व्यावसायिक परीक्षण रिपोर्ट
**COMMERCIAL TEST REPORT**

संख्या/ **No.: COMB-345/3149/2024**
माह/**Month: April, 2024**

**THIS TEST REPORT VALID UP TO : 30th April, 2031**


# AHLAWAT AGRO IMPLEMENTS, VR-HR77
# SELF PROPELLED COMBINE HARVESTER (TRACK TYPE)

सत्यमेव जयते

भारत सरकार
**Government of India**
कृषि एवं किसान कल्याण मंत्रालय
**Ministry of Agriculture and Farmers Welfare**
कृषि एवं किसान कल्याण विभाग
**Department of Agriculture and Farmers Welfare**
उत्तरी क्षेत्र कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान
**Northern Region Farm Machinery Training and Testing Institute**
ट्रैक्टर नगर, सिरसा रोड, हिसार, (हरियाणा) - 125 001
**Tractor Nagar, Sirsa Road, HISAR (Haryana)-125 001**
**[ISO 9001:2015 CERTIFIED]**

Website: http://nrfmtti.gov.in/

E-mail: fmti-nr@nic.in

| NON CONFORMING EVALUATIVE PARAMETERS AS PER IS: 15806-2018 | | |
|---|---|---|
| **Parameter** | **:** | **Remark** |
| **None** | | |

| | | |
|---|---|---|
| **Name of Machine** | : | Combine Harvester |
| **Type** | : | Self Propelled (Track Type) |
| **Make** | : | Ahlawat Agro Implements |
| **Model** | : | VR-HR77 |
| **Manufactured by (apa)** | : | Ahlawat Agro Implements,<br>Opp. New Anaj Mandi, Delhi Road, Sampla<br>Rohtak (Haryana) |
| **Test Requested by** | : | Ahlawat Agro Implements,<br>Opp. New Anaj Mandi, Sampla<br>Jhajjar-124501 (Haryana) |
| **Test Conducted by** | : | Government of India,<br>Northern Region Farm Machinery<br>Training & Testing Institute<br>Tractor Nagar, Sirsa Road,<br>Hisar-125001(Haryana) |

**THIS TEST REPORT VALID UP TO : 30th April, 2031**

**[vide F. No. 13-22/2020- M&T (I&P) dated 12.12.2023]**

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**Report No. COMB-345/3149/2024** **Month : April** **Year : 2024**

**GOVERNMENT OF INDIA**
**NORTHERN REGION FARM MACHINERY TRAINING & TESTING INSTITUTE**
**TRACTOR NAGAR, SIRSA ROAD, HISAR–125001 (HARYANA)**
**[ISO 9001:2015 CERTIFIED]**

| | | | |
|---|---|---|---|
| Type of Test | : | Commercial | |
| Test Code/ Procedure | : | i. | IS: 4905-1968 – Method of random sampling |
| | | ii. | IS: 8122 (Part-1)-1994 – Test code for combine harvester- thresher terminology |
| | | iii. | IS: 8122 (Part-2)-2000 – Test code for combine harvester- thresher performance test |
| | | iv. | IS: 6024-1983 – Guards for harvesting machines |
| | | v. | IS: 6025-1982 – Specification for knife section for harvesting machines |
| | | vi. | IS: 6283 (Part-1)-2006 and IS: 6283 (Part-2)-2007 – Tractors and machineries for agriculture and forestry, powered lawn and garden equipments-symbols for operator control and other display.<br>Part 1- Common symbols<br>Part 2- Symbols for agricultural tractors and machineries |
| | | vii. | IS: 10378-1982 – Specification for knife back for harvesting machines |
| | | viii. | IS: 15806-2018 – Combine harvester- recommendations on selected performance and other characteristics. |
| | | ix. | Amendment no. 3, IS: 15806-2018 – Combine harvester-recommendations on selected performance and other characteristics. |
| Period of Test | : | November, 2023 to March, 2024 | |
| Test Report No. | : | COMB-345/3149/2024 | |
| Month & Year | : | April, 2024 | |

| | |
|---|---|
| i) | The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions. |
| ii) | The data given in this report pertain to the particular sample submitted by the applicant for test. |
| iii) | The results presented in this report do not in any way attribute to durability of the machine. |
| iv) | **The report should not be reproduced in part or full without prior permission of the Director, Northern Region Farm Machinery Training & Testing Institute, Hisar-125001.** |

## SELECTED CONVERSIONS

**1. Force**

1 kgf = 9.80665 N
= 2.20462 lbf

**2. Power**

1 HP = 1.01387 Metric HP (Ps)
= 745.7 W

1 Ps = 735.5 W

**3. Pressure**

1 psi = 6.895 kPa
1 kgf/sq.cm = 98.067 kPa = 735.56 mm of Hg
1 bar = 100 kPa = 10 N/sq.cm.
1 mm of Hg = 1.3333 m-bar

## CONTENTS

## 1. METHOD OF SELECTION

i) Test requested by : The applicant

ii) Selected for test by : NRFMT&TI, Hisar

iii) Method of selection : Randomly selected by the representative of the institute through Virtual meeting

iv) Serial number of the available machine at the time of Random selection of the test sample : The test sample was selected out of two numbers of samples, made available by the applicant for random selection.

| Sr. No. | Sr. No. of machine |
|---|---|
| 1. | **VTC84909AA0051** |
| 2. | VTC84909AA0061 |

v) Serial number of sample selected : **VTC84909AA0051**

## 2. SPECIFICATIONS

### 2.1 General

| | | |
|---|---|---|
| Name & address of manufacturer **(apa)** | : | Ahlawat Agro Implements,<br>Opp. New Anaj Mandi, Delhi Road, Sampla<br>Rohtak (Haryana) |
| Name & address of applicant | : | Ahlawat Agro Implements,<br>Opp. New Anaj Mandi, Sampla<br>Jhajjar-124501 (Haryana) |
| Make | : | Ahlawat Agro Implements |
| Model | : | VR-HR77 |
| Brand's name | : | Veer |
| Type of machine | : | Self Propelled, Combine Harvester (Track Type) |
| Year of manufacture | : | 2023 |
| Country of origin | : | India |
| Serial number /Chassis no. | : | VTC84909AA0051 |
| Type of crop recommended for harvesting | : | Paddy |

