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BUREAU OF INDIAN STANDARDS
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भारतीय मानक *मसौदा*

कंबाइन हार्वेस्टर — भाग 2 परीक्षण संहिता

(आइ एस 8122 (Part 2) *का दूसरा पुनरीक्षण*)

Draft **Indian Standard**

COMBINE HARVESTER — PART 2 TEST CODE

[*Second Revision of* IS 8122 (Part 2)]

ICS 65.060.50

Agricultural Machinery and Equipment Sectional Committee, FAD 11	Last date for Comments: **23 November 2025**

FOREWORD

(*Formal clause will be added later)*

Combine-harvester, commonly known as combine, is used for a combination of operations, such as, harvesting, threshing, separating and cleaning, particularly for cereal crops. As a result of its increasing use in the country, the standard was brought out to help the testing authorities for the assessment of the performance of the combine on uniform and rationalized basis.

This standard (Part 2) covering the method of various tests to be conducted to assess the performance of the combine including its prime mover, in case of self-propelled type combine was first published in 1981 and subsequently revised in 2000.

The second revision of the standard (Part 2) has been undertaken to incorporate following modifications:

1) The title has been changed to 'Combine Harvester Part 2 Test code' from the earlier title 'Combine harvester — Test code Part 1 Terminology'.
2) Nowadays combine harvesters comes with diesel exhaust fluid (DEF) reservoir. Accordingly, provision of DEF reservoir has been included at suitable places to reflect the current practices.
3) Under clause **5.1**, the term 'Engine Performance Test' is used in place of 'Power Test', and the term 'Header Lifting Test' is used in place of 'Hydraulic Test' to bring clarity.
4) The time duration for field performance test has been reduced to minimum 50 hours from the earlier minimum 100 hours for wheat and paddy. For any additional crop recommended by the manufacturer, the time duration for field performance test has been reduced to minimum 25 hours from the earlier minimum 30 hours.

The standard is published in two parts. The other part is as under:

Part 1 Terminology

In revision of this standard considerable assistance has been derived from Northern Region Farm Machinery Training and Testing Institute, Hisar.

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.

Draft **Indian Standard**

COMBINE HARVESTER — PART 2 TEST CODE

[*Second Revision of* IS 8122 (Part 2)]

1 SCOPE

This standard (Part 2) covers the methods of performance testing of combine-harvester.

2 REFERENCES

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

IS No.	*Title*
IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 5994 : 2022	Agricultural tractors — Test code (*fourth revision*)
IS 6024 : 2025	Guards for harvesting machines — Specification (*second revision*)
IS 6025 : 2024	Knife sections for harvesting machines — Specification (*second revision*)
FAD 11 (28724)WC	Combine harvester Part 1 — Terminology [*second revision of* IS 8122 (Part 1)]
IS 8132 : 2023/ISO 3600 : 2022	Tractors, machinery for agriculture and forestry, Powered lawn and garden equipment — Operator's manuals — Content and format (*third revision*)
IS 10743 : 1983	Method for determination of center of gravity on agricultural tractors
FAD 11 (22346)	Drivers field of vision for agricultural tractor — Requirements (*second revision* of IS 11442)
IS 11859 : 2023/ISO 789-3 : 2015	Agricultural tractors — Test procedures — Turning and clearance diameters (*second revision*)
FAD 11(29762)	Agricultural tractors — Test procedures — Power tests for power take-off (*second revision of* IS 12036)
FAD 11(27927)	Agricultural tractors — Braking performance — Method of test (*second revision of* IS 12061)
IS 12180 (Part 1) : 2024/ISO 5131 : 2015	Tractors for agriculture and forestry — Noise measurement — Method of test Part 1 Noise at the operator's position — Survey method (*second revision*)
IS 12180 (Part 2) : 2024/ISO 7216 : 2015	Tractors for agriculture and forestry — Noise measurement — Method of test Part 2 Noise emitted when in motion (*second revision*)

FAD 11 (28583)	Agricultural tractors — Test procedures — Power tests for drawbar (second revision of IS 12226)

3 TERMINOLOGY

For the purpose of this standard, the definition of various terms are given in FAD 11 (28724) shall apply.

4 SAMPLING AND GENERAL GUIDELINES

4.1 Specification Sheet: The applicant shall supply the specifications of the combine consisting of the items listed in the specimen report given in Annex A as well as any additional data required to carry out the tests. The manufacturer shall also supply literature consisting of operational and maintenance manual, service manual and parts catalogue with the combine. The literature should be in Hindi/English.

4.2 Sampling

The combine shall either be selected at random (*see* IS 4905) from the production lot by the testing institute for commercial tests or shall be submitted by the applicant to the testing authority for confidential/initial commercial tests as the case may be. The combine selected or submitted for test shall be completed with its usual accessories and in a condition generally offered for sale. The combine shall be new and shall not be given any special treatment or preparation for test. The method of selection is given in Annex B.

4.3 Fuel and Lubricants

The properties of fuel and lubricant used for test shall conform to **5.3** of FAD 11(28583).

4.3.1 The oil change-over period as given in the printed literature shall be followed at the testing institute.

4.4 Running-in

The combine shall be run-in at the testing institute by the applicant in collaboration with the testing institute before the start of the test, under his responsibility and in accordance with his usual instructions. If this procedure becomes impracticable for any reasons, the testing institute shall run-in the combine provided that the authority of the applicant or his representative, who will remain responsible for running-in, is obtained.

4.4.1 The duration of running-in and place shall be indicated.

4.5 Servicing and Preliminary Settings after Running-in

4.5.1 After completion of running-in test the servicing/adjustments as per printed literature/ information supplied by the applicant/manufacturer shall be done. No adjustment shall be made unless it is recommended in the literature or specific recommendations are submitted before start of test. All the parts replaced shall be reported.

NOTE — However, the adjustment of fuel injection pump shall not apply to the combine randomly selected for test.

4.6 Repair and Adjustment during Test

The applicant during the course of test shall not make any major adjustment or introduce any major alterations or modifications which may affect the normal performance. However, normal operational adjustments, to suit crop and field conditions or as conformance to the specifications made available to the testing authority, can be made during the test. In case of combine submitted for confidential test, the testing authority at its discretion can permit major alterations or modifications on the request of the applicant.

4.7 Ancillary Equipment

For power tests, all power consuming devices may be disconnected only if it is practicable for the operator to do so as a normal practice in the work, in accordance with the operator's manual and without using tools, except as otherwise specified for a particular test. If not, they shall remain connected and operate at minimum load.

4.8 Fuel Consumption

The fuel measurement apparatus during laboratory tests shall be so arranged that the fuel pressure at the fuel transfer pump of the engine is equivalent to that which exists when the combine fuel tank is half full. The fuel temperature shall be comparable to that in the normal operation of the combine when fuel is taken from the combine fuel tank.

4.8.1 To obtain hourly fuel consumption by volume and the work performed per unit volume of fuel, conversion of unit of mass to unit of volume shall be made using the density value at 15°C.

4.8.2 When the fuel consumption is measured by volume, the specific fuel consumption shall be calculated using the density corresponding to the appropriate fuel temperature.

4.9 Atmospheric Conditions

a) Atmospheric Pressure — Minimum 96.6 kPa during laboratory tests. The pressure shall be noted at the beginning of the test.

b) Temperature — For power tests, the normal ambient temperature shall be 27 ± 7°C. The temperature for high ambient test shall be 43 ± 2°C.

NOTE — No correction shall be made to the test results for atmospheric conditions.

4.10 Conditions for Checking of Dimensions

4.10.1 The combine shall be standing on a firm, level and horizontal surface.

4.10.2 The combine shall be stationary with its wheels and components in positions they would be as if the combine was travelling in a straight line.

4.10.3 The pressure in pneumatic tyres shall be adjusted to the value recommended by the applicant for field work. The tyres shall be new. The measurement of height of lugs shall be made at the center line of tyres.

4.10.4 Measurement conditions for various dimensions and characteristics as stipulated in FAD 11 (28724) shall also be followed.

5 TESTS

The following laboratory and field tests shall be conducted.

5.1 Laboratory Tests

a) Specification checking,

b) Material analysis,

c) Visual observations and checking of provision for adjustments,

d) Engine Performance Test

e) Header lifting test

f) Noise level measurement,

g) Vibration test,

h) Operator's field of vision,

j) Brake test,

k) Air cleaner oil pull-over test,

m) Turning ability test,

n) Position of center of gravity, and

p) Components/Assembly inspection.

