

**BUREAU OF INDIAN STANDARDS****DRAFT FOR COMMENTS ONLY**

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भारतीय मानक मसौदा

एयर स्क्रीन बीज/अनाज क्लीनर — विशिष्टि

और परिक्षण संहिता

(आई एस 11041 का पहला पुनरीक्षण)

*Draft Indian Standard*

**AIR-SCREEN SEED/GRAIN CLEANER — SPECIFICATION  
AND TEST CODE**

*(First Revision of IS 11041)*

**ICS 65.060**

Agriculture and Food Processing Equipment  
Sectional Committee, FAD 20

Last Date of Comments: **1 October 2024**

**FOREWORD**

*(Formal clauses will be added later)*

The freshly harvested seeds often contain inert matter like chaff, stems, stones, deteriorated and damaged seeds, weeds and other crop seeds. Air screen cleaners are used to remove these impurities from the pure seeds, therefore, it is important to select cleaner with better cleaning efficiency and keep it maintained while in operation.

This standard providing guidelines to the manufacturers and users in production, purchase and operation of air screen cleaner was published in 1984. In order to solve certain problems faced in implementation of the standard, a need was felt to revise the standard. In this revision, to update the standard with the latest industrial development and manufacturing practices, the following major modifications have been made:

- a) Addition performance requirements have been incorporated like noise level, no sagging in screen and no leakage in air chamber.
- b) Material of construction is updated, and requirements have been given for individual component of the cleaner.
- c) The minimum load that guards shall withstand without any permanent set has been decreased from 1200 N/0.1 m<sup>2</sup> to 600 N/0.1 m<sup>2</sup>.
- d) All the related terminologies and methods of test for evaluating the performance of cleaner have been incorporated which were earlier covered in IS 5718.

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: 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.

*The draft revision of this standard was earlier issued in wide circulation on 5 December 2024 for comments for 60 days. Based on the further decision taken to merge IS 5718 into this draft, the document is being issued into second wide circulation incorporating the test methods & terminology for the air-screen seed cleaner which were earlier covered in IS 5718.*

## 1 SCOPE

This standard specifies material, constructional, performance and other requirements for air screen seed/grain cleaners (*see* Fig. 1). It also prescribes the methods of test to evaluate the performance and durability of this equipment.

