with the manufacturer's recommendations

12 TESTS

12.1 General Tests

12.1.1 *Visual Examination and Checking of Dimensions*

The equipment shall be examined with respect to the requirements given in 5 (except 5.3.1, 5.11.1, 5.13) and 8. Conformity of the requirements shall be reported.

12.1.2 *Checking of Material of Construction*

The material of construction of various parts of the duster shall be checked as per 4 and reported. Conformity of the material for various components shall be reported.

12.2 Performance Tests

12.2.1 *Test for Air Output*

12.2.1.1 The air output shall be tested by pitot tube method.

12.2.1.2 Connect the blower fan outlet of the duster with a pipe, having diameter equal to the diameter of the blower fan outlet, through a hose coupling. Ensure that the connection is leak proof. The length of the pipe shall be eight times the diameter of the pipe. Insert the pitot tube into the centre of this pipe at a distance, from the end, twice the diameter of the pipe. Connect the pitot tube with the manometer (*see* Fig. 2).

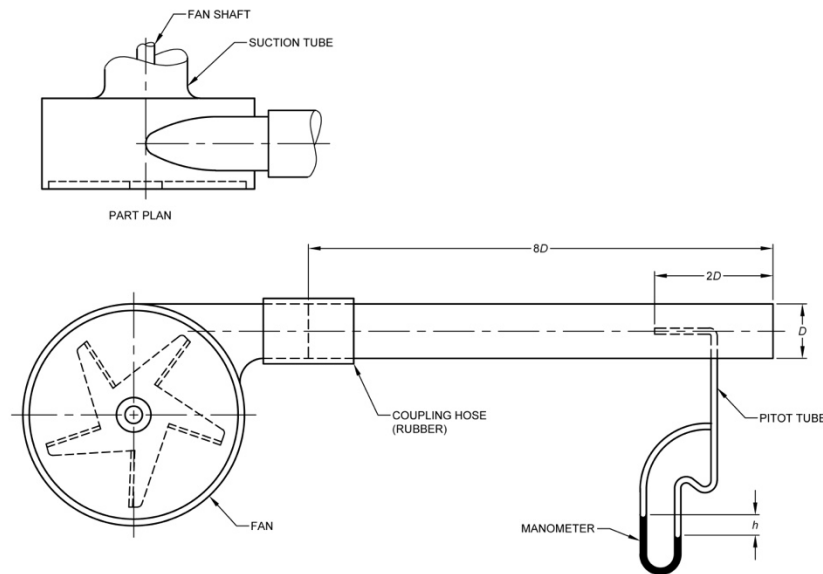


FIG. 2 DETERMINATION OF AIR OUTPUT OF THE DUSTER

12.2.1.3 Operate the fan at 35 ± 2 rev/min of crank handle and note the rise of water (h) in the manometer and calculate the air output by the following formula:

$$Q = c_d \times A \times V$$

Where,

Q = air output in m^3/min ,

c_d = coefficient of discharge (0.8),

A = cross-sectional area of blower fan outlet in m^2 ,

V = mean flow velocity in m/min ,

$V = 246 \sqrt{h}$, and;

h = velocity pressure measured in the manometer in mm.

12.2.1.4 Repeat the above test for at least three times and average of the values obtained shall give the average air output of the blower fan.

12.2.2 Test for Dust Delivery

12.2.2.1 The hopper shall be filled up to three-fourth of its total capacity with talc powder (*see 12.3.1*). The duster with all its working accessories shall be weighed to the nearest gram. The duster shall be fixed rigidly in place and then operated continuously and uniformly at a speed of 35 ± 2 rev/min of the crank handle and at the maximum discharge rate setting of the dust feed control mechanism for at least two minutes. The mass of the duster shall again be determined and the rate of discharge per minute determined.

12.2.2.2 Repeat the above test for at least three times and calculate the average discharge rate per minute.

NOTE — A period of pre-test usage may be applied to overcome variation in initial discharge.

12.2.3 *Test for Dust Throw*

12.2.3.1 The hopper shall be filled up to three-fourth of its total capacity with talc powder (*see 12.2.1*). Set the duster and delivery pipe at its horizontal position. The dust deflector shall be removed. Operate the duster continuously and uniformly at a speed of 35 ± 2 rev/min of the crank handle. Measure the horizontal distance from the outermost point of the delivery pipe and the outermost point where dust falls on the ground.

12.2.3.2 Repeat the above test for at least three times and calculate the average horizontal distance.

NOTE — Dust delivery test (**12.2.2**) and dust throw test (**12.2.3**) may be done in one setting.

12.2.4 **Test for Leakage**

12.2.4.1 The hopper shall be filled up to three-fourth of its total capacity with talc powder (*see 12.2.1.1*). Set the duster at its horizontal position and plug the blower fan outlet. Operate the duster at a speed of about 35 ± 2 rev/min for two minutes. No leakage of dust shall occur at any place in the duster during this test.

12.3 **Test for Components**

12.3.1 *Test for Agitation*

The hopper shall be filled up to three-fourth of its total capacity with talc powder used for insecticidal formulations. Minimum of 90 percent by mass of the talc powder shall pass through the 75-micron IS test sieve [*see IS 460 (Part 2)*]. The bulk density after compacting, when tested, in accordance with **12.2** of IS 6940 shall not exceed the value obtained before compacting, by more than 60 percent. The duster shall be fixed rigidly in place and shall be operated continuously and uniformly at a speed of 35 ± 2 rev/min of the crank handle and at medium discharge rate setting of feed control mechanism as specified by the manufacturer till the discharge at the outlet sizes. The duster shall be deemed to have passed the test, if upon the completion of test, not more than 500g of dust remains in the hopper.

NOTE — BS sieve 200, ASTM test sieve 200 and Tyler test sieve 200 have their apertures within the limits specified for 75-micron IS test sieve.

12.3.2 *Test for Dust Feed Control Mechanism*

12.3.2.1 The hopper shall be filled up to full of its total capacity with talc powder (*see 12.3.1*). The duster with all its working accessories shall be weighed to the nearest gram. The duster shall be fixed rigidly in place and then operated continuously and uniformly at a speed of 35 ± 2 rev/min of the crank handle and at maximum, $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ discharge rate settings of the feed control mechanism for at least two minutes in each setting of the feed control mechanism. The mass of the duster shall be determined after every change of discharge rate settings of the feed control mechanism. The total mass of the dust discharged at each setting shall be computed.

12.3.2.2 The above test shall be repeated for at least three times and calculate the average discharge rate in different settings of the feed control mechanism.

12.3.3 Test for Strap and Its Assembly

The hopper shall be filled with the talc powder (*see 12.3.1*) to its total capacity. The duster shall be hung from a solid support by its straps, simulating its carriage by the operator. It shall be lifted to a height of 30 cm and allowed to drop and hang by the straps 25 times. The straps and their assembly shall be deemed to have passed this test if none of its parts (straps, brackets, etc) break during the test.