NOTES

1 Tests indicated at (d), (f), (g) and (k) shall be conducted in self-propelled combines only.

2 The laboratory tests shall preferably be conducted prior to taking up field tests. However, if the necessity arises the sequence of laboratory and field tests can be changed by the Testing Authority.

5.2 Field Tests

a) Rate of work and combine capacity

b) Quality of work

1) Efficiencies:

i) Threshing

ii) Cleaning

2) Non-collectable losses:

i) Pre-harvest
ii) Header
iii) Rack and shoe

c) Output

1) Straw

2) Grain

d) Fuel consumption

e) Visual observations

6 LABORATORY TESTS

6.1 Specification Checking

The specifications of the combine given by the applicant (*see* **4.1**) shall be checked and reported in Annex A by the testing authority. While checking various dimensions, the conditions stipulated in **4.10** shall be followed.

6.2 Material Analysis

The hardness and chemical analysis of critical components, such as knife section (*see* IS 6025) rasp bar, peg tooth, ledger plate and knife guards (*see* IS 6024) shall be made and reported in Annex C.

6.3 Visual Observations and Checking of Provision for Adjustments

The combine shall be subjected to thorough inspection with particular attention to bearings, drives and other moving parts, correctness of various adjustments, tightness of bolts and nuts, etc. The observation given in Annex D shall be recorded.

6.4 Engine Performance Test

6.4.1 The following tests on the engine as per FAD 11 (29762) shall be conducted:

a) Maximum power (absolute) test [*see* **6.1.2.1** of FAD 11 (29762)] .
b) Varying speed test at full load [*see* **6.1.2.2** of FAD 11 (29762)].
c) Varying loads test [*see* **6.1.4** of FAD 11 (29762)].

NOTE — If the engine speed recommended for field tests is different from rated engine speed, then tests at the recommended setting shall also be conducted.

6.4.2 *High Ambient Test*

The following tests on the engine under high ambient temperature (43 ± 2ºC) shall be conducted.

6.4.2.1 *Varying speed test*

This test shall be carried out in accordance with **6.1.2.1** of FAD 11 (29762).

6.4.2.2 *Five hour engine rating test*

The engine shall be run at 90 percent of load corresponding to maximum power continuously for 4 hours. During the fifth hour, the engine shall be run at a load corresponding to maximum power. During the test, all the parameters specified in **6.1.6** of FAD 11 (29762) shall be recorded after every half-an-hour during the first 4 hours and after every 15 minutes during the fifth hour. The coolant and lubricating oil consumption shall be recorded as under:

a) Coolant-percent of total coolant capacity, and

b) Lubricating oil-g/kWh.

6.4.3 The data shall be recorded in **D-l**.

6.5 Header Lifting Test

This test shall be carried out as under:

a) The engine speed set at speed recommended for field operation.

b) The assemblies/sub-assemblies other than hydraulic system shall remain disengaged.

c) The cycle of lifting and lowering shall be kept continuous. This shall be done for 1000 times.

d) Before test oil temperature shall be 65 ± 5°C.

The data shall be recorded in **D-2**.

6.6 Noise Level Measurements

6.6.1 The combine shall be operated at the recommended travel speed at full accelerator with and without variator. All mechanisms in the combine shall be in working position. The cutter bar height shall be up to 150 mm above the ground level. The noise measurement at by-stander's position and drivers ear level shall be conducted in as per CMVR in accordance with IS 12180 (Part 1) and (Part 2) respectively and data shall be recorded in proforma given in Annex E.

6.7 Vibration Measurement

6.7.1 The amplitude of mechanical vibration of those assemblies and components of the combine which are functionally important shall be measured with the help of suitable vibration measuring device. The combine shall be parked on level concrete surface.

6.7.2 The observations shall be recorded when the combine sub-assemblies are operating at no load engine speed recommended for field work. The inflation pressure in the tyres shall be the same as recommended by the manufacturer for field operation. The height of cutter bar shall be kept at 150 mm above ground level. The maximum horizontal displacement (HD) and vertical displacement (VD) due to vibration shall be measured by mounting the measuring device in related position and expressed in microns.

6.7.3 The vibration measurement shall be made on the points and the components given in **D-3**.

6.8 Operator's Field of Vision

This test shall be carried out in accordance with FAD 11(22346). During the test the header unit and other system shall remain attached. The height of cutter bar above ground level shall be at 150 mm.

6.8.1 The data shall be recorded in **D-4.**

6.9 Brake Performance Test

The cold and hot brake test shall be conducted in accordance with FAD 11(27927) in a condition recommended for road transport.

6.9.1 *Parking Brake Test*

The force, necessary to apply at the control of the parking braking device to hold the combine harvester stationary, when facing up and down on 12 percent gradient in a condition recommended for road transport, shall be measured. The maximum actuating force shall not be more than 400 N for hand operated and 600 N for foot operated parking brake device.

6.9.2 The data shall be recorded in **D-5**.

6.10 Air Cleaner Oil Pull-Over Test

The test shall be carried out in accordance with **6.2** of IS 5994 in following conditions:

a) Combine parked in horizontal level position,

b) Combine tilted 10º to either side, and

c) Combine tilted 10º to forward and backward in relation to the direction of travel of the combine.

6.10.1 The data shall be recorded in the format given in Annex C of IS 5994.

6.11 Turning Ability Test

The test shall be carried out in accordance to IS 11859. During the test the header unit shall remain attached and the height of cutter bar above ground level shall be 150 mm. The data shall be recorded in **D-6**.

6.12 Position of Centre of Gravity: The test shall be conducted in accordance with IS 10743. However, during the test the grain tank(s) shall be fully tilled with grain, header assembly fully raised and the reel adjusted in its most forward position.

6.12.1 The data shall be recorded in **D-7**.

6.13 Components/Assembly Inspection

The engine, transmission, brakes, front axle, starter motor, dynamo and other critical components (chain sprocket and belts, bearings, hydraulic pumps and cylinders, wear of rasp bar and peg teeth) as may be decided by the testing authority, shall be partially dismantled after conducting all tests including field tests. The observations listed under **10.1.1** to **10.1.11** of IS 5994 shall be made and reported in the format given in Annex E of IS 5994.

7 FIELD TESTS

7.1 Field and Crop Conditions

The combine shall be operated under prevailing crop and field conditions, preferably meeting the requirements of **5.2** of FAD 11(28724). The minimum period of operation shall be:

- 50 hours for wheat and paddy (together or individually).
- An additional 25 hours for each extra crop recommended by the manufacturer.

Notes:

1 As far as possible, attempts should be made to complete the test in one year. However, part of work/test may be carried over to the following year if required range of conditions cannot be obtained in a single season.
2 For combines intended only for wheat and paddy, the total testing period shall be **50 hours**.
3 In case of single crop, it shall be tested for minimum 50 hours.

7.1.1 In addition, combining shall also be carried out under following conditions, if exist in the field:

a) Weedy crops on rough hard ground and under soft ground condition (type of weed and weed intensity should also be reported);

b) Surfaces have pronounced ridges and furrows or similar undulations (height of bunds and ridges, their spacing and size should also be reported); and

c) Sloppy field having a maximum slope of 5 percent.

7.2 General Condition for Operation

The combine shall be operated by an experienced operator. The applicant or his representative shall demonstrate the operation of the combine to the testing authority in actual field condition. The testing shall not be carried out until the testing authority is satisfied that the machine is operating correctly. Before starting the test, the combine shall be adjusted as per manufacturer's recommendations. This adjustment may be modified to obtain the highest possible output consistent with percentage of losses regarded as reasonable by the testing authority and the applicant's representative. Performance values obtained during preliminary adjustment need not be reported. The combine may be adjusted for operational adjustments between successive test runs in order to maintain optimum performance at varying speeds. Manufacturer's recommendations for various adjustment shall be followed. Some recommendations for better performance are given in Annex F.

7.3 Field Operation

7.3.1 The pre-harvest losses shall be determined, at three places randomly selected within the area selected, for test run of at least 15 m. The area from where the sample is to be collected shall preferably be 1 m in direction of travel and full or half width of cutter bar of the machine depending upon its size. All the loose grains, complete and incomplete earheads fallen in the marked area before the machine has run over it shall be picked up manually without undue vibrating the plants and analyzed for determining the pre-harvest losses in kg/ha.

7.3.2 For determining rack and shoe loss, the straw and chaff afflux is collected separately. To collect the straw and chaff leaving the machine, two rolls of cloth (preferably 1.5 times the width of straw/chaff outlet) are suspended on especially attached fittings beneath the rear of the machine, so that as it unrolls, one cloth sheet catches the afflux from the straw walker and the other from the sieve. Each cloth sheet is 30 m in length. The test run shall not be less than 15 m in length. The unrolling operation of the sheet should start in advance by 5 m distance behind the starting point of the test run. The unrolling of sheets shall terminate after the combine has passed over 5 metres ahead to the end point of the test run (*see* Fig. 1).