### 2.2 Prime mover

| | | |
|---|---|---|
| Make | : | Zhejiang Xinchai Co. Ltd. |
| Model | : | 4D35ZT |
| Type | : | Turbo charged, direct injection, compression ignition, diesel engine |
| Engine sr. no. | : | S22212563 |
| **Engine speed (Manufacturer's recommended setting), rpm** | | |
| Maximum speed at no load, rpm | : | 2808±50 |
| Rated speed, rpm | : | 2600±50 |
| No load engine speed for field operation, rpm | : | 2100±100 |

| | | | |
|---|---|---|---|
| | Low idle speed, rpm | : | 850±50 |
| | Location | : | Below the operator's seat |
| | Country of origin | : | **China** |
| **2.2.1** | **Cylinder and cylinder head** | | |
| | Number | : | Four |
| | Disposition | : | Vertical, In-line |
| | Bore/Stroke, mm **(apa)** | : | 98/115 |
| | Capacity, $cm^3$ **(apa)** | : | 4068 |
| | Compression ratio **(apa)** | : | 18:1 |
| | Type of cylinder head | : | Monoblock |
| | Type of cylinder liners | : | Dry |
| | Arrangement of valves | : | Overhead, In-line |
| | Type of combustion chamber **(apa)** | : | Swirl type |
| | Valve clearance in cold, mm | | |
| | Inlet | : | 0.35 |
| | Exhaust | : | 0.45 |
| **2.2.2** | **Fuel system** | | |
| | Type of fuel system | : | Forced feed |
| **2.2.2.1** | **Fuel tank** | | |
| | Material | : | M.S sheet |
| | Outer size, mm (W×H×L) | : | 280×800×450 |
| | Capacity, l **(apa)** | : | 90 |
| | Location | : | Behind grain tank |
| | Provision for draining of sediment/water | : | Water separator is provided in fuel line. |
| | Provision for indicating fuel level | : | Transparent tube is provided |
| **2.2.2.2** | **Fuel feed pump** | | |
| | Make | : | **Not specified** |
| | Type | : | Diaphragm type |
| | Part no./Group combination no. | : | **Not specified** |
| | Provision of sediment bowl | : | **Not provided** |
| **2.2.2.3** | **Fuel filter** | | |
| | Make | : | **Not specified** |
| | Model | : | CX7085 |
| | Part no. | : | M16X1.5 |
| | Number | : | One |
| | Type | : | Throw-away type |
| | Type of element | : | Paper |
| | Capacity of final filter, l **(apa)** | : | 0.5 |
| | **Water separator** | | |
| | Make | : | **Not specified** |
| | Location | : | In fuel line |

**2.2.2.4 Fuel injection pump**

| | | |
|---|---|---|
| Make | : | Shandong Kangda Precision Machinery Manufacturing Co. Ltd. |
| Model | : | BQ2000/BH4QT95R9 |
| Type | : | In-line plunger |
| Serial number | : | 4QTZ804BZ |
| Method of drive | : | Through timing gear |

**2.2.2.5 Fuel injectors**

| | | |
|---|---|---|
| Make **(apa)** | : | Heze |
| Model/ Group combination no. **(apa)** | : | KBAL-P0527 |
| Type **(apa)** | : | Multi hole |
| Manufacturer's production pressure setting, $kgf/cm^2$ **(apa)** | : | 220±5 |
| Injection timing **(apa)** | : | $8^o$ before TDC |
| Firing order **(apa)** | : | 1-3-4-2 |

**2.2.3 Governor**

| | | |
|---|---|---|
| Make **(apa)** | : | Shandong Kangda |
| Type **(apa)** | : | Mechanical |
| Governed range of engine speed, rpm **(apa)** | : | 800-2858 |

**2.2.4 Air intake system**

| | | |
|---|---|---|
| Type | : | Dry |

**2.2.4.1 Pre-cleaner**

| | | |
|---|---|---|
| Make | : | Shandong Aitech |
| Type | : | Centrifugal, with transparent dust collector |
| Number | : | One |
| Location | : | At the inlet tube of air cleaner |

**2.2.4.2 Air cleaner**

| | | | |
|---|---|---|---|
| Make | : | **Not specified** | |
| Type | : | Dry | |
| Number | : | One (Dual element) | |
| Location | : | At LHS of engine | |
| Number & type of elements | : | One, paper | |
| Size of dry filter element, mm | | **Primary** | **Secondary** |
| Inner dia. | : | 135 | 116.3 |
| Outer dia. | : | 196 | 120.5 |
| Length | : | 360 | 340 |
| Service indicator | : | **Not provided** | |
| Provision for cleaning the air cleaner | : | Automatic dust unloader is provided | |
| Service schedule **(apa)** | : | Clean primary and secondary air cleaner element after every 10 hours and 50 hours respectively and replace after every 200 hours of operation. | |

| | | | |
|---|---|---|---|
| | Suction pressure at max. power, kPa **(apa)** | : | 4.0 |
| **2.2.5** | **Exhaust** | | |
| | Make | : | **Not specified** |
| | Type **(apa)** | : | Cylindrical, horizontal draft |
| | Size of muffler, mm | | |
| | Length | : | 660 |
| | Dia. | : | 140 |
| | Model/Part no. | : | **Not specified** |
| | Range of exhaust gas pressure at max. power, kPa **(apa)** | : | 8 to 10 |
| | Provision of spark arresting device/any other device | : | Turbo charger is provided in exhaust system |
| **2.2.5.1** | **Detail of Turbo charger** | | |
| | Make **(apa)** | : | Ningbo Weifu Tainli Turbocharging |
| | Model | : | **Not specified** |
| | Serial no. | : | 10505 110 AB0010 |
| | Part no. | : | **Not specified** |
| | **No. of blade** | | |
| | Turbine wheel | : | 10 |
| | Compressor wheel | : | 06 |
| | Method of drive | : | Exhaust gas driven |
| | Means of lubrication | : | Force feed oil lubrication |
| **2.2.5.2** | **Charged air cooler unit** | : | **Not provided** |
| **2.2.6** | **Lubricating system** | | |
| | Type | : | Splash and forced lubrication |
| **2.2.6.1** | **Pump** | | |
| | Make | : | JFJ |
| | Type of oil pump **(apa)** | : | Vane type |
| | Method of drive **(apa)** | : | Through timing gear |
| | Pressure release setting, $kg/cm^2$ | : | **Not specified** |
| | Minimum permissible pressure, $kg/cm^2$ | : | **Not specified** |
| | Oil sump capacity, l **(apa)** | : | 8.5 |
| | Oil change period, h | : | **Not specified** |
| | Recommended grade of oil | : | **Not specified** |
| **2.2.6.2** | **Filters** | | |
| | Make | : | **Not specified** |
| | Model/Part no. | : | **Not specified** |
| | Type **(apa)** | : | Full flow spin on |
| | Location | : | On LHS of engine |
| **2.2.7** | **Cooling system** | | |
| | Type | : | Pressurised coolant circulation |
| **2.2.7.1** | **Water pump** | | |
| | Make | : | **Not specified** |