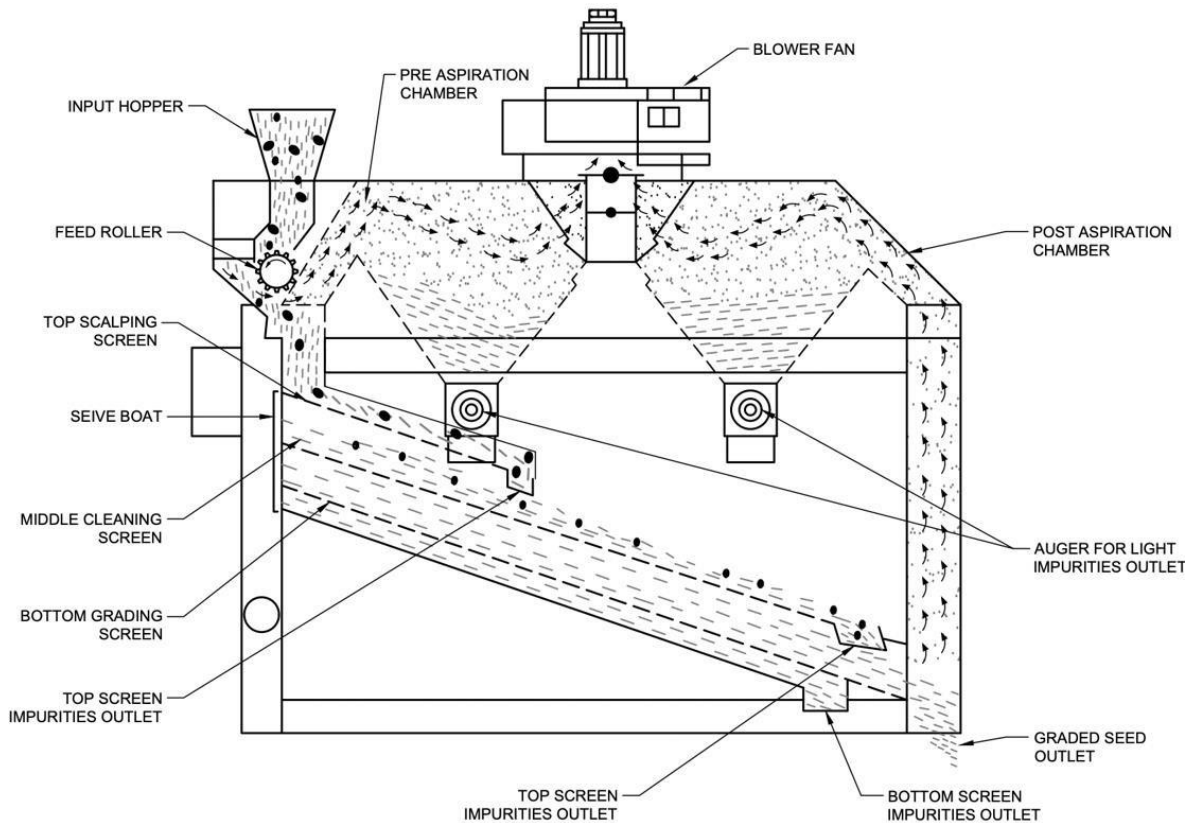


FIG. 1 GENERAL ARRANGEMENT OF SEED CLEANER

## 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 the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 210: 2009	Grey Iron Castings — Specification ( <i>fifth revision</i> )
IS 399: 1963	Classification of Commercial Timbers and Their Zonal Distribution ( <i>first revision</i> )
IS 816: 1969	Code of practice for use of metal arc welding for general construction in mild steel ( <i>first revision</i> )
IS 1891 (Part 1): 2021	Conveyor and elevator textile belting — Specification Part 1 General purpose

	belting ( <i>fifth revision</i> )
IS 2062: 2011	Hot rolled medium and high tensile structural steel — Specification ( <i>seventh revision</i> )
IS 4333 (Part 2): 2017	Methods of Analysis for Foodgrains Part 2 Determination of Moisture Content
ISO 712: 2009	( <i>second revision</i> )
IS 6911: 2017	Stainless steel plate, sheet and strip — Specification ( <i>second revision</i> )
IS 8132: 2023/ ISO 3600	Tractors and Machinery for Agriculture and Forestry, Powered Lawn and Garden Equipment — Operator's Manuals — Content and Format ( <i>third revision</i> )
IS 14635 (Part 1): 2020	Fluoropolymer dispersions and moulding and extrusion materials Part 1 Designation system ( <i>first revision</i> )

### 3 TERMINOLOGY

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

**3.1 Aspirator** — A unit used for cleaning the seeds by drawing the air through the seed mass.

**3.2 Blower** — A device which gives air blast to blow the light material, that is, chaff, small seeds, trash, etc., out of the seed mass.

**3.3 Clean Seed** — Seed free from foreign matter.

**3.4 Feed Hopper** — Part of the machine through which the seeds are fed.

**3.5 Feed Mechanism** — Tile mechanism which regulates the feed rate of uncleaned seeds.

**3.6 Feed Rate** — The quantity of material fed into the cleaner per unit of time.

**3.7 Final Aspiration** — The suction or air blast which removes light seeds of poor germination or trash from the screened bold seed mass after it has passed over the last screen of the seed cleaner.

**3.8 Foreign Matter** — It includes inorganic and organic matter present in the feed lot. The inorganic matter shall include sand, gravel, dirt, pebbles, stones, lumps of earth, mud and iron chips. The organic matter shall include chaff, straw, weed seeds, dead insects, worms and other grains.

**3.9 Indented Cylinder Grader** — A machine which makes a length separation of seeds on grain length basis by either lifting or rejecting them in pockets or indentations pressed into the side of a cylindrical body which revolves with the seed mass inside the cylinder.

**3.10 Magnetic Separator** — A device to remove the ferrous material from the seed mass using the magnets.

**3.11 Maximum Input Capacity** — The maximum feed rate at which no choking occurs in the seed cleaner and no stalling occurs in the prime mover at the specified speed.

**3.12 Pre-sieve Aspiration** — The suction or air blast which removes dust and light material from seeds before the seed is fed to the sieve of the seed cleaner.

**3.13 Rated input Capacity** — The feed rate at which the cleaning efficiency and purity of seed are within the specified limit for a particular seed.

**3.14 Routine Test** — Test carried out on each cleaner to check the requirements which are likely to vary during manufacturing.

**3.15 Scalper** — A machine used for pre-cleaning of seeds.

**3.16 Screen (Sieve)** — The component of the seed cleaner in the form of perforated or slotted sheet metal or woven wire mesh which separates seeds by size.

- a) *Lower Screen* — The screen located at lower position in the sieve set for separating finer fractions.
- b) *Scalping Screen* — The screen used for pre-cleaning of seeds.
- c) *Upper Screen* — The screen used to eliminate foreign matter larger in size than the material being cleaned.

**3.17 Screen Cleaning Mechanism** — The mechanism which keeps perforations of the screen in unchecked condition.

**3.18 Screen Slope** — The inclination, in degrees, of the screen with the horizontal.

**3.19 Seed Cleaner** — A machine which removes foreign matter and under size immature seed from the seed lot.

**3.20 Shoes** — Vibrating or shaking units of the machine into which the screens are fitted.

**3.21 Size of Seed** — Length, width, thickness or diameter of the seeds.

**3.22 Type Test** — Test carried out on the cleaner to prove conformity with the requirements of relevant standard. These are intended to prove the general qualities and design of a particular cleaner.