7.3.2.1 Signals shall be given at the start and at the end of the test run to determine the time taken by the machine to cover the test run and for collection of grain at the main outlet and secondary outlet. The straw and chaff for the test run shall be collected from the sheets and rest of the material discarded.

7.3.3 The header loss shall be determined on those portion of the ground which are protected from combine afflux by the use of rolls of cloth or sheet. The loose grains, and complete and incomplete ear heads fallen on the marked area, where the pre harvest losses were determined, shall be picked-up manually and represented as a percentage of grain throughput to the combine.

7.3.3.1 Care should be taken that no material falls down from the combine over marked areas. The header loss like pre-harvest loss shall be determined at three places and average of the observations shall be reported.

7.3.4 The combine should be operated for at least 10 m before recording the data to ensure that the crop and the grain circuits and the cleaning systems have been filled. The combine should be operated at a uniform speed and in such a manner as to use its full cutting width. As far as possible, a constant stubble height shall be maintained.

7.3.4.1 In each-field the test shall be carried out at the same forward speed as used in the preliminary adjustment.

7.3.4.2 No change in the forward speed adjusted before the test and any stoppage during the test run shall be permitted. If this happens because of some unavoidable circumstances the test observations shall be repeated.

7.3.4.3 During and after the test run, the observations shall be recorded in Annex G. Three samples from the grain tank (main outlet) and complete sample for the run from straw walker and sieve shall also be collected.

7.3.4.4 The moisture content of the grain sample obtained from grain tank (main outlet) and straw (standing crop) shall be determined. The samples collected from grain tank, straw walker and sieve shall be analyzed for the following and data recorded in data sheet given in Annex H.

a) Clean grain,

b) Foreign matter,

c) Unthreshed grain, and

d) Damaged grain.

7.3.4.5 From the observations made under **7.3.4.3** and **7.3.4.4**, the following shall be calculated and the data recorded in Annex H.

a) Rate of work in ha/h;

b) Net grain output kg/h and kg/ha;

c) Grain throughput (net grain output + header loss + rack loss + shoe loss) in kg/h and kg/ha;

d) Straw output in kg/h and kg/ha;

e) Losses expressed as percentage of grain throughput:

1) Header loss,
2) Cylinder loss,
3) Sieve loss,
4) Secondary sieve loss (if applicable),
5) Straw walker loss, and
6) Grain breakage.

f) Cleaning efficiency, percent;

g) Threshing efficiency, percent; and

h) Combine capacity (gross grain output and straw output), t/h.

NOTES

1 A minimum of three tests may be conducted on a particular variety of the crop and the average of these observations shall give the representative figure of the combine losses.

2 The losses may be grouped as collectable and non-collectable. The definitions of collectable loss and non-collectable loss shall be as given in FAD 11(28724).

3 The pre-harvest losses shall be reported separately in kg/ha.

4 The combine capacity as stipulated against **5.2.1.1** of FAD 11(28724) shall be determined and reported. The range of combine capacity shall be declared by conducting three tests with three varieties of the crop as far as possible.

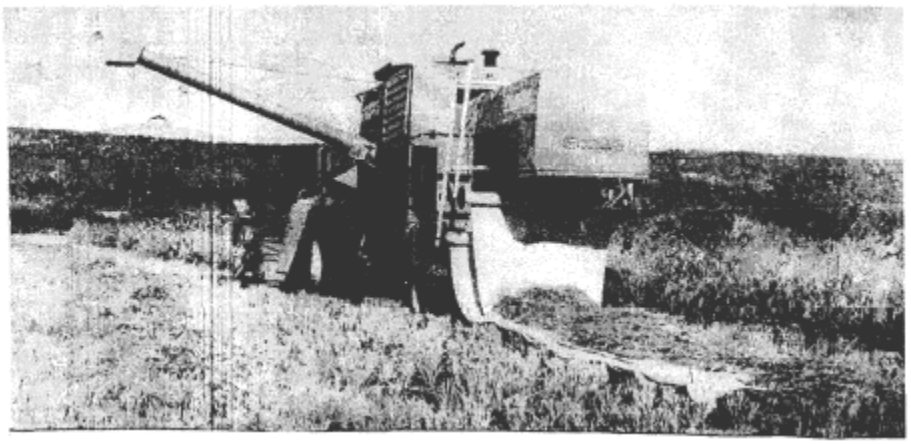

FIG. 1 COLLECTION OF STRAW OVER CLOTH ROLLS ON COMBINE

7.3.4.6 *Test under difficult conditions*

If facilities exist, combine shall be operated in at least one test run under the conditions given in **7.1.1**.

7.4 The combine shall be operated continuously for a minimum of 10 h duration. The behaviour of various functional components of the combine shall be recorded.

7.4.1 During and after the operation, following observations shall be recorded:

a) Area covered;

b) Time of operation;

c) Time lost in turning (this may be recorded for at least one-hour operation);

d) Time required to fill the grain tank;

e) Time required to empty the grain tank;

f) Fuel consumed;

g) Lubricating oil consumed

h) Coolant (water) consumed;

j) Operating speed;

k) Average working width;

m) Time for any stoppage;

n) Accessibility of controls;

p) No load and on load engine speed; and

q) Maximum temperature of engine oil/coolant, and ambient temperature.

r) DEF consumption

7.4.2 Following additional observations shall also be made and recorded.

7.4.2.1 *Night observations*

A night trial lasting for minimum of two hours shall be conducted to assess the intensity and suitability of the lighting equipment for the night work.

7.4.2.2 *Ease of operation and handling*

Observations shall be made on skill and intensity of effort required to operate various controls of the machine. Adequacy of accessibility of controls and visibility of the header and instrumentation shall also be recorded. The note on operator's working condition, the ease of setting adjustment, routine maintenance and other similar features shall also be made.

7.4.2.3 *Safety provisions*

The note on safety device, such as slip clutches, shear pin, signal horns, indicator lights, provided for various systems shall be taken. The provision of stone trap, spark arrester and any other safety feature shall also be checked and reported.

7.4.2.4 Soundness of construction: Observations shall be made of these features which adversely affect the operation and efficiency of machine in the field. All the breakdowns and defects occurring during the course of field evaluation period shall be recorded. The modification which could bring about improvement in the quality of rate of work shall also be noted.

ANNEX A

(*Clauses* 4.1 and 6.1)

SPECIFICATION SHEET FOR COMBINE HARVESTER

A-l GENERAL

a) Name and address of' manufacturer

b) Make

c) Model

d) Type

e) Year of manufacture

f) Serial number

A-2 PRIME MOVER

A-2.1 General

a) Make

b) Model

c) Type

d) Serial number

e) Engine speed (Manufacturer's recommended setting) (rpm)

1) Maximum speed at no load

2) Rated speed

3) Low idle speed

f) Location

g) Mounting

A-2.2 Cylinder and Cylinder Head

a) Number

b) Disposition

c) Bore/Stroke (mm)

d) Capacity as specified by the applicant (cu.cm)

e) Compression ratio

f) Type of cylinder head

g) Type of cylinder liners

h) Arrangement of valves

j) Type of combustion chamber

k) Valve clearance in cold/hot (mm)

1) Inlet valve

2) Exhaust valve

A-2.3 Fuel System

A-2.3.1 *Type of Fuel System*

A-2.3.2 *Fuel Tank*

a) Capacity (1)

b) Location

c) Provision for draining of sediments/water

A-2.3.3 *Fuel Feed Pump*

a) Type

b) Make

c) Model

d) Provision of sediment bowl

A-2.3.4 *Fuel Filters*

a) Make

b) Model

c) Number

d) Type of elements

e) Capacity of final stage filter (1)

A-2.3.5 *Injection Pump*

a) Make

b) Model

c) Type

d) Sl No.

e) Method of drive

A-2.3.6 *Fuel Injectors*

a) Make

b) Model

c) Type

d) Manufacturer's production pressure setting, MPa

e) Injection timing

f) Firing order

A-2.4 Governor

a) Make

b) Model

c) Type

d) Governed range of engine speed (rpm)

e) Rated engine speed (rpm)

A-2.5 Pre-cleaner

a) Make

b) Type

c) Number

d) Location

e) Height of pre-cleaner top above ground level (mm)