| | | | |
|---|---|---|---|
| | Type **(apa)** | : | Centrifugal, semi open impeller |
| | Size of impeller, mm **(apa)** | | |
| | Diameter | : | 85 |
| | No. of vanes **(apa)** | : | 07 |
| | Method of drive | : | Through crank shaft pulley by V belt common to alternator |
| **2.2.7.2** | **Details of fan** | | |
| | Material & type | : | Plastic, suction |
| | No. of blades **(apa)** | : | 07 |
| | Size, mm **(apa)** | : | 420 Ø |
| **2.2.7.3** | **Radiator** | | |
| | Make | : | **Not specified** |
| | Part no. | : | **Not specified** |
| | Serial no. | : | **Not specified** |
| | Type of radiator cap | : | Pressurised |
| | Radiator cap pressure, $kg/cm^2$ **(apa)** | : | 0.9 |
| | Means of temperature control | : | Thermostat |
| | Bare radiator capacity, l **(apa)** | : | 8.5 |
| | Total coolant capacity, l **(apa)** | : | 16.0 |
| **2.2.8** | **Starting system** | | |
| | Type | : | 12V, electrical |
| | Aid for cold starting | : | **None** |
| | Any other device provided for easy starting | : | **None** |
| **2.2.9** | **Electrical system** | | |
| **2.2.9.1** | **Battery** | | |
| | Make | : | Amaron |
| | Number and type | : | One, lead acid |
| | Model/Type no. | : | BL1000 LMF |
| | Capacity and rating **(apa)** | : | 12V |
| | Location | : | Below the sieve assembly |
| **2.2.9.2** | **Starter** | | |
| | Make | : | Mnxen Electrics Ltd. |
| | Model /Group combination no. **(apa)** | : | QDJ1409EP |
| | Type | : | Solenoid operated |
| | Voltage & capacity **(apa)** | : | 12V, 3.8 kW |
| | Part no./Sr. no. | : | BC07280050 |
| | Location | : | On LHS of engine |
| **2.2.9.3** | **Alternator** | | |
| | Make | : | Mnxen Electrics Ltd. |
| | Model | : | JFWZ19-69 |
| | Output rating **(apa)** | : | 12V, 55A |
| | Location | : | On LHS of engine |

Method of drive : Through crankshaft pulley by V belt common to fan/ water pump pulley

**2.2.9.4 Voltage regulator** : In-built with alternator

**2.2.9.5 Horn**

Make : **Not specified**

Type : Electromagnetic contact vibrator

Number and capacity : One, 12V

Location : Under control panel

**2.2.9.6 Fuse box**

Make : Farmtrac

Location : On control panel

Number and capacity :

| Capacity | 15A | 10A |
|---|---|---|
| Number | 05 | 01 |

**2.2.9.7 Details of lights**

| Description | No. & capacity of bulb | Height above ground level to centre of beam (mm) | Size of beam (mm) | Distance from centre of beam to outside edge of combine (mm) |
|---|---|---|---|---|
| Field working light and head light | Two, 12V, 55W | 1440 | 100×100 | 375 |
| | | | | 1410 |
| Rear light | One, 12V, 55W | 1800 | 100×100 | 180 |
| Grain unloading light | One,12V, 55W | 2300 | 100×100 | 500 |
| Engine inspection light | One,12V, 55W | 1930 | 100×100 | 790 |

**2.3 Combine**

**2.3.1 Track laying equipments**

**2.3.1.1 Track**

Make **(apa)** : John Deere

Type : Moulded endless rubber track

Number : 02

Track distance/spacing, mm : 1250

Width of track, mm : 490 (each track)

Grouser height, mm : 35

Number of grouser : 56

Grouser pitch, mm : 90

Length of track on ground, mm : 1850

Total ground contact area, sq. m : 0.91

**Nominal ground pressure, kg/cm$^2$**

-Bare machine : 0.44

-With grain tank full (with paddy) : 0.52

Method of track tensioning : Mechanical, by adjusting tensioner bolt provided with idler on each track

| | | | |
|---|---|---|---|
| **2.3.1.2** | **Drive sprocket** | | |
| | Diameter, mm | : | 244 |
| | No. of teeth, mm | : | 08 |
| | Face width, mm | : | 32 (at top of the teeth) |
| | Pitch of teeth, mm | : | 84 |
| **2.3.1.3** | **Type of suspension** | : | **Not provided** |
| **2.3.1.4** | **Guide roller/Idler** | | |
| | Number | : | 2, one on each side |
| | Diameter, mm | : | 277 |
| | Face width, mm | : | 39.3 |
| | Method of mounting | : | Mounted at rear side of chassis |
| | Lubricants | : | Multipurpose grease |
| **2.3.1.5** | **Carrier rollers** | | |
| | Number | : | 2, one on each side |
| | Diameter, mm | : | 140 |
| | Face width, mm | : | 42 |
| | Lubricants | : | Multipurpose grease |
| | Method of mounting | : | Roller shaft supported on ball bearing inside housing, which is bolted to track carrying frame |
| **2.3.1.6** | **Track roller** | | |
| | Number | : | 12, six on each side |
| | Diameter, mm | : | 181 |
| | Face width, mm | : | 42 |
| | Lubricant | : | Multipurpose grease |
| | Distance between front track roller to rear, mm | : | 1520 |
| | Distance between centre of drive sprocket & idler roller, mm | : | 2070 |
| **2.3.2** | **Transmission system** | | |
| | Type | : | Continuously variable transmission having combination of hydrostatic and mechanical drive. HST unit drives the drive sprocket shaft through gear box. |
| **2.3.2.1** | **Clutch system** | : | **Not provided** |
| **2.3.2.2** | **HST unit** | | |
| | Make | : | **Not specified** |
| | Model | : | **Not specified** |
| **2.3.2.3** | **Gear box** | | |
| | Make | : | **Not specified** |
| | Model | : | **Not specified** |
| | Type | : | Mechanical, sliding mesh |
| | Location | : | At front, between the tracks on chassis |
| | Method of operation | : | Manual through a range shifting lever provided at LHS of operator |
| | Recommended oil grade | : | **Not specified** |

| | | | |
|---|---|---|---|
| | Oil capacity, l | : | **Not specified** |
| | Oil change period | : | **Not specified** |
| **2.3.2.4** | **Ground speed (kmph)** | : | Max. 9.35 |
| **2.3.3** | **Brakes** | | |
| **2.3.3.1** | **Service brake** | : | **Not provided** |
| **2.3.3.2** | **Parking brake** | | |
| | Type | : | Oil immersed disc type |
| | Location | : | RHS & LHS of transmission |
| | Method of operation | : | By pressing the brake pedal |
| **2.3.4** | **Steering** | | |
| | Type | : | Hydrostatic |
| | Method of operation | : | By means of joystick in front of operator |
| **2.3.5** | **Hydraulic system** | | |
| **2.3.5.1** | **Hydraulic pump** | | |
| | Type | : | Gear |
| | Make **(apa)** | : | WD |
| | Model | : | WHST-45L-000J |
| | Serial no. | : | 1L03-103S |
| | Number | : | One |
| | Method of drive | : | Through timing gear |
| **2.3.5.2** | **No. of hydraulic cylinders** | : | 4 (One for header, two for reel assembly, one for unloading auger) |
| **2.3.5.3** | **Hydraulic tank** | | |
| | Type | : | M.S sheet fabricated |
| | Outer size, mm (H×L×W) | : | 430×330×300 |
| | Location | : | Below the operator platform |
| | Capacity of hydraulic tank, l **(apa)** | : | 40 |
| | Provision for oil drain | : | Provided |
| | Provision for checking oil level | : | Provided |
| | No. & type of oil filters | : | Wire mesh filter at suction inside tank and replaceable paper element type filter in hydraulic line) |
| | Recommended grade of oil | : | **Not specified** |
| | Hydraulic oil change period | : | **Not specified** |
| **2.3.5.4** | **Hydraulic oil coolers** | | |
| | Number | : | One |
| | Make | : | Pal radiators |
| | Type | : | Tube type |
| | No. of tubes | : | 24 |
| | Size, mm | : | 335×410×40 |
| | Oil capacity, l | : | **Not specified** |
| **2.3.6** | **Reel assembly** | | |
| | Type | : | Pick up tyne |
| | Number of tine bars | : | 5 |
| | Type of tine bar | : | MS pipe with strips having holes for fitting tyne. |