**3.23 Unclean Seed** — The mixture of clean seed and foreign matter.

**3.24 Vibrating Mechanism** — The mechanism which shakes the shoe/sieve set.

## 4 MATERIALS

**4.1** The material used in construction of various components shall be as given in Table 1. The thickness of sheets, wherever used, shall be not less than 1 mm.

**4.2** The material for various components not covered in the Table 1 shall be declared by the manufacturer and reported in Annex A.

**Table 1 Material of Construction**  
*(Clause 4.1)*

<b>Sl No.</b>	<b>Component</b>	<b>Material</b>	<b>Reference to IS</b>
(1)	(2)	(3)	(4)
1.	Bearing housing/Plummer block	Cast iron	IS 210
2.	Blower casing	Cast iron	IS 210
		Mild steel	IS 2062
3.	Blower impeller (blade holder)	Cast iron	IS 210
4.	Feed hopper	Stainless steel	Grade 204/304 of IS 6911
5.	Feed roll	Cast iron	IS 210
		Teflon	IS 14635 (Part1)
6.	Feed rate/distribution plates	Stainless steel	Grade 204/304 of IS 6911
7.	Frame	Mild steel	IS 2062
8.	Gears	High carbon steel	-
9.	Cam	High carbon steel	-
10.	Hand wheels/adjustment levers	Cast iron	IS 210
		Mild steel	IS 2062
11.	Plummer block	Cast iron	IS 210
12.	Pulley	Cast iron	IS 210
		Mild steel	IS 2062
		Aluminum	-
13.	Belt	Textile Belts	IS 1891 (Part 1)
14.	Screen/sieves	Stainless steel	Grade 204/304 of IS 6911
15.	Shafts	Mild steel	IS 2062
16.	Sieve Frame/Shoe	Mild steel	IS 2062
		wood	IS 399

## **5 CONSTRUCTIONAL REQUIREMENTS**

### **5.1 Feed Hopper**

It shall be adequately proportioned so as to provide for total cover of the feed roll or the full length of the discharge opening. A safety release plate may be fitted behind the feed roll so that hard tramps are released to the scalper screen without damaging the feed roll.

### **5.2 Feed Regulating System**

The system shall be such that the feeding rate can be varied as in the range of capacity of machine for any specific crop.

### **5.3 Scalping System**

The shoe should carry a scalping system of a screen or set of screens comprising such a system. Suitable outlet to discharge the scalplings away from the machine should be provided.

### **5.4 Primary Air Cleaning**

In two-air cleaning machines, the scalped seed should fall in a uniform layer into an aspirating leg (suction duct). The light tramps having been drawn up should be discharged through adequately proportioned discharge chutes fitted with flap air seals to prevent air leakage into the aspirating chamber (causing drop in pick up). If a positive air pressure-blow system is adopted, a properly designed venturi and expansion chamber should be provided. Where a common fan is used for primary (initial) and secondary (final) aspiration, suitable control valves should be provided to permit independent regulation of aspirating pressures on both legs.

### **5.5 Transfer of Seed from Aspirating Leg**

The transfer may be by gravity (by dropping directly from the aspirating leg) or through a perforated reciprocating plate fitted to the shoe and reaching into the aspirating leg.

### **5.6 Shoe**

**5.6.1** The shoe should be so designed that the screen can be removed and inserted from one end and also be suitably clamped in position. The construction of the shoe should be such that it is geometrically symmetric so that it reciprocates along a single plane not exceeding 20 mm on full stroke.

**5.6.2** The shoe shall be provided with screen guides of which at least two in the case of 3 screen models and at least one in the case of 2 screen models may be pitched to different angles up to 10° from an initial inclination of 5° to 7.5 °. The guides should be capable of being locked in any desired position within this range.

### **5.7 Grading Screens**

The grading screens should preferably be punched sheets. The punching should be clean with all burrs

removed. Maximum permissible distortion of the sheet shall be 32 mm over 400 mm and mounting of screens should be such as to ensure maximum uniformity of the screening surface. Suitable provision should be made to prevent screen blinding during use.

### **5.8 Secondary or Final Air Cleaning**

The secondary cleaning shall be carried out in an aspirating leg with suitable arrangements for uniform presentation of graded seed, for control of suction air through the aspirating column and for discharge of the separated immature and air lifted tramp. The expansion chamber in this leg should have window to view.

### **5.9 Tramp Discharge**

All tramp should be discharged from chutes suitably placed away from machine with the provisions to fit bags or lead-down spouts.

### **5.10 Main Aspirating Chamber**

The main aspirating chamber shall be mounted rigidly on the frame at a convenient point. Where the fan volutes form a part of the chamber access to the volutes should be made easy with controls placed preferably on the suction end. All control handles for air regulation should be positioned for easy access from outside the machine and at a convenient height. Windows should be provided wherever expansion and drop in pressure is planned. Reinforcement of the chamber should be done wherever necessary to prevent vibration. Fan outlets should be flanged to accept ducts. All internal partitions should be rigidly riveted or welded so that air leakage between partitions is prevented. The initial and final aspiration legs should be preferably removable and flanges connected with suitable gaskets.