A-2.6 Air Cleaner

a) Make

b) Type

c) Number

d) Location

e) Size of dry filter element ID/OD/Length

f) Range of suction pressure, kPa (mm of Hg)

g) Oil capacity (1)

h) Oil change period

A-2.7 Exhaust

a) Type of silencer

b) Position of silencer outlet

c) Range of exhaust gas pressure kPa (mm of Hg)

d) Provision of spark arresting device

A-2.8 Lubricating System

A-2.8.1 *Type*

A-2.8.2 *Filters*

a) Type

b) Number

c) Oil sump capacity (1)

d) Oil change period

A-2.8.3 *Pump*

a) Type

b) Method of drive

c) Pressure release setting kPa (kgf/sq.cm)

d) Minimum permissible pressure, kPa (kgf/sq.cm)

e) Method of oil cooling

A-2.9 Details of Heat Exchanger

a) Type

b) Make

c) Model

d) Number of tubes

e) Size of tube (mm)

f) Capacity (1)

1) Oil

2) Water

A-2.10 Cooling System

A-2.10.1

a) Type

b) Details of pump

c) Details of fan

d) Means of temperature control

A-2.10.2 *Radiator*

a) Effective size of radiator (mm):

b) Number of tubes

c) Type of radiator grill

d) Means of grill cleaning

e) Method of mounting

f) Type of radiator cap

g) Radiator cap pressure kPa (kgf/sq.cm)

h) Bare radiator capacity (l)

j) Total coolant capacity (1)

A-2.11 Starting System

a) Type

b) Aid for cold starting

c) Any other device provided for easy starting

A-2.12 Electrical System

A-2.12.1 *Battery*

a) Make

b) Number and type

c) Capacity and rating

d) Location

A-2.12.2 *Starter*

a) Make

b) Model

c) Type

d) Capacity and rating

A-2.12.3 *Alternator*

a) Make

b) Model

c) Type

d) Output rating

e) Location

f) Method of drive

A-2.12.4 *Voltage Regulator*

a) Make

b) Type

c) Capacity

A-2.12.5 *Detail of lights*

Description	***Number and capacity of bulb***	***Height above ground to the centre beam (mm)***	***Size of beam (mm)***	***Distance from centre of the beam to outside edge of combine (mm)***
(1)	(2)	(3)	(4)	(5)
Head lights Front working light Centre working light Front side light Front side indicator light Tail light-cum-brake light Rear side indicator light for unloading Rear work light Engine inspection light Side inspection light Flasher light (Red)				

Dash board light Trailer light: a) Parking-cum-brake b) Side indicator light Main switch details Light switch detail				

A-2.12.6 *Horn*

a) Make
b) Type
c) Location

A-2.12.7 *Fuse Box*

A-2.12.8 *Details of Other Electrical Accessories*

A-2.13 Operational Mass of Prime Mover (kg)

A-3 COMBINE

A-3.1 Wheel Equipment

A-3.1.1 *Driving Wheels*

a) Make

b) Type

c) Location

d) Number and size

e) Track width (mm)

f) Recommended tyre pressure, kPa

A-3.1.2 *Steering Wheel*

a) Make

b) Type

c) Location

d) Number and size

e) Track width (mm)

f) Recommended tyre pressure, kPa

A-3.1.3 *Wheel Base* (mm)

A-3.2 Transmission System

A-3.2.1 *Clutch*

a) Make

b) Type

c) Size (mm)

d) Number of friction discs

e) Location

f) Method of operation

A-3.2.2 *Gear Box and Differential*

a) Make

b) Type

c) Location

d) Number of speed

e) Method of drive

f) Method of gear shifting

g) Oil capacity (1)

h) Oil changing period

A-3.2.3 *Final Drive*

a) Type

b) Reduction ratio

c) Location

d) Oil capacity (1)

e) Oil changing period

A-3.2.4 *Nominal Speed*

Movement	***Gear No.***	***No. of engine revolutions for one revolution of driving wheel***	***Nominal speed at rated engine speed when fitted with____ size tyre at an inflation pressure of ___ kPa and***

			rolling radius of____ mm (kmph)
(1)	(2)	(3)	(4)
Without Variator: Forward 1 2 3 Reverse: R			
With Variator:			
Forward 1 2 3 Reverse: R			

A-3.3 Brakes

A-3.3.1 *Service Brake*

a) Make

b) Type

c) Location

d) Area of liners (sq.cm)

e) Thickness of liner (mm)

f) Method of operation

A-3.3.2 *Parking Brake*

a) Make

b) Type and location

c) Method of operation

A-3.4 Steering System

a) Make and model

b) Type

c) Method of operation

d) Diameter of steering control wheel (mm)

e) Location

A-3.5 Hydraulic System

A-3.5.1 *Pump*

a) Type

b) Make

c) Model

d) Number

e) Method of operation

f) Location

A-3.5.2 *Hydraulic Tank*

a) Type

b) Location

c) Size (mm)

d) Capacity (1)

e) Oil change period (h)

f) Number and type of oil filters

A-3.5.3 *Number of Hydraulic Cylinders*

A-3.6 Reel Assembly

a) Type

b) Number of tyne bars

c) Size of tyne bars (mm)

d) Type of tyne bar

e) Dia of reel (mm)

f) Width of reel (mm)

g) Range of speed corresponding to rated engine speed for field work (rpm)

h) Arrangement for speed variation

j) Number of tynes on each bar and their spacing

k) Maximum distance ahead of cutter bar points (mm) (*see* **A** in Fig. 2)

m) Maximum distance behind the cutter bar points (mm) (*see* **B** in Fig. 2)

n) Maximum vertical distance below the cutter bar points (mm) (*see* **C** in Fig. 2)

p) Maximum vertical distance above the cutter bar points from the centre of reel (mm) (*see* **D** in Fig. 2)

q) Distance from cutter bar points to the front of feeding auger (mm) (*see* **E** in Fig. 2)

r) Arrangement for raising and lowering the reel

s) Arrangement for forward and backward movement of reel

t) Arrangement for variation of angle of the tyne

u) Type of reel drive

v) Safety device in reel drive

A-3.7 Cutter Bar Assembly

a) Working width (mm) (*see* **T**, in Fig. 3):

b) Effective cutter bar width (mm) (*see* **T**, in Fig. 3)

c) Number and spacing of knife guards (*see* **R** in Fig. 3):

d) Number and type of knife blades

e) Details of knife drive

f) Knife safety arrangement

g) Knife stroke (mm)

h) Strokes per minute

j) Knife speed corresponding to rated engine speed for field-work (rpm)

k) Type of ledger plate

m) Arrangement and range of adjusting cutting heights

n) Type of dividers

p) Arrangement for lifting lodged crop

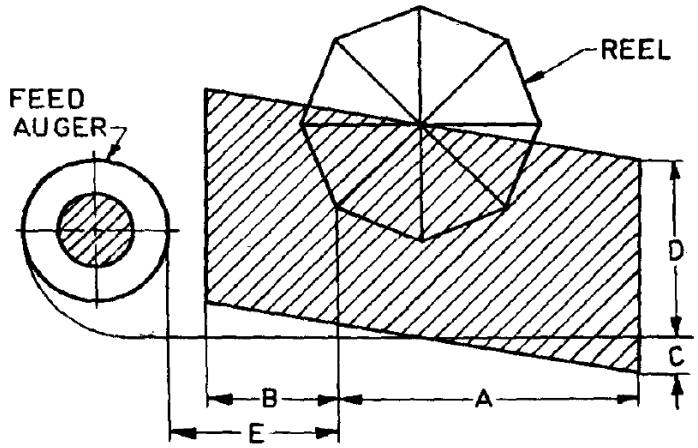

FIG. 2 REEL ASSEMBLY

A-3.8 Hardness of Knife Blades (HRC)

a) Hardened zone

1) Minimum

2) Maximum

b) Remainder zone

1) Minimum

2) Maximum

A-3.9 Chemical Composition of Knife Blade and Knife Guards

	Knife Blade	*Knife Guards*
a) Carbon (%)		
b) Manganese (%)		
c) Phosphorus (%)		
d) Sulphur (%)		
e) Silicon (%)		
f) Copper (%)		
g) Nickel (%)		
h) Chromium (%)		

j) Tin (%)

k) Molybdenum (%)

A-3.10 Cutting Platform Auger

a) Type of crop conveyor

b) Size of auger (mm)

1) Dia

2) Width

c) Speed of the auger corresponding to rated engine speed for field work (rpm):

d) Details of retractable fingers

1) Number

2) Range of throw out (mm)

3) Axial spacing between the fingers (mm)

4) Peripheral distance between the fingers (mm)