Size of tine bars, mm

| | | |
|---|---|---|
| Diameter | : | 27 |
| Length | : | 2160 |
| Diameter of reel, mm | : | 982 |
| Working width of reel, mm | : | 2115 |
| Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 36 (Fixed) |
| Arrangement for speed variation | : | **Not provided** |
| Number of tines on each bar and their spacing, mm | : | 9 pair, 116 mm |
| Max. distance ahead of cutter bar points, mm | : | 915 |
| Max. distance behind the cutter bar points, mm | : | 270 |
| Max. vertical distance below the cutter bar point, mm | : | 45 |
| Max. vertical distance above the cutter bar points from the centre of reel, mm | : | 980 |
| Distance from cutter bar points to the front of feeding auger, mm | : | 340 |
| Arrangement for raising and lowering the reel assembly | : | Hydraulic, by reel height adjustment lever on front of operator with two hydraulic cylinders on both side of reels |
| Arrangement for forward and backward movement of reel | : | By shifting the reel shaft mounting bracket on support arm having six holes at 35 mm spacing |
| Arrangement for variation of angle of the tine | : | Manual, by changing position of three eccentric rollers by adjusting plate having long hole and slot for changing position of one bolt in desired hole |
| Type of reel drive | : | V-belt and pulley |
| Safety device in reel drive | : | Provided |

**2.3.7 Cutter bar assembly**

| | | |
|---|---|---|
| Total width, cm | : | 258 |
| Effective cutter bar width, cm | : | 236 |
| No. & spacing of knife guards | : | 16 pairs, 80 mm |
| Type of knife guard | : | $B_2$ double point |

**2.3.7.1 Knife blades**

| | | |
|---|---|---|
| No. & type of knife blades | : | 32, serrated |

Dimensions, mm

**Dimensions of knife blade (as per IS: 6025-1982) (Ref. Fig. 1)**

| Sr. no | Designation | Dimension as per IS (mm) | Tolerance (mm) | Dimensions as observed | Remarks |
|---|---|---|---|---|---|
| 1. | A | 76.2 | -0.2 to -0.4 | 75.8 | Conforms |
| 2. | B | 50.8 | ±0.1 | 51.6 | **Does not conform** |
| 3. | C | 12.7 | ±0.1 | 12.2 | **Does not conform** |
| 4. | D | 5.5 | +0.2 | 6.8 | **Does not conform** |

| | | | | | |
|---|---|---|---|---|---|
| 5. | E | 9.5 (min.) | - | 19.3 | Conforms |
| 6. | F | 9.0 (min.) | - | 11.3 | Conforms |
| 7. | G | 0.8 (min.) | - | 1.83 | Conforms |
| 8. | H | 11.0 | ±0.5 | 6.6 | **Does not conform** |
| 9. | J | 12.5 (min.) | - | 14.6 | Conforms |
| 10. | K | 31.8 | ±0.25 | 30.8 | **Does not conform** |
| 11. | L | 65 | ±0.50 | 63.2 | **Does not conform** |
| 12. | T | 2.0 | - | 2.25 | Conforms |
| 13. | α | 19° | ±1° | 20 | Conforms |

**Marking**

Manufacturer's name or recognized trade mark : **Not marked**

Batch or code number : **Not marked**

Type and thickness : **Not marked**

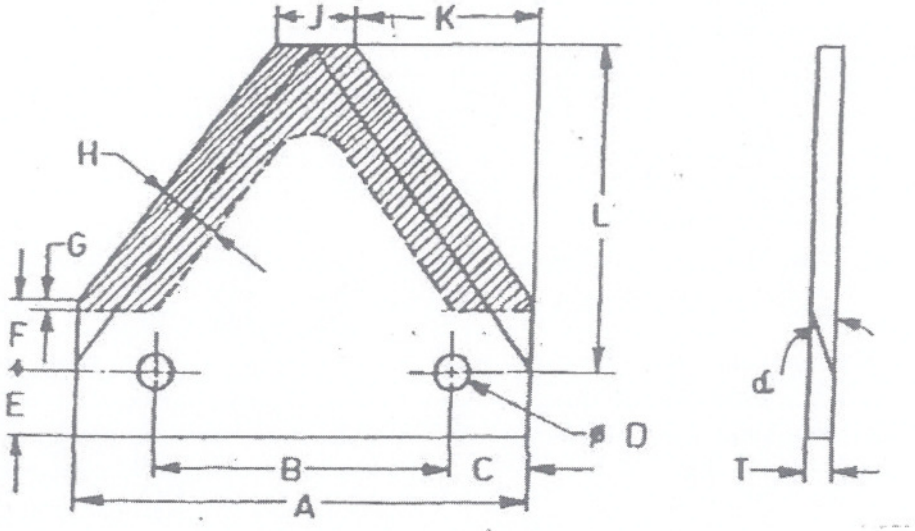



**FIG. 1 DIMENSIONS OF KNIFE SECTION**

Details of knife drive : By pitman shaft through oscillating shaft driven by chain & sprocket

Knife drive safety arrangement : **Not provided**

Knife stroke, mm : 80

Knife frequency per minute : 768

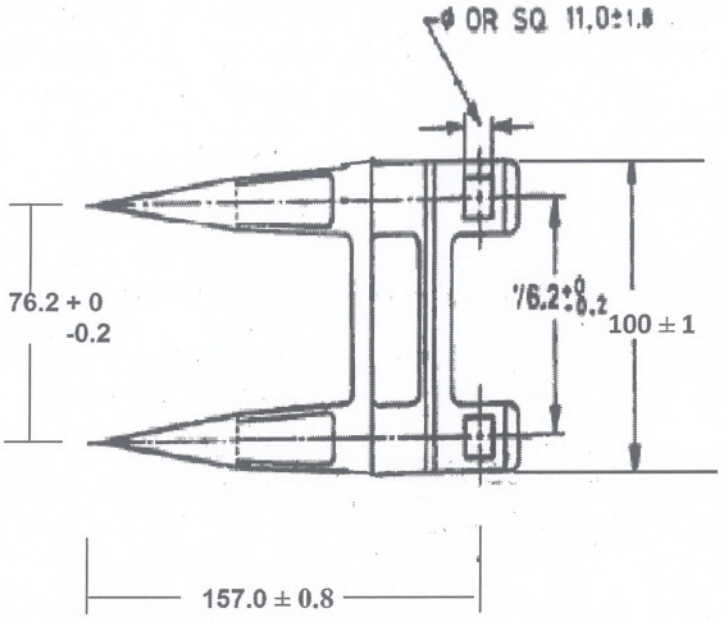
Knife speed corresponding to the no load engine speed recommended for field work (2200 rpm), m/s. : 1.03