### **5.11 Fan**

The blades should be statically and dynamically balanced. The shaft should be carried on self-aligning ball bearings with dust protected bearing housings or plummer blocks.

### **5.12 Shoe Shaking Device**

The shake imparted to the shoe may be by a self-contained geared unbalanced system or by a pair of eccentrics. On three screen and larger machines, a variable speed of shake should be preferred. The speed of shake should range from 350 to 900 stroke/min. The eccentrics should be fitted preferably with ball bearings, however other types suitably lubricated and protected bearings may be used. The eccentric shaft should be carried on ball bearings in housings rigidly bolted to the main frame.

### **5.13 Bearing**

All high speed shafts should be carried on ball bearings. Where bearing housings are carried on non-machined supports or where the shaft deflection is expected to be more than 1/500 of its span, self-aligning ball bearings shall be used. Adequate locking of the bearings on the shaft shall be provided.

### **5.14 Lubrication**



All rotating parts should have provision for lubrication. All bearings should be adequately protected from dust and dirt and all housings should have sufficient capacity to hold the lubricant. Lubricating points should be accessible and marked for lubrication. When oil lubrication is required, oil hold covers should be provided, except for pawl and ratchet wheel, where manual oil brushing is adequate.

### **5.15 Frame**

The machine frame should be of welded construction with all members formed or cut from structural steel sections. Bracings should be provided in the vertical panels to resist sway. Gusset plates are to be welded at the joints to stiffen these. Four to six foundation bolts not less than 16 mm should hold down the machine. The frame be geometrically aligned to within 3 mm on extreme diagonals.

### **5.16 Transmission Guards**

**5.16.1** Guards shall be provided to prevent accidental contact of persons or parts of clothing being caught in the transmission system, unless the system is so constructed or placed as to be safe without guards.

**5.16.2** The guards shall be so designed as not to hinder in easy adjustment, servicing and operation of the cleaner.

**5.16.3** It is preferable that all guards shall be either permanently attached or firmly secured to prevent their removal without the aid of the tools. The servicing and adjustments should be possible without complete removal of the guards.

**5.16.4** The guards shall have sufficient strength to support load of 600 N applied at any point over an area of 0.1 m<sup>2</sup> without permanent set.

## **6 PERFORMANCE REQUIREMENTS**

**6.1** The equipment shall fulfill all the provisions and observatory requirements and allow for all the adjustments specified in Annex B.

**6.2** During the no-load run, when tested as per **11.5.2**, no failure shall occur as indicated in **C-2** of Annex C.

**6.3** The rated input capacity in quintals per kWh energy consumed, with 5 and 10 percent foreign matter in the feed, shall be declared by the manufacturer. The various adjustments, clearances, and speeds for that capacity shall also be declared. The rated input capacity, when determined as per **11.5.3.6**, shall not differ by  $\pm 5$  percent from the capacity declared by the manufacturer.

**6.4** When tested under load as per **11.5.3**, the cleaner shall not show any failure as specified in Annex D.

**6.5** During and after the long run test, conducted as per **11.5.4**, no breakdown or defect shall develop in the seed cleaner.

## **7 OTHER REQUIREMENTS**

**7.1** Provisions for the adjustments of the following shall be made:

- a) Feed rate;
- b) Shaking speed;
- c) Screen slope;
- d) Air displacement;
- e) Screen cleaning assembly;
- f) Stroke of shoe assembly;
- g) Broken grains discharge trough; and
- h) Emergency switch off button.

**7.2** All the controls shall be easily accessible and capable of being locked in a chosen position.

**7.3** Provision for belt tightening shall be made.

**7.4** Provision for easy transportation and towing with tractor shall be provided. In case of stationary unit, the cleaner should be grounded adequately to withstand static and dynamic loads.

**7.5** The cleaner shall be provided with the operator's manual (*see 4.2* of IS 8132). Manual shall also contain the information given in Annex E.

## **8 WORKMANSHIP AND FINISH**

**8.1** Welding used for joining different components shall not be porous (*see IS 816*).

**8.2** The components of the cleaner shall be free from cracks, cuts and other visual defects which may be detrimental for their use. Rust preventive coating to the steel components and varnish to the wooden components shall be provided.

## **9 MARKING AND PACKING**

**9.1 Marking** — Each cleaner shall be marked with the following particulars:

- a) Manufacturer's name and recognized trademark, if any;
- b) Model number;
- c) Batch, code or serial number;
- d) Power rating, kW; and
- e) Rated input capacity.
- f) Year of manufacture

**9.1.1** A minimum cautionary notice worded as follows shall be written in vernacular language legibly and prominently on the main body of the cleaner:

- a) Do not wear loose dress, bangles, watch, etc, while working;
- b) Do not work under the influence of intoxicants like liquor, opium, etc;
- c) Children and aged persons should be discouraged for working on cleaner;
- d) Do not cross over moving belts;
- e) Do not operate cleaner without guards and safety devices;

- f) Do not make adjustment when cleaner is working; and
- g) Do not put or take-off belt while pulley is running.