5) Arrangement for adjustment of fingers

e) Arrangement for adjusting the clearance of crop auger

f) Auger drive safety arrangement

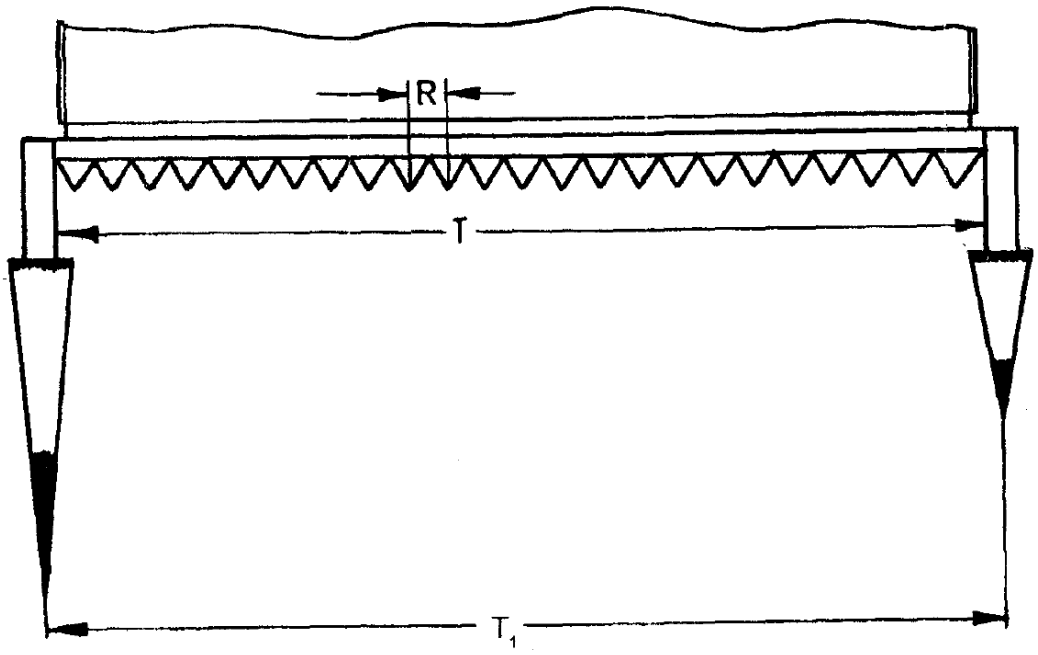

FIG. 3 CUTTER BAR ASSEMBLY

A-3.11 Height of Header Assembly in the Transport Position (mm)

A-3.12 Arrangement for Locking the Header Assembly in Raised Position

A-3.13 Arrangement for Side Way Tilting the Header Assembly

A-3.14 Undershot Conveyor

a) Type of feeder conveyor

b) Number and type of chains

c) Number of combs

d) Size of combs (mm)

e) Size of chain (mm)

f) Roller dia (mm)

g) Pitch (mm)

h) Spacing of combs (mm)

j) Width of conveyor (mm)

k) Conveyor drive safety arrangement

m) Arrangement for adjusting clearance between comb and platform

n) Speed of conveyor corresponding to rated engine speed for field work (rpm)

p) Number of teeth on comb bar

A-3.15 Threshing Drum

	Raspbar Type	*Pegtooth Type*
a) Type		
b) Width (mm)		
c) Outside dia (mm) (*see* **D** in Fig. 4)		
d) Range of speed corresponding to rated engine speed for field work (mm)		
1) Minimum		
2) Maximum		
e) Peripheral speed (m/sec)		
1) Minimum		
2) Maximum		
f) Number of bars		
g) Number of hub plate(s)		
h) Number of pegs and their spacing on each bar		
j) Height of pegs (mm)		
k) Length of raspbar (mm)		
m) Number of rasps/l 00 mm		
n) Number of rasps on each bar		
p) Number and type of bearings		
q) Arrangement of bars		
r) Hardness (HRC)		

1) Minimum

2) Maximum

s) Chemical composition

1) Carbon (%)

2) Manganese (%)

3) Silicon (%)

4) Phosphorus (D/O)

5) Sulphur (%)

6) Molybdenum (%)

7) Chromium (%)

8) Nickel (%)

9) Copper (%).

10) Tin (%)

11) Aluminium (%)

t) Method of speed variation

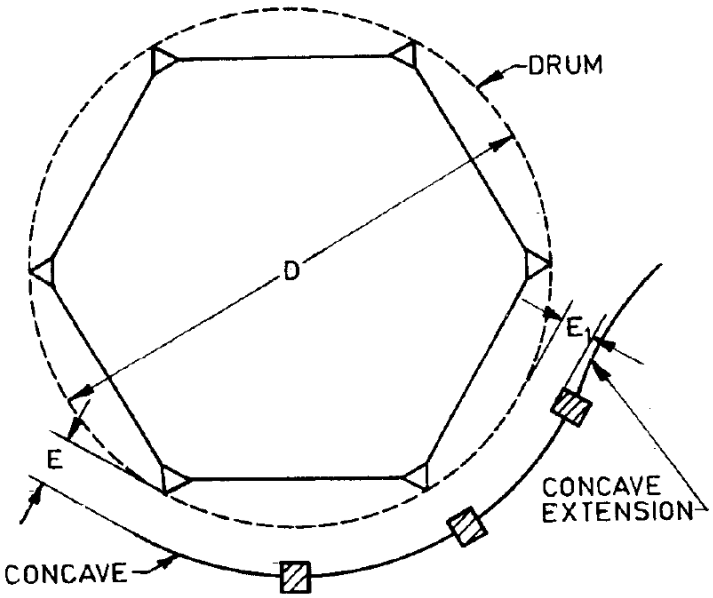

FIG. 4 DRUM ASSEMBLY

A-3.16 Concave

	Raspbar Type	*Peg tooth Type*
a) Width of concave (mm)		
b) Effective width (mm)		
c) Type of concave		
d) Number of bars		
e) Number of pegs per bars		
f) Height/spacing of the pegs (mm)		
g) Peripheral length (mm)		
h) Effective area (sqm)		
j) Additional area of extension (sq.m)		
k) Details of extension		
m) Range of clearance (mm)		
1) Front (*see* in Fig. 4)		

2) Rear (*see* in, Fig. 4)

n) Method of adjusting the clearance between drum and concave

A-3.17 Rear Beater

a) Type

b) Size (mm)

c) Arrangement and location

d) Type of drive

A-3.18 Baffle Plate (Deflector)

a) Type

b) Number of flaps

c) Size of flap (mm)

d) Location

e) Method of flap adjustment

f) Method of fixing flap

A-3.19 Separating Mechanism

A-3.19.1 *Straw Walkers*

a) Number

b) Type

c) Size of each straw walker (mm)

1) Length (*see* **P** in Fig. 5)
2) Width (*see* **R** in Fig. 5)
3) Area (m^2)

d) Effective separating area of straw walker (m^2)

e) Lift/throw (mm)

f) Oscillation per minute corresponding to field speed of engine

g) Type of extension

h) Number and type of bearing

A-3.19.2 *Stepped Grain Pan*

a) Type

b) Size (mm)

c) Effective area of pan (sq.m)