Type of crop dividers : Shoe type

Arrangement for lifting lodged crop : **Not provided**

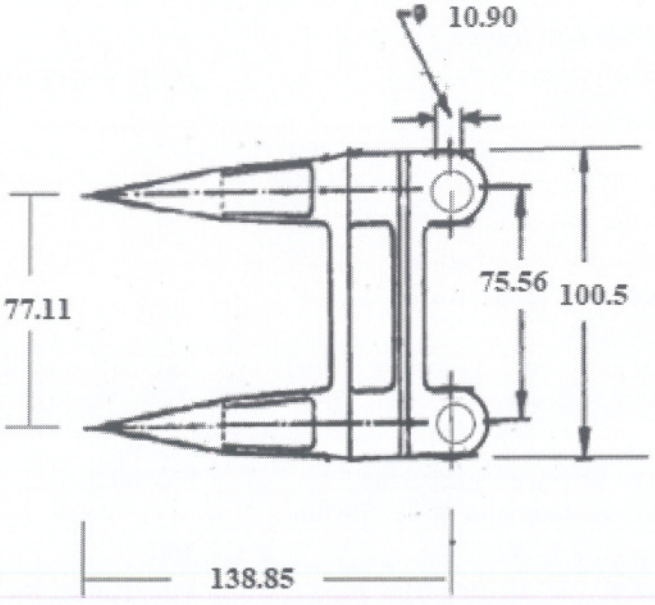
**2.3.7.2 Knife guard**

| | | |
|---|---|---|
| No. & type of knife guard | : | 16 no. & $B_2$, double point without ledger plate |
| Dimensions, mm | : | Refer fig. 2 & 3 |
| Anti corrosive coating | : | Provided |
| **Marking** | | |
| Manufacturer's name or recognized trade mark | : | SM |
| Batch or code number | : | **Not marked** |
| Type | : | **Not marked** |




**All dimensions are in mm**

**FIG. 2 DIMENSIONS REQUIREMENT OF KNIFE GUARD AS PER IS: 6024-1983**




All dimensions are in mm

**FIG. 3 OBSERVED DIMENSIONS OF KNIFE GUARD**

**2.3.7.3 Knife back**

| | | |
|---|---|---|
| Type | : | Flat strip |
| Dimensions, mm | : | Refer fig. 4 |
| Workmanship and finish | : | No noticeable defect observed |
| **Marking** | | |
| Manufacturer's name or recognized trade mark | : | **Not marked** |
| Batch or code number | : | **Not marked** |

**Dimensions of knife back (As per IS: 10378-1982) (Ref. Fig 4):**

| Sr. no. | Designation | Dimension as per IS (mm) | Tolerance (mm) | Dimensions as observed (mm) | Remarks |
|---|---|---|---|---|---|
| 1. | A | 20.0 (min.) | - | 25.0 | Conforms |
| 2. | B | 4.5 (min.) | - | 6.0 | Conforms |
| 3. | C | 50.8 | ±0.1 -0.0 | 51.4 | **Does not conform** |
| 4. | D | 12.0 (min.) | - | 12.5 | Conforms |
| 5. | E | 25.4 | ±0.1 | 24.8 | **Does not conform** |
| 6. | F | 5.5 | +0.2 -0.0 | 6.63 | **Does not conform** |
| 7. | α | $75^0$ or $90^0$ | $\pm1^o$ | NR | -- |

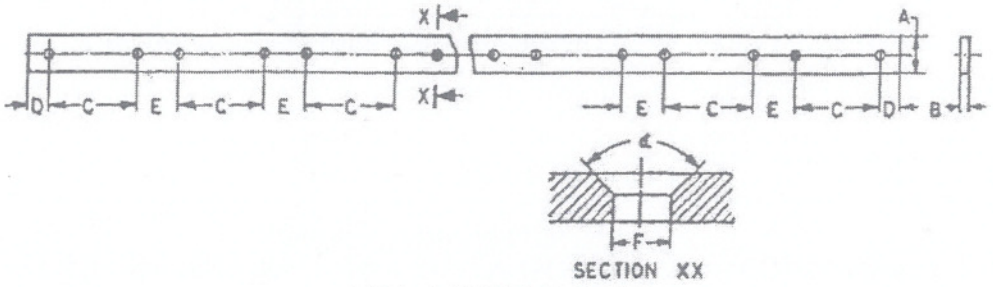



**FIG. 4 KNIFE BACK**

**2.3.8 Cutting platform auger**

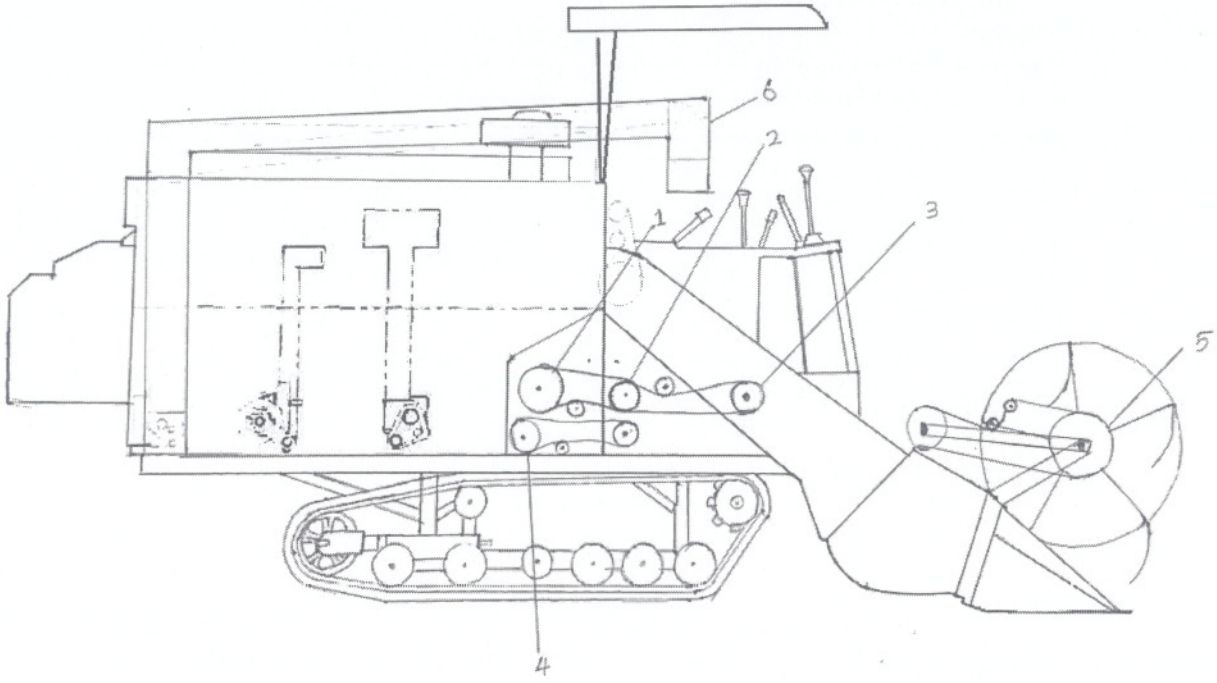
| | | |
|---|---|---|
| Type of crop conveyor | : | Screw auger with retractable fingers |
| Size of auger, mm | | |
| Diameter | : | 515 |
| Width | : | 2315 |
| Speed of the auger corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 197 |
| Arrangement for adjusting the clearance of crop auger | : | Manual, by adjusting the mounting plate by nut & bolt on both side in groove of 47 mm length |
| Auger drive safety arrangement | : | Provided |
| Height of header assembly in the transport position, mm | : | 560 |
| Arrangement for locking the header assembly in raised position | : | Mechanical lock is provided |
| Arrangement for side way tilting the cutter bar | : | **Not provided** |