**9.2 Packing** — The cleaner or its components shall be packed as agreed to between the purchaser and the supplier.

### **9.3 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.

## **10 SAMPLING AND TESTS**

**10.1** At least one cleaner of a production model shall be tested under type testing (*see 11.5*) for all the requirements of this standard.

**10.2** Each cleaner shall be tested under routine testing for the following:

- a) Requirements given under **11.5.2** and **8**; and
- b) Dimensional measurement of the characteristics given in **E-3** to **E-11** of Annex E and comparing  
the values with those which were obtained for the cleaner type tested:

**10.3** For lot acceptance, the method of sampling and criteria of conformity shall be as agreed to between the purchaser and the supplier.

## **11 METHODS OF TEST**

### **11.1 Selection of Equipment**

The cleaner shall be selected at random by the testing authority from the production line.

### **11.2 Specification**

The manufacturer shall supply the specification sheet duly filled in as given in Annex E as well as any further information required to carry out the tests. The manufacturer shall also supply all the literature, the operational manual, spare parts catalogue and a schematic diagram of grain flow in the cleaner. The manufacturer shall also indicate the rated input capacity with the foreign matter at 5 percent and 10 percent of the seed mass and achievable cleaning efficiency under given test condition.

### **11.3 Pre-Test Observation**

#### **11.3.1 Determination of Foreign Matter**

The foreign matter present in the seed lot, to be cleaned, shall be determined in accordance with **6.2** of IS 4333 (Part 1).

### **11.3.2 Determination of Moisture**

The moisture content of the seed shall be determined in accordance with IS 4333 (Part 2).

NOTE — In this standard, the term 'moisture content' refers specifically to the moisture percentage measured on a wet basis only.

### **11.4 Running-in and Preliminary Adjustments**

**11.4.1** The seed cleaner shall be installed on level and preferably on a hard surface. All the adjustments shall be made in accordance with the manufacturer's recommendations.

**11.4.2** The seed cleaner shall be run-in without load before commencing the tests. The procedure for the running-in shall be in accordance with the manufacturer's recommendations.

### **11.5 Type Tests**

#### **11.5.1 General**

**11.5.1.1 Checking of specifications** — The specification given by the manufacturer (*see 11.2*) shall be checked and reported in the proforma as given in Annex E.

**11.5.1.2 Checking of material** — The material of construction of all the components of the cleaner shall be reported in the data sheet as given in Annex A.

**11.5.1.3 Visual observations and checking of provision for adjustments** — The observations and adjustments given in data sheet of Annex B shall be made and reported.

#### **11.5.2 Test at No-Load**

##### **11.5.2.1 Energy consumption**

a) All the adjustments shall be made in accordance with the manufacturer's recommendations. The seed cleaner shall be driven by a suitable prime mover preferably with an electric motor with auto-voltage stabilizer and suitable provision for a cut-off device for under voltage. An energy meter or some form of transmission dynamometer shall be fitted. The power delivered to the cleaner may be supplied in the following ways:

- i) Directly coupling the prime mover with the main shaft of the cleaner through a gear box wherever necessary; or
- ii) Connecting the prime mover with the help of a flat or V-belt and a pulley with the main shaft of the cleaner.

In case of (i), the power delivered to the cleaner would be the power output of the prime mover; whereas in case of (ii), the allowance for flat and V-belt drive losses may be taken as 6 and 3 percent, respectively.

- b) The cleaner shall be run at no-load for 10 min at the specified speed and the readings of the energy meter or dynamometer shall be recorded. The energy consumption at no-load shall be

calculated.

- c) The test shall be repeated at least 6 times to get the average energy consumption. The data shall be recorded in accordance with **C-1** of Annex C.

#### **11.5.2.2** *Visual observations*

During and after completion of the energy consumption test (*see 11.5.2.1*), the observations given in **C-2** of Annex C shall be made visually and recorded.

#### **11.5.3** *Test at Load*

Sufficient quantity of seeds of the same variety having foreign matter (*see 11.3.1*) not exceeding 10 percent and moisture content (*see 11.3.2*) not exceeding 13 percent for paddy and 12 percent for other seeds shall be taken.

##### **11.5.3.1** *Preparation and analysis of samples*

The three sets of samples obtained at the clean seed outlet and the foreign matter outlets for various feed rates shall be thoroughly mixed separately to form a composite sample out of these composite samples, 100 g of sample shall be taken and analyzed for the following and the data shall be recorded in the data sheet given in Annex F.

- a) *Clean seed outlet* — to be analysed for foreign matter and broken grains, and
- b) *Foreign matter outlets* — to be analysed for clean seed and broken grains.