d) Details of extension

e) Location

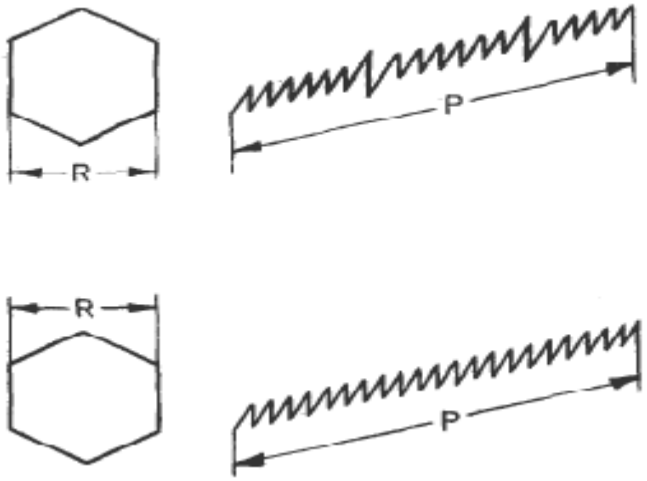

FIG. 5 SEPARATING MECHANISM

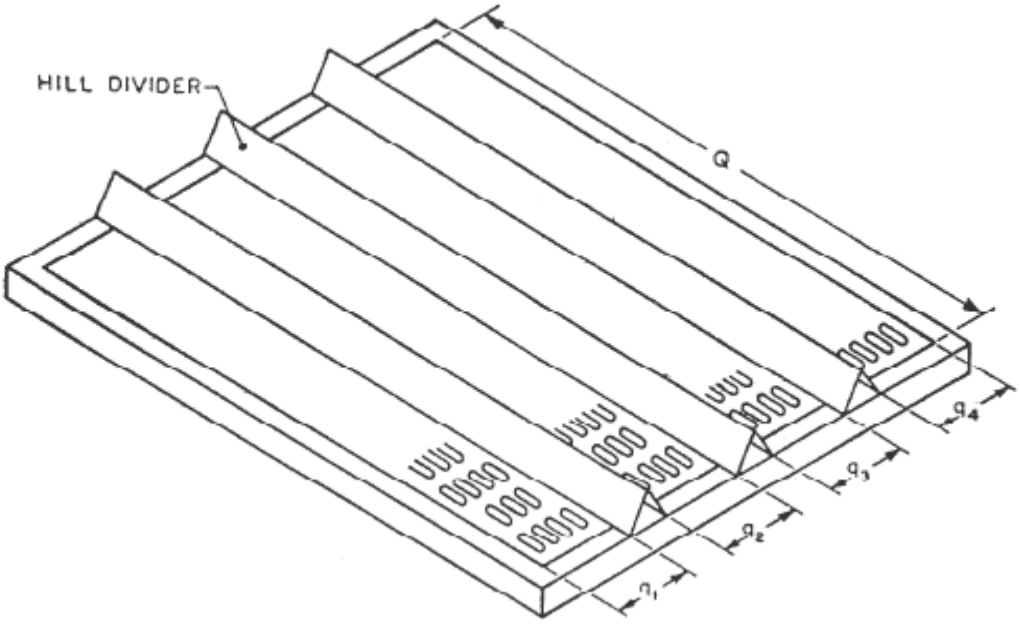

FIG. 6 CLEANING SIEVE

A-3.19.3 *Cleaning Sieves* (*see* Fig. 6)

A-3.19.3.1 *Top sieves*

a) Number of sieve

b) Type

c) Overall size of sieve

1) Length (mm)
2) Width (mm)

d) Effective cleaning area (m^2)

e) Type of extension

f) Area of extension (m^2)

g) Oscillation per minute corresponding to field speed of engine

h) Lift/throw (mm)

j) Arrangement for varying

k) The opening of the sieve

m) Height of lips at maximum opening (mm)

n) Method of varying oscillation

p) Method of drive

q) Number and type of bearing

A-3.19.3.2 *Bottom sieve*

a) Number of sieve

b) Type

c) Size (mm)

d) Effective cleaning area (m^2)

e) Size of hole (mm)

f) Spacing of hole

g) Oscillations per minute corresponding to rated engine speed

h) Method of varying oscillations

j) Height of lips at maximum opening (mm)

k) Arrangement for varying the opening sieve

m) Density of holes/100 mm^2

A-3.19.3.3 *Blower*

a) Dia (mm)

b) Effective width (mm)

c) Number and type of blade

d) Size of blade (mm)

1) Length
2) Width

e) Type of drive

f) Method of varying the blower speed

g) Speed corresponding to rated engine speed for field work (rpm)

1) Minimum
2) Maximum

h) Method of controlling the air blast

A-3.19.3.4 *Grain pan*

a) Type

b) Size (mm)

c) Inclination

d) Location

A-3.20 Grain Conveying Mechanism

A-3.20.1 *Bottom Grain Conveyor*

a) Type

b) Length of conveyor (mm)

c) Outer dia of auger (mm)

d) Pitch of conveyor screw (mm)

e) Speed corresponding to field speed of engine (rpm)

f) Number and type of bearings

g) Method of drive

h) For safety device

A-3.20.2 *Grain Elevator*

a) Type

b) Length of elevator (mm)

c) Outside section (mm)

d) Number and type of pad

e) Size of pads (mm)

f) Spacing of pads (mm)

g) Speed corresponding to field speed of engine (rpm)

h) Type and size of chain (mm)

j) Elevator drive safety arrangement

k) Method of tensioning the chain

A-3.20.3 *Upper Grain Auger*

a) Type

b) Length (mm)

c) Dia (mm)

d) Pitch of conveyor screw (mm)

e) Speed corresponding to field speed of engine (rpm)

f) Type of drive

g) Safety arrangement

A-3.21 Tailing Conveying Mechanism

A-3.21.1 *Bottom Tailing Auger*

a) Type

b) Dia (mm)

c) Length of auger (mm)

d) Pitch of conveyor screw (mm)

e) Speed corresponding to field speed of engine (rpm)

f) Type of drive

g) Number and type of bearing safety device

A-3.21.2 *Tailing Elevator*

a) Type

b) Length of elevator (mm)

c) Outer section (mm)

d) Number and type of pads

e) Size of pads (mm)

f) Spacing of pads (mm)

g) Type and size of chain (mm)

h) Method of tensioning the chain

j) Elevator drive safety arrangement

A-3.22 Grain Tank

A-3.22.1 *General*

a) Location

b) Capacity

1) Volume basis (cu.m)
2) Mass basis (kg)

c) Method of agitating the grains in tank

d) Size of grain tank opening (mm)

A-3.22.2 *Grain Conveying Auger (Bottom of Grain Tank)*

a) Type

b) Dia (mm)

c) Pitch of screw (mm)

d) Length of screw (mm)

e) Speed corresponding to field speed of engine (rpm)

f) Number and type of bearing

g) Type of drive

A-3.22.3 *Grain Unloading Auger*

a) Type

b) Dia of auger (mm)

c) Pitch of screw (mm)

d) Length of unloading auger (mm)

e) Horizontal reach (mm)

f) Discharge height above ground level (mm)

g) Clearance height (mm)

h) Speed corresponding to field speed of engine (rpm)

j) Type of drive

k) Safety device

A-4 SAFETY DEVICES PROVIDED ON THE MACHINE

a)
b)
c)
Etc.

A-5 OPERATING CONTROLS, GAUGES AND INSTRUMENTS

A-5.1 On the Panel Board

a)
b)
c)
Etc.

A-5.2 Controls on RHS of the Operator

a)
b)
c)
Etc.

A-5.3 Controls on LHS of the Operator

a)
b)
c)
Etc.

A-6 OPERATOR'S THIN SEAT

a) Make

b) Type

c) Type of suspension

d) Type of dampening

e) Longitudinal adjustment (mm)

f) Adjustment of back rest

A-7 HELPER'S SEAT

a) Make

b) Type

c) Adjustments

d) Location

A-8 CANOPY

a) Type

b) Size (mm)

c) Height from operator's platform (mm)

A-9 OVER4LL DIMENSIONS OF COMBINE HARVESTER IN WORKING POSITION (mm)

a) Length

b) Width

c) Height

A-10 MASSES

Mass of combine harvester with coolant, fuel, lubricants and grain tank full and 75 kg mass on the operator's seat (kg)

a) Total

b) Front

c) Rear

A-11 MINIMUM GROUND CLEARANCE (mm)

A-l2 TOTAL NUMBER OF LUBRICATING POINTS

a) Greasing

b) Oiling

A-l3 COLOUR OF COMBINE

A-l4 HEADER TRANSPORT TRAILER

a) Type

b) Number and type of wheels

c) Make

d) Size (mm)

e) Track width (mm)

f) Height of hitch in working position (mm)

g) Minimum ground clearance (mm)

h) Transport length of combine with header assembly on trailer (mm)

j) Overall dimensions (mm)

1) Length

2) Width

3) Height

A-15 DETAILS OF STANDARD ACCESSORIES AVAILABLE WITH THE COMBINE

A-15.1 Standard Accessories

A-15.2 Optional Accessories

ANNEX B

(*Clause* 4.2)

RANDOM SELECTION OF COMBINE HARVESTER FOR COMMERCIAL TESTTNG

B-l DATE OF SELECTION

B-2 PLACE

B-3 SELECTED BY

B-4 DESIGNATION

B-5 Combine selected out of _____ No.s of Combine Harvesters bearing S. No.....