**Details of retractable fingers**

| | | |
|---|---|---|
| Number | : | 12 |
| Range of throw out, mm | : | 4.7 to 128.3 |
| Axial spacing between the fingers, mm | : | 145 |
| Peripheral distance between the fingers, mm | : | 170 |
| Arrangement for adjustment of fingers length | : | Provided at LHS of header |

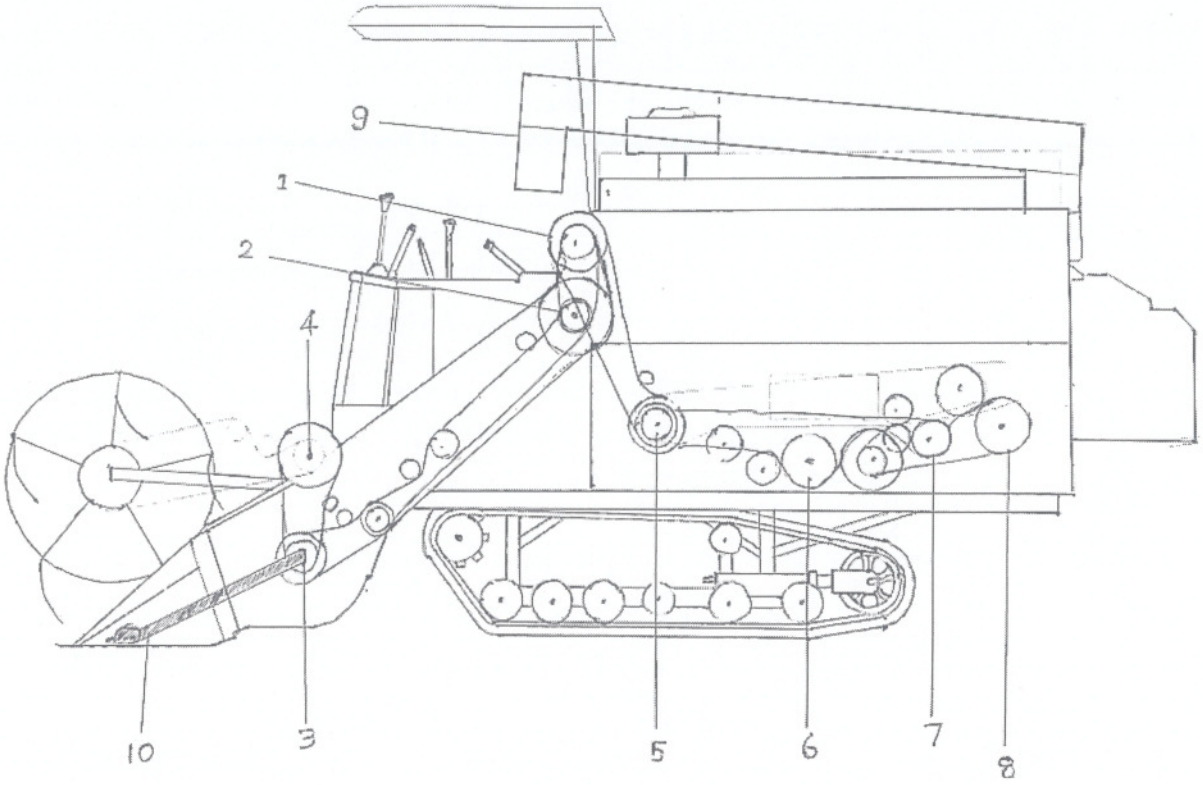
**2.3.9 Undershot conveyor**

| | | |
|---|---|---|
| Type of feeder conveyor | : | Chain & comb |
| No. and type of chains | : | Two, roller |
| No. of comb | : | 15 |
| Size of comb, mm | | |
| Length | : | 505 |
| Width | : | 35 |
| Height | : | 30 |
| Thickness | : | 2.8 |
| Spacing of comb, mm | : | 230 |
| No. of teeth on each comb | : | 37 |
| Size of chain, mm | | |
| Length | : | 3370 |
| Roller dia. | : | 11.1 |
| Pitch | : | 40.5 |
| No. of rollers | : | 178 |
| Type of conveyor drive | : | V-belt and pulley |
| Width of conveyor, mm | : | 600 |
| Conveyor drive safety arrangement | : | **Not provided** |
| Arrangement for adjusting clearance between comb and platform | : | **Not provided** |
| Arrangement for tensioning chain | : | By tightening the tensioner nut & bolt mounted on both side. |
| Speed of conveyor corresponding to the no load engine speed recommended for field work (2100 rpm), rpm | : | 401 |
| Stone trap | : | Provided on feeder conveyor |
| No. of sprocket on drive shaft | : | 2 |
| No. of teeth on sprocket | : | 13 |