##### **11.5.3.2** *Operation and collection of data*

The seed cleaner as installed under **11.4** shall be operated at its specified speed for one hour after stabilization of machine operation at the rated input capacity specified by the manufacturer. During the one hour run, the following samples and data shall be collected:

- a) Three sets of samples at an interval of 20 minutes shall be collected from feed and from following outlets for 2 minutes:
  - 1) Clean seed outlet
  - 2) Foreign matter outlets:
    - i) Pre-sieve aspirator
    - ii) Upper screen
    - iii) Lower screen
    - iv) Final aspirator
    - v) Dust cyclones
    - vi) Indented cylinders
- b) The speed of the main shaft and the readings of the energy meter or dynamometer shall be recorded.

- c) At the end of one-hour feeding, the cleaner shall be run idle for some time, so that practically no more material already fed comes out. At the end of the test, the material dropped through sieve and the seed received at cleaned seed outlet shall be collected and weighed. The mass of the sample collected at clean seed outlet shall be added to the mass of the seed collected after one hour run. If the agricultural tractor or engine is used as prime mover, the fuel consumed during the run period shall also be recorded. The test given at **11.5.3.2** shall be repeated with 10 percent higher rated input capacity in case the cleaner meets with the requirement of cleaning efficiency and purity of seeds (*see 11.5.3.4*). In case the cleaner does not meet with the requirements of the cleaning efficiency and purity, the test should be conducted at 10 percent below the rated input capacity specified by the manufacturer. The tests may be conducted with minimum three different crops for establishing rated input capacity of different crops. The data shall be recorded in the data sheet as given in Annex D.

### **11.5.3.3 Visual observation**

During and after the run tests, the cleaner shall be inspected visually and the observations recorded in the data sheet given in Annex D.

### **11.5.3.4 Cleaning efficiency**

Cleaning efficiency for various feed rates shall be calculated by the following formula and the data shall be recorded in the data sheet given in Annex G.

$$D = \frac{100 \times E (F - G) \times (E - F) \times (1 - G)}{F \times (E - G)^2 \times (1 - G)}$$

where,

- $D$  = cleaning efficiency in percent,
- $E$  = fraction of clean seed at clean seed outlet,
- $F$  = fraction of clean seed in feed, and
- $G$  = fraction of clean seed at foreign matter outlets.

### **11.5.3.5 Power consumption**

- a) In case of the prime mover fitted within energy meter the difference between two consecutive readings shall be taken as the energy consumption for 20 min. The energy consumption per hour giving due allowances to the type of drive [*see 11.5.2.1 (a)*] shall be calculated.
- b) In case of the prime mover fitted with a dynamometer, the average of the readings shall be taken as the average torque required. The power requirement shall be calculated by the following formula:

$$\text{Power in kW} = \frac{T \times S}{9549.30}$$

where,

$T$  = torque in Nm, and  
 $S$  = speed in rev/min.

c) The data shall be given in Annex G recorded in the data sheet.

#### **11.5.3.6 Rated input capacity**

The feed rate at which the cleaning efficiency shall be not less than 80 percent with the purity of the seed being minimum 98 percent shall be selected. The capacity in terms of energy consumed shall be calculated by dividing the capacity by power consumption (*see 11.5.3.5*) and the data shall be recorded in the data sheet given in Annex G.

#### **11.5.3.7 Performance index**

Performance index of the cleaner shall be determined by following formula and the data shall be recorded in data sheet given in Annex G.

$$PI = \frac{\text{Capacity} \times \text{Cleaning efficiency}}{\text{Power}}, \text{ in kg/kWh}$$

#### **11.5.4 Long-run Test**

The cleaner shall be operated for at least 50 h at no load which should be covered by a continuous run of at least 5 h. The major breakdowns, defects developed and repairs made, shall be recorded in the data sheet given in Annex H.

#### **11.6 Routine Tests**

- a) Visual observations and checking of provision for adjustments (*see Annex B*), and
- b) Test at no-load (*see 11.5.2*).

### **12 SUMMARY REPORT**

For the guidance of the user, a summary report on the proforma as given in Annex J shall be compiled.

**ANNEX A**  
*(Clauses 4.2 & 11.5.1.2)*

**DATA SHEET FOR MATERIAL OF CONSTRUCTION**

**A-1 Date of Test**

**A-2 Material of Construction**

<b>Sl. No.</b>	<b>Component</b>	<b>Material</b>	<b>Size</b>	<b>Weight</b>
(1)	(2)	(3)	(4)	(5)
i)	Frame			
ii)	Feeding hopper			
iii)	Blower/Aspirator			
iv)	Main shaft			
v)	Blower shaft			
vi)	Screen (frame included)			
vii)	Shoe			
viii)	Elevator			
ix)	Transport wheel			
x)	Pulleys			
xi)	Indented cylinder(s)			
xii)	Bearing housing			
xiii)	Others			

**NOTES**

1. Delete the component which is not applicable to a particular cleaner and add if my other component is provided.
2. Column 4 and 5 should be recorded, wherever feasible.