B-6 OBSERVATION ON COMBINE HARVESTER SELECTED

Sl. No.	Component	Make	Model/ Size	Serial No.
(1)	(2)	(3)	(4)	(5)
1.	Combine harvester			
2.	Engine			
3.	F.I. pump			
4.	Governor			
5.	Gear box			
6.	Hydraulic pump			
7.	Self-starter			
8.	Generator/alternator			
9.	Front tyres i) L.H. ii) R.H			
10.	Rear Tyres i) L.H. ii) R.H			
11.	Trailer tyres i) L.H. ii) R.H			

12.	Engine hour meter reading : ……..h.

B-7 COMBINE HARVESTER ASSEMBLY TO BE SEALED

1.	Tappet cover	Yes/No
2.	Fuel injection pump coupling, mounting bolts	Yes/No
3.	F.I. Pump and governor screw	Yes/No
4.	Injectors	Yes/No
5.	Engine sump	Yes/No
6.	Engine bell housings	Yes/No
7.	Starter motor	Yes/No
8.	Dynamo	Yes/No
9.	Hydraulic pump - Nos. (One/Two)	Yes/No
10.	Gear box front cover	Yes/No
11.	Final drive assembly, LHS and RHS	Yes/No
12.	Rear wheel axle	Yes/No
13.	Reel support	Yes/No
14.	Blade ball strap	Yes/No
15.	Crop auger	Yes/No
16.	Feeder conveyor assembly	Yes/No
17.	Threshing drum shaft	Yes/No
18.	Blower assembly	Yes/No
19.	Grain auger mechanism	Yes/No
20.	Sieve oscillating mechanism	Yes/No

21.	Straw walker crank mechanism	Yes/No
22.	Tailing auger mechanism	Yes/No
23.	Grain elevator	Yes/No
24.	Tailing elevator	Yes/No
25.	Bevel crank mechanism	Yes/No
26.	Any other component/assembly (Please specify)	Yes/No

ANNEX C

(*Clause* 6.2)

DATA SHEET FOR MATERIAL OF CONSTRUCTION

Elements of Composition	Knife section	Ledger Plate/ Guard	Threshing Cylinder	
			Rasp Bar	Peg Tooth
Carbon (%)				
Manganese (%)				
Phosphorus (%)				
Sulphur (%)				
Silicon (%)				
Copper (%)				
Nickle (%)				
Chromium (%)				
Vanadium (%)				
Molybdenum (%)				

C-l OBSERVATIONS

a) Adequacy of marking of inlets and outlets

b) Adequacy of marking of rotation of threshing units

c) Adequacy of protection of bearing against the ingress of dust

d) Adequacy of safety arrangements, specially at moving points

e) Provision of lubrication of moving parts

f) Provision for easy changing of components requiring frequent replacement

g) Provision for easy replacement and cleaning of screens

h) Yielding of seams

j) Tightness of bolts and nuts and other fasteners

k) Provision of belt tightening

m) Other observations

C-2 PROVISION FOR ADJUSTMENTS

a) Concave clearance

b) Speeds for

1) Reel
2) Feed auger
3) Threshing drum
4) Blower
5) Separating unit
6) Cleaning unit
7) Grain discharge auger
8) Grain elevator

c) Screen slope

d) Sieve opening

e) Air displacement

f) Wind deflector

Testing Engineer

ANNEX D

(*Clauses* 6.3, 6.4.3, 6.5, 6.7.3, 6.8.1, 6.9.2, 6.11 and 6.12.1)

DATA SHEET FOR LABORATORY TESTS

D-l POWER TEST

a) Date and place of test

b) Type of dynamometer used

c) Fuel used:

1) Type
2 Density at 15°C

d) Engine oil used:

1) Type
2) Grade

e) Transmission oil used

f) No load maximum engine speed, rev/min

g) Engine oil consumption during rating test in kg/h under high ambient conditions

h) Engine performance test data sheet given in **E-8**.

D-2 HEADER LIFTING TEST

a) Date of test

b) Make and model of combine

c) Engine speed corresponding to field speed (rpm)

d) Operating condition

e) Temperature of hydraulic fluid after each 100 cycle

f) Hydraulic oil leakage from any point

g) Abnormality, if any

h) Any other

D-3 VIBRATION MEASUREMENT

a) Date and location of test

b) Type of accelerometer

c) Test data:

Sl. No.	Measuring Points	Vibration, Microns Combine Parked	
		HD	VD
(1)	(2)	(3)	(4)
i)	Foot rest, left		
ii)	Foot rest, right		
iii)	Gear shifting lever		
iv)	Cutting unit engaging lever		
v)	Brake pedal, left		
vi)	Brake pedal, right		
vii)	Hydraulic lever for platform		
viii)	Clutch pedal		
ix)	Steering control wheel		
x)	Seat back, bottom		
xi)	Accelerator level		
xii)	Threshing and clearing unit engaging lever		
xiii)	Threshing drum speed changing lever		
xiv)	Cylinder concave clearance adjusting lever		
xv)	Unloading auger engaging lever		
xvi)	Hydraulic lever for reel speed variation		
xvii)	Hydraulic lever for reel height variation		
xviii)	Hydraulic lever for agitating plates of grain tank		
xix)	Hydraulic lever for radiator grill cleaning flaps		
xx)	Forward speed variator lever		
xxi)	Cabin		
xxii)	Door hand (cabin)		
xxiii)	Ladder - top, bottom		
xxiv)	Ladder railing		
xxv)	Blower speed adjusting lever		
xxvi)	Top sieve opening adjusting lever		
xxvii)	Bottom sieve opening adjusting lever		
xxviii)	Head lights		
xxix)	Back lights		
xxx)	Parking lights		
xxxi)	Signal lights		

D-4 OPERATOR'S FIELD OF VISION

a) Non-visible space in front_____m and _____times the wheel base of combine.

b) Non-visible space on left side_____ m and_____ times the track of combine.

c) Non-visible space on right side _____m and_____ times the track of combine.

d) List of major components creating obstruction.

D-5 BRAKE TEST

D-5.1 Data Sheet - Service Brake Performance Test:

a) Make and model of combine

b) Tyre inflation pressure:

1) Drive wheel: k Pa

2) Steering wheel: k Pa

c) Combine masses during test:

Front (kg)	Rear	Total (kg)

d) Type of test

e) Method of heating the service brake : _____ Self braking

f) Travel speed before application of brakes : _____ km/h

g) Force required to achieve 2.5 m/s* deceleration : _____ N

Test Data

Sl. No.	**Observations**			
1.	Force on brake pedal (N)			
2.	Mean deceleration (m/s*)			
3.	Stopping distance (m)			

D-5.2 Parking Braking Device Test

Combine Mass : Refer above

Test Observations

Observations	*12 Percent Slope*	
	Parking Braking Device Facing up Slope	Parking Braking Device Facing Down Slope
Parking device control force (kgf/N)		

Whether rolling of braking wheels noticed	Yes/No	Yes/No
Efficacy of brakes		

D-6 TURNING ABILITY

a) Details of wheels' equipment:

b) Wheel track, mm

1) Drive wheel
2) Steering wheel

c) Size and pressure of tyres:

1) Drive wheel
2) Steering wheel

d) Type of drive:

1) 2 wheel
2) 4 wheel

e) Wheel base, mm

f) Test data:

Description	*Minimum Turning Diameter*		*Minimum Turning Space Diameter*	
	Right Hand, m	Left Hand, m	Right Hand, m	Left Hand, m
(1)	(2)	(3)	(4)	(5)
With brakes applied				
With brakes released				

D-7 LOCATION OF CENTRE OF GRAVITY

a) Height above ground, mm

b) Forward distance from the vertical plane containing the axis of the rear wheels, mm

c) Distance from the median plane parallel to the longitudinal axis of combine bisecting the driving wheel track, mm

Testing Engineer

D-8 ENGINE PERFORMANCE TEST

Brake Power kW (PS)	Crank Shaft Torque N-m (kgf-m)	Engine Speed (rpm)	Fuel Consumption		Specific Energy (g/bhph)	Temperature °C				Pressure			Atmospheric Condition		
			Hourly kg/h (1/h)	Specific g/kWh (g/bhph)		Engine Oil	Coolant (Water)	Exhaust Gas	Intake Air	Intake Air kPa (mm of Hg)	Exhaust Gas kPa (mm of Hg)	Lub Oil kPa (kgf/sq.cm)	Temp. Deg. (C)	R.H. (%)	Pressure kPa (m-bar)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

a) Maximum power - Two hours test

b) Power at rated engine speed

c) Maximum torque:

d) Part load test:

1) Torque corresponding to maximum power

i) 85% of the torque obtained at maximum power:

ii) 75% of the torque defined in (i):

iii) 50% of the torque defined in (i):

iv) 25% of the torque defined in (i):

v) Minimum load:

e) Five hours rating test

1) At load corresponding to 90% of maximum power (4 hours):

i)

ii)

iii)

iv)

v)

vi)

vii)

viii)

Average:

2) At load corresponding to maximum power (1 hour):

i)

ii)

iii)

iv)

Average:

ANNEX E

(*Clause* 6.6)