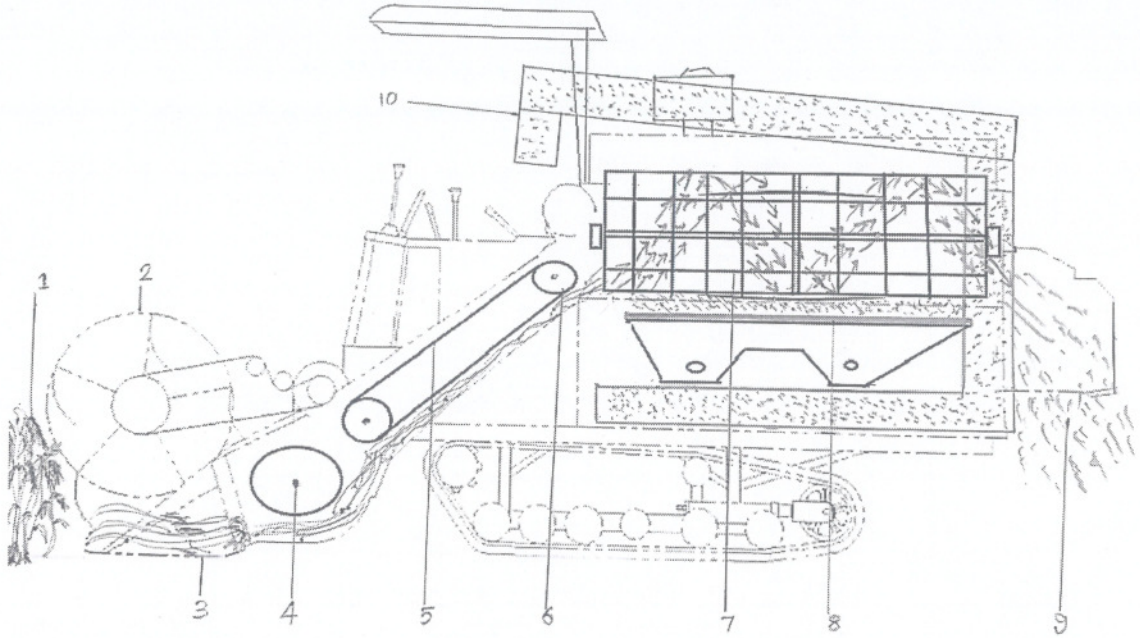

| | | | |
|---|---|---|---|
| 1. | Blower drive | 2. | Engine fly wheel pulley |
| 3. | HST drive pulley | 4. | Grain tank auger drive pulley |
| 5. | Reel drive pulley | 6. | Grain unloading auger |

**FIG. 5 POWER TRANSMISSION SYSTEM (RHS)**




| | | | | | |
|---|---|---|---|---|---|
| 1. | Threshing drum drive pulley | 2. | Undershot conveyor drive pulley | 3. | Platform auger drive sprocket |
| 4. | Reel drive pulley | 5. | Blower drive Pulley | 6. | Grain auger drive pulley |
| 7. | Tailing auger drive pulley | 8. | Sieve box drive pulley | 9. | Grain unloading auger |
| 10. | Pitman shaft | | | | |

**FIG. 6 POWER TRANSMISSION SYSTEM (LHS)**




| | | | | | |
|---|---|---|---|---|---|
| 1. | Crop | 2. | Reel | 3. | Cutter bar |
| 4. | Platform auger | 5. | Undershot conveyor | 6. | Undershot conveyor drive rotor |
| 7. | Threshing drum | 8. | Sieve assembly | 9. | Straw |
| 10. | Grain unloading auger | | | | |

**FIG. 7 CROP FLOW DIAGRAM**

**2.3.11 Threshing drum (paddy only)**

| | | |
|---|---|---|
| Type | : | Peg tooth type |
| **Size, mm** | | |
| Total width | : | 1580 |
| Effective width of threshing drum | : | 1530 |
| Width of feeding worm, mm | : | 600 |
| Outside dia., mm | : | 660 |
| Range of speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 578 |
| Peripheral speed, m/s | : | 19.96 |
| No. of bars | : | 6 |
| No. of hub plates | : | **Not applicable** |
| No. of peg tooth and their spacing on each bar | : | 14 no. bars at the spacing of 100 mm |
| Height of peg, mm | : | 65 |
| Arrangement of bars | : | Horizontal and installed parallel to drum axis |
| Method of speed variation | : | **Not provided** |
| Provision of stone trap | : | Provided on undershot conveyor |

**2.3.11.1 Concave paddy only**

| | | | |
|---|---|---|---|
| Type of concave | | : | Open grate (open flat bars) |
| Overall width of concave, mm | | : | 1370 |
| Effective width, mm | | : | 1360 |
| Peripheral length, mm | | : | 1250 |
| Effective peripheral length, mm | | : | 1180 |
| Effective area, sq. cm. | | : | 160480 |
| Details of extension | | : | **None** |
| Deflecting plate details | | : | 7 No. of M.S plates arranged spirally at upper cover of cylinder, spacing 280 and height 60 mm and thickness of 3.5 mm |
| **Range of clearance, mm** | | | |
| Total cylinder | | | |
| | Front | : | 22 (Fixed) |
| | Rear | : | 26 (Fixed) |
| Method of adjusting the clearance between drum and concave | | : | Three holes are provided at peg bar mounting |

**2.3.12 Stepped grain pan**

| | | | |
|---|---|---|---|
| Type | | : | Stepped M.S sheet |
| No. of hill divider | | : | 03 |
| Size, mm | | | |
| | Length | : | 300 |
| | Width | : | 980 |
| Effective area, $mm^2$ | | : | 294000 |
| No. of extension | | : | **None** |
| Location | | : | Below the concave in oscillating assembly before top sieve. |
| Inclination, degree | | : | 2 |
| Type of extension | | : | None |

**2.3.13 Separating mechanism** : The threshed grain and fine straw mixture from concave fall on the stepped grain pan and from stepped grain pan it falls on sieve assembly for separation. The straw comes out from the straw outlet.

**2.3.14 Cleaning sieves**

**2.3.14.1 Top sieve (chaff sieve assembly)**

| | | | |
|---|---|---|---|
| No. of sieve | | : | One |
| Type | | : | Open lip frog mouth type (variable angle chaff plate type) |
| Overall size of sieve, mm | | | |
| | Length | : | 780 |
| | Width | : | 980 |
| Effective cleaning area, $mm^2$ | | : | 764400 |
| Type of extension | | : | 39 serrated stepped M.S. plate of 280 mm length driving 10 steps bolted at rear of sieve at 25 mm spacing on M.S plate |
| Area of extension, $mm^2$ | | : | 274400 |

| | | | |
|---|---|---|---|
| | Oscillation per minute corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 351 |
| | Lift/throw, mm | : | 17/32 |
| | Arrangement for varying the opening of the sieve | : | Provided (through nuts and bolt provided at the rear side of sieve assembly) |
| | Method of drive | : | By V belt & pulley |
| | Height of lip at max. opening, mm | : | 30 |
| **2.3.14.2** | **Bottom sieve** | | |
| | No. of sieve | : | One |
| | Type | : | Perforated sheet made of stainless steel |
| | Length, mm | : | 690 |
| | Width, mm | : | 1000 |
| | Effective area, $mm^2$ | : | 690000 |
| | Dia. of hole, mm | : | 13.5 |
| | No. of hole per 10000 $mm^2$ | : | 30 |
| | Type of extension | : | **None** |
| **2.3.15** | **Blower** | | |
| | Diameter, mm | : | 350 |
| | Effective width, mm | : | 1050 |
| | No. & type of blade | : | 4, metallic, trapezoidal section |
| | Size of blade, mm | | |
| | Length | : | 1000 (Divided into 2 parts) |
| | Width | : | 110 |
| | Thickness | : | 1.6 |
| | Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 1230 |
| | Method of varying the blower speed | : | **None** |
| **2.3.16** | **Grain pan** | | |
| | Number | : | One |
| | Type | : | Plain M.S sheet |
| | Size, mm | : | 980×300 |
| | Location | : | Below sieve assembly |
| | Inclination, degree | : | 35 |
| **2.3.17** | **Grain conveying mechanism** | | |
| **2.3.17.1** | **Bottom grain auger** | | |
| | Type | : | Screw auger |
| | Size, mm | | |
| | Length | : | 1200 |
| | Diameter | : | 122 |
| | Pitch of conveyor screw | : | 124 |
| | Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 695 |
| | Method of drive | : | By V belt and pulley |
| | Drive safety | : | **Not provided** |

**2.3.17.2 Grain lifting auger**

| | | |
|---|---|---|
| Type | : | Screw auger |
| Size, mm | | |
| Length | : | 1450 |
| Diameter | : | 124 |
| Pitch of conveyor screw | : | 120 |
| Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 695 |
| Type of drive | : | Through bevel gear from bottom grain auger |
| Size of grain conveyor box, mm | | |
| Overall length | : | 1500 |
| Outer diameter | : | 136 |
| Drive safety | : | **Not provided** |

**2.3.18 Tailing conveying mechanism**

**2.3.18.1 Tailing pan**

| | | |
|---|---|---|
| Type | : | Plain M.S sheet |
| Size, mm | : | 980×240 |
| Location | : | Below sieve assembly |
| Inclination, degree | : | 37 |

**2.3.18.2 Bottom tailing auger**

| | | |
|---|---|---|
| Type | : | Screw auger |
| Size, mm | | |
| Length | : | 1200 |
| Diameter | : | 122 |
| Pitch of conveyor screw | : | 123 |
| Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 971 |
| Type of drive | : | By V belt & pulley |
| Safety device | : | **Not provided** |

**2.3.18.3 Tailing lifting auger**

| | | |
|---|---|---|
| Type | : | Screw auger |
| Size, mm | | |
| Length | : | 800 |
| Diameter | : | 120 |
| Pitch of conveyor screw | : | 118 |
| Size of tailing auger box, mm | | |
| Overall length | : | 920 |
| Outer diameter | : | 137 |
| Method of drive | : | V belt pulley and chain and sprocket and then through bevel gear from bottom tailing auger. |
| Safety device | : | **Not provided** |

**2.3.18.4 Grain tank**

| | | |
|---|---|---|
| Capacity | | |
| Volume basis, $m^3$ **(apa)** | : | 1.0 |
| Method of agitating the grains in tank | : | **Not provided** |

| | | | |
|---|---|---|---|
| | Size of grain tank opening (L×W), mm | : | 680×470 |
| | Provision of grain tank cover | : | Provided |
| | Provision for indication of grain tank filling | : | An electric sensor is provided inside the tank which senses the grain level and gives the audio alarm. |
| **2.3.18.5** | **Grain conveying auger (Bottom of grain tank)** | | |
| | Type | : | Screw auger |
| | Size, mm | | |
| | Length | : | 1020 |
| | Diameter | : | 135 |
| | Pitch of conveyor screw | : | 125 |
| | Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 1522 |
| | Type of drive | : | By V belt through gear box |
| | Safety device | : | **Not provided** |
| **2.3.18.6** | **Vertical grain conveying auger** | | |
| | Type | : | Screw auger |
| | Auger length, mm | : | 1490 |
| | Auger diameter, mm | : | 166.5 |
| | Pitch of auger, mm | : | 165.0 |
| | Size of conveyor box, mm | | |
| | - Overall length | : | 1470 |
| | - Outer diameter | : | 188 |
| | Method of drive | : | Though grain conveying auger |
| **2.3.18.7** | **Grain unloading auger** | | |
| | Type | : | Screw auger |
| | Size, mm | | |
| | Length | : | 3430 |
| | Diameter | : | 166.5 |
| | Pitch of conveyor screw | : | 197 |
| | Horizontal reach (max.), mm | | |
| | RHS | : | 3580 |
| | LHS | : | 2000 |
| | Discharge height above ground level, mm | : | 1235 to 3220 |
| | Clearance height, mm | : | 1490 to 3040 |
| | Speed corresponding to the no load engine speed recommended for field work (2200 rpm), rpm | : | 1522 |
| | Type of drive | : | Through vertical grain conveying auger |
| | Safety device | : | **Not provided** |

| | | |
|---|---|---|
| Provision for adjusting position of auger | : | Through a hydraulic motor for rotation in LHS/RHS and behind the combine and hydraulic cylinder for up/down position. Controlled by switch provided at front of operator seat. |

**Details of electric motor**

| | | |
|---|---|---|
| Make | : | Eaton |
| Model | : | CH-390 |
| Serial no. | : | 2210053713 |
| Location | : | At vertical grain conveying auger for rotating, rising and lowering of unloading auger. |

**2.4 Safety devices provided on the machine**

i) Guards for reel drive, platform auger drive and cutter bar drive are provided
ii) Guards for conveyor drive, blower drive, sieve drive, auger drive are provided
iii) Audio warning for reverse movement of machine
iv) Fuse box
v) Rear view mirror
vi) Fire extinguisher

**2.5 Operating controls, Gauges and Instruments**

**2.5.1 On control panel (in front of operator)**

i) Reel height adjustment lever
ii) Key ignition switch
iii) Coolant temperature gauge
iv) Oil pressure indicator
v) Battery charging indicator
vi) Grain unloading auger position adjustment switch
vii) Parking brake pedal

**2.5.2 On LHS of the operator**

i) Hydraulic step less gear shift joystick
ii) Sub transmission lever (Low, Medium, High, Neutral)
iii) Throttle/accelerator lever
iv) Threshing clutch lever
v) Header drive reversing cum undershot conveyor reverse engaging lever
vi) Engine tachometer
vii) Cumulative run hour meter (digital)
viii) Headlight and all lights switch

**2.5.3 Behind Operator's seat**

i) Grain unloading auger engaging lever
ii) Grain tank full visibility through glass

**2.6 Seat**

| | | |
|---|---|---|
| Make | : | **Not specified** |
| Type | : | Cushioned |
| Type of suspension | : | **None** |

| | | | |
|---|---|---|---|
| | Type of dampening | : | **None** |
| | Horizontal adjustment, mm | : | 100 |
| | Vertical adjustment of seat, mm | : | **None** |
| | Helper seat | : | **Not provided** |
| **2.7** | **Canopy** | | |
| | Type | : | Rectangular synthetic fibre & plastic |
| | Size, mm | : | 1050×840 |
| | Height from operator's platform, mm | : | 1690 |
| **2.8** | **Provision for safety & comfort of operator** | | |
| **2.8.1** | **Conformity with IS: 6283 (Part I)-2006 & (Part II)-2007.** | | |
| | Does not meet the requirements of Indian Standards. | | |
| **2.8.2** | **Conformity with IS: 8133-1983** | | |
| | Does not meet the requirements of Indian Standards. | | |
| **2.9** | **Overall dimensions of combine harvester, mm** | | |
| | Length | : | 5130 |
| | Width | : | 2930 |
| | Height | : | 2750 |
| **2.10** | **Mass:** | | |
| | Mass of combine harvester with coolant, fuel, lubricants & grain tank full (paddy) and 75 kg mass on the operator's seat, kg | | |
| | Total | : | 4710 |
| **2.11** | **Total number of lubricating points (Refer annexure IV)** | | |
| | Grease point | : | 24 |
| | Oiling | : | 8 |
| **2.12** | **Colour of combine** | | |
| | Platform auger, reel assembly & chassis | : | Grey |
| | Upper sheet metal and control panels | : | Black, red & white |
| | Canopy | : | White |
| **2