Testing Engineer



**ANNEX B**  
*(Clauses 6.1, 11.5.1.3 & 11.6)*

**DATA SHEET FOR VISUAL OBSERVATIONS AND PROVISION FOR  
ADJUSTMENTS**

**B-1 Observations**

- a) Adequacy of marking of inlets and outlets
- b) Adequacy of protection of bearings against the ingress of dust
- c) Adequacy of safety arrangements, like cover, controls, etc, specially at moving points and at inlet
- d) Provision for lubrication of moving parts
- e) Provision of belt tightening
- f) Provision for air exhaust arrangement
- g) Type of settling chambers provided or collection of waste seeds blown out through air
- h) Provision for easy transportation
- j) Provision for easy changing components requiring frequent replacement
- k) Provision for locking the screens
- m) Provision for easy replacement and cleaning of screens and aspiration chamber
- n) Anti-corrosive coatings provided or not
- p) Provision for inspection windows/covers
- q) Provision for marking of air displacement
- r) Tightness of bolts, nuts and other fasteners
- s) Welding of seams
- t) Adequacy of marking to real speed of both main and blower shafts
- u) Provision of feed regulating and spreading system
- w) Other observations

**B-2 Provision for Adjustments**

- i) Feed rate
- j) Shaking speed
- k) Screen slope
- l) Air displacement
- m) Screen cleaning assembly
- n) Stroke of shoe assembly
- o) Speed of indented cylinder(s)
- p) Broken grains discharge trough of indented cylinder(s)

Testing Engineer

**ANNEX C**  
*[Clauses 6.2 & 11.5.2.2]*

**DATA SHEET FOR TEST AT NO-LOAD**

**C-1 Energy Consumption**

- a) Source of power
- b) Type of drive
- c) Total time of run
- d) Average energy consumption for one hour

**C-2 Observations**

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Any marked unusual wear or slackness in any component
- f) Any marked rise in bearing temperature
- g) Any vibration in running fan
- h) Accessibility of various controls and capability of being locked in a chosen position
- j) Unusual heating of any component
- k) Noise level of more than 90 dB at 1 meter from the machine;
- l) Sagging of screen; and
- m) Any leakage in air chamber
- n) Other observations (if any)

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**ANNEX D**  
(Clauses 6.4, 11.5.3.2 & 11.5.3.3)

**DATA SHEET FOR TEST AT LOAD**

**D-1 Source of Power**

**D-2 Power Rating**

**D-3 Type Of Drive**

**D-4 Variety Of Seed**

**D-5 Moisture Content (Wet Basis)**

**D-6 Percentage of Foreign Matter in Seed Before Feeding**

**D-7 Screen Slope**

**D-8 Sieve Clearance**

**D-9 Air Flow**

**D-10 Speed of Rotary Screen**

**D-11 Stroke Length, cm**

**D-12 Observations**

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Frequent clogging of screen perforations
- f) Smooth flowing of material through different components
- g) Any vibration in running fan
- h) Frequent clogging of grain in elevator unit
- j) Frequent clogging of aspiration unit
- k) Any marked rise in bearing temperature
- m) Any marked wear, deformation and breakdown
- n) Frequent loosening of fasteners
- p) Ease of replacement of the screens
- q) Variation in the position of the screen due to vibration
- r) Leakage of seeds from the cleaner while in operation
- s) Unusual heating of any component
- t) Other observations (if any)

**D-13 Test Data**

Sl. No.	Date	Duration of Operation	Speed (rev/min)	Feed Rate (q/h)	Power Requirement (kW)	Fuel Consumed (l/h)	No. of Samples	Feed, kg	Quantity (kg) of sample from		Total quantity of good seeds at feed, kg	Total Quantity of Grain Mixture at Clean seed Outlet (kg)	Total Quantity of Grain Mixture at Sieve Under flow (kg)
									Clean seed outlet	Foreign matter outlet			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
							i)						
							ii)						
							iii)						

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**ANNEX E**  
(Clauses 7.5, 10.2, 11.2 & 11.5.1.1)

**SPECIFICATION SHEET**

TO BE FILLED IN BY

Manufacture

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**E-1 General**

- a) Make
- b) Model
- c) Type
- d) Year of manufacture
- e) Rated capacity

**E-2 Power Unit**

- a) Type of prime mover
- b) Recommended power, kW
- c) Type of drive

**E-3 Main Drive**

- a) Type
- b) Size and number of belts
- c) Size of pulley on prime mover
- d) Diameter of main shaft
- e) Sub-drive, if any
- f) Main shaft speed
- g) Size of pulley on seed cleaner
- h) Type of belt tightening arrangement
- i) Details of gear system

**E-4 Screens**

- a) Type
- b) Number of sieve:
  - 1) Upper
  - 2) Lower
- c) Total length and width of each screen
- d) Effective length and width of each screen
- e) Number of holes per cm<sup>2</sup>: of each screen or percentage opening
- f) Size of hole of each screen

- g) Sieve clearance
- h) Screen slope range
- j) Recommended screen slope
- k) Provision for screen cleaning

#### **E-5 Shoes**

- a) Type
- b) Number of strokes per minute
- c) Length of stroke
- d) Number and type of bearings