DATA SHEET FOR NOISE MEASUREMENT

E-l AT OPERATOR'S EAR LEVEL

E-l.1 Brief Description of the Silencing System:

E-l.2 Background Noise Level:

E-1.3 Detail of the Test Site:

E-l.4 Type of Sound Level Meter:

E-l.5 Type of Octave Filter and Frequency Analyser, If Used:

E-l.6 Date of Test:

E-l.7 Atmospheric Conditions

a) Temperature, ^{o}C

b) Pressure, kPa

c) Relative humidity, percent

E-l.8 Test Data

SI No.	*Gear Used*	*Travelling Speed km/h*	*Sound Level*	
			dB	Sones
(1)	(2)	(3)	(4)	(5)

Testing Engineer

E-2 AT BYSTANDER'S POSITION

E-2.1 Brief Description of the Silencing System:

E-2.2 Background Noise Level:

E-2.3 Detail of the Test Site:

E-2.4 Type of Sound Level Meter:

E-2.5 Type of Octave Filter and Frequency Analyser, If Used:

E-2.6 Date of Test:

E-2.7 Atmospheric Conditions

a) Temperature, “C

b) Pressure, kPa

c) Relative humidity, percent

E-2.8 Test Data

SI No.	*Gear Used*	*Travelling Speed km/h*	*Sound Level*	
			dB	Sones
(1)	(2)	(3)	(4)	(5)

Testing Engineer

ANNEX F
(*Cl*ause 7.2)
RECOMMENDATIONS FOR COMBINE PERFORMANCE

F-1 COMBINE ADJUSTMENT

F-1.1 Cylinder Speed and Concave Clearance

Too slow cylinder speed or too wide concave clearance may result into back feeding at cylinder. A compromise between the cylinder speed and concave clearance may result into back feeding at cylinder. These are given in Table I for guidance.

Table 1 Recommended Speed and Mean Clearance

Sl No.	Crop	Peripheral Speed (m/s)	Mean Clearance mm
(1)	(2)	(3)	(4)
i)	Wheat	15 to 30	5 to 13
ii)	Paddy	6 to 15	5 to 10
iii)	Soybean		
iv)	Bengal Gram		

F-1.2 Forward Speed

A speed range of 2.5 to 4.5 km/h is recommended for standing crop. For lodged crop, the speed should be 1.0 to 1.5 km/h.

F-1.3 Reel Adjustment

The horizontal positioning should be such that reel tynes have a distance of 50 to 100 mm in front of cutter bar. The optimum value of the reel index should be 1.10 to 1.15 for minimum cutter bar loss. Use of pick-up reel is advantageous for lodged crops.

F-2 CROP CONDITIONS

F-2.1 Paddy

For high yielding varieties of paddy, moisture in the range of 16 to 25 percent is recommended. However for seed, the grain having the moisture in the range of 16 to 22 percent may be harvested

F-2.2 Wheat

For commercial purpose moisture content in the range of 10 to 20 percent and for seed purpose 10 to 16 percent is recommended. Wheat varieties with loose kernels attachment should be harvested earlier than those of tight kernel. Rough estimate of grain moisture for wheat may be made in the field by tooth biting of the grain. If the grain cracks clearly under tooth pressure the crop is ready for harvest. However, if the grain has a soft bite the combining should not be attempted. The presence of profused green tillers may affect the time of combining. If the number of green tillers

is 4 to 6 per m^2, it may not impair threshing. However more than 6 tillers affect the threshing and increase loss.

ANNEX G
(*Clause* 7.3.4.3)
DATA SHEET FOR FIELD TESTING

G-l FIELD CONDITIONS

a) Topography - Sloppy/level/uneven

b) Surface conditions

c) Type of soil

d) Frequency and size of bunds

e) Weed type and its extent (space/average/dense)

f) Size of field

g) Shape of field

G-2 CROP CONDITIONS

a) Weeds present

b) Whether laid or not

c) Weed moisture

d) Height of stubble where grain-straw ratio is taken

e) Stubble height in harvested plot

G-3 BREIF SPECIFICATION OF COMBINE HARVESTER

G-4 PERFORMANCE OF COMBINE

a) Steering (easiness)

b) Whether engine stalls at momentary overloads

c) Can the combine be adjusted from operator’s seat

d) Stability of combine

e) Effectiveness of different systems

f) Defects and breakdown, if any

g) Accessibility of control

h) Presence of undue knocking or rattling sound

j) Any marked vibration

k) Slippage of belts

m) Smooth running of shaft in their bearing clogging in cutting/threshing/separating/cleaning units

n) Flow of material

p) Loss of grain ahead of cutter bar

q) Carrying of straw around reel

r) Dirt and stone, etc, entering into the combine

s) Uneven feed of crop to threshing cylinder

t) Type of swath — Turning space required

u) Wheel sinkage

v) Safety and comfort for operator

w) Cylinder — concave clearance

a) Front

b) Rear

y) Grain tank capacity (Kg):

z) Grain unloading Time (s):

G-5 ANY OTHER DETAIL

G-6 AREA COVERED

Observations made by : _____ Checked by : _____

Recorded by :_____ Signature : _____

Signature :_____ Date : _____

G-7 DATA SHEET FOR FIELD TEST

Date : _____ Gear used : _____ Intensity :

Place of test : _____ Crop : _____ Variety :

Time of start : _____ Time of end : _____ Combine : Model: Height of plant : Grain moisture:

Supervisor : _____ Operator : _____ Tractor : H.P: Length of ear (cm) :Straw moisture:

Sl. No.	Time (Sec.) 20/10	Width of Cut for 3 Rows (W	Time taken To fill the grain tank	Temperature							Observations
				Hour of the day	Amb. °C	Fuel °C	Eng. °C	Coolant °C	Trans. °C	Atmos. Pressure (mm of Hg)	1) Engine speed (No load) rpm 2) Engine speed (On load) rpm 3) Threshing cylinder speed (No load) rpm 4) Threshing cylinder speed (On load) rpm 5) Blower speed (No load) rpm 6) Blower speed (On load) rpm 7) Forward speed kmph 8) Area covered ha 9) Fuel consumed l 10) Duration of test h. 11) Total time stopped h. 12) Net time h. 13) Average time loss at corners hr. 14) Average width of cut cm 15) Fuel consumption: a) Per hour l b) Per hectare l 16) Area covered ha/h 17) Time required per ha hr. 18) Height of stubble cm 19) Average No. of grains/ear 20) Number of plant/m^2 21) Number of fillers/m^2 22) (Diesel Exhaust Fluid) DEF consumption (ml)
Total											
Avg.											

<table>
<tr><td>Time (min/s)</td><td>Cause</td><td rowspan="2">a) Details of samples:
1. Pre-harvest losses g/sq.m.
2. Postharvest losses g/sq.m.
<table><tr><th>Sample Collected</th><th>Time (s)</th><th>Distance (m)</th><th>Outlet</th></tr><tr><td></td><td></td><td></td><td>Grain Outlet (1)
Grain Outlet (2)
Grain Outlet (3)
Grain Outlet (4)
Straw outlet
chaff and Bhusa outlet</td></tr></table>b) Grain outlet:
a) kg/ha
b) kg/ha
c) kg/ha
c) Time required to unload the grain tank :
d) Number of persons required for :
handling combine harvester</td></tr>
<tr><td></td><td></td></tr>
</table>

ANNEX H

(*Clauses* 7.3.4.4 and 7.3.4.5)

FIELD TEST DATA ANALYSIS SHEET

Test No.	Date of Test	Duration of Test (h)	Travel Speed (kmph)	Width of Cut (m)	Rate of Work		Through Put		Fuel Consumption		Pre-harvest Loss (kg/ha)	Crop Through Put (t/h)	Grain Breakage In Main Outlet (%)
					Area Covered (ha/h)	Grain Output (kg/h)	Grain (kg/h)	Straw (kg/h)	(1/h)	(1/ha)			
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1													
2													
3													
4													
5													
6													
7													
8													
9													

Test No.	Total Collectable Losses (A) Unthreshed from Main Outlet (%)	Losses Due to Combine, Percent by Mass Non Collectable Losses (B)										Total Losses (%) A+B	Threshing Efficiency (%)	Cleaning Efficiency (%)
		Straw outlet (Rake)				Sieve (Shoe)				Header Loss (c)	Total (a+b+c)			
		Threshed	Unthreshed	Broken	Total (a)	Threshed	Unthreshed	Broken	Total (b)					
	15	16	17	18	19	20	21	22	23	24	25	26	27	28

1
2
3
4
5
6
7
8
9