#### **E-6 Blower/Aspirator**

- a) Number of blowers
- b) Type
- c) Number of blades
- d) Diameter of blower, m
- e) Recommended speed/air displacement for:
  - 3) Bold seeds
  - 4) Medium seeds
  - 5) Light seeds
- f) Provision for changing air displacement
- g) Number and type of bearings
- h) Drive, if separate
- i) Air flow rate at static pressure of 500 Pa, m<sup>3</sup>/min

#### **E-7 Feeding Hopper**

- a) Storage capacity of feed hopper, m<sup>3</sup>
- b) Type of feed mechanism
- c) Height and location of feeding hopper, m
- d) Recommended maximum input capacity, kg/h
- e) Rated input capacity at 5 percent foreign matter, kg/f
- f) Rated input capacity at 10 percent foreign matter, kg/f
- g) Method of arrangement of even distribution of seed mass in the hopper
- h) Type of drive for feed mechanism

#### **E-8 Transport Arrangement**

- a) Type
- b) Number of wheels
- c) Size of wheels
- d) Wheel bearing
- e) Type of towing arrangement

- f) Wheel tread, m
- g) Wheel base, m

#### **E-9 Indented Cylinder Grader Assembly**

- a) Type
- b) Number of indented cylinder(s)
- c) Length of indented cylinder(s), m
- d) Diameters of indented cylinder(s), m
- e) Range of speed, RPM or m/s
- f) Indent size of various indented cylinder(s)
- g) Provision for air aspiration

#### **E-10 Outlets**

- a) Size and location of seed discharge outlet(s), m
- b) Location of outlet(s) for rejects, m
- c) Size and location of air exhaust outlets, m

#### **E-11 Overall Dimensions and Mass**

- a) Length, m
- b) Width, m
- c) Height, m
- d) Ground clearance, m
- e) Total mass, kg

#### **E-12 Tools, Accessories and Manuals Provided**

##### NOTES

1. The items which are not applicable in a particular cleaner should be crossed while filling,
2. If any other items are provided, their details should be filled in.

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**ANNEX F**  
*(Clause 11.5.3.1)*

**DATA SHEET FOR ANALYSIS OF SAMPLE**

Sl. No.	Source	Feed Rate (g/h)	Sample Source	Sample Mass	Mass of			Remarks
					Clean Seed (g)	Broken Grain (g)	Foreign Matter (g)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i.	Feed							
ii.	Clean seed outlet							
iii.	Foreign matter outlet							
NOTE — For different feed rates, use the same proforma as above								

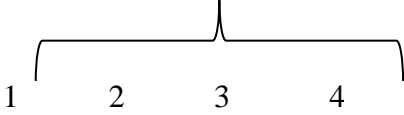
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**ANNEX G**  
*[Clauses 11.5.3.4, 11.5.3.5 (c), 11.5.3.6 & 11.5.3.7*

**DATA SHEET FOR EFFICIENCY, POWER REQUIREMENT,  
CAPACITIES AND PERFORMANCE**

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<b>Sl. Item No.</b>	<b>Test No.</b>
	
	etc
i) Cleaning unit speed, rev/min	
ii) Feed rate, kg/h	
iii) Power required, kW	
iv) Total grain received at clean grain outlet, kg	
v) Cleaning efficiency, percent	
vi) Purity of seed, percent	
vii) Rated input capacity, kg/h	
viii) Performance Index	

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**ANNEX H**  
*(Clause 11.5.4)*

**DATA SHEET FOR LONG-RUN TEST**

- a) Total running time, h
- b) Continuous running time, h
- c) Breakdowns in cleaning unit
- d) Breakdowns in elevation unit
- e) Breakdowns in the main frame
- f) Breakdown in shoe assembly
- g) Breakdown in blower/aspiration unit
- h) Breakdown in indented cylinder grader assembly
- j) Major wear and tear
- k) Any major repairs conducted
- m) Any other observations (if any)

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**ANNEX J**  
**SUMMARY REPORT**  
*(Clause 12)*

**J- 1 Summary Report**

**J-2 Name of Manufacturer**

**J-3 Type, Make and Model Number**

**J-4 Name of Testing Station**

**J-5 Brief Description of The Cleaner**

**J-6 Name and Variety of Seeds Used**

**J-7 Percentage Foreign Matter Before Feeding**

**J-8 Moisture Content Before Feeding**

**J-9 Provisions for Adjustment**

- a) Frequency of oscillation of shaking mechanism
- b) Screen slope
- c) Air displacement
- d) Feed rate
- e) Stroke of shoe assembly
- f) Speed of indented cylinder
- g) Amplitude of shoe assembly oscillation

**J-10 Power Requirement, kW**

- a) Recommended power
- b) Observed power at no-load
- c) Observed power at load at rated input capacity

**J-11 Cleaning Efficiency %**

**J-12 Purity of Seed, Percent**

**J-13 Rated Input Capacity, Kg/h**

**J-14 Any Other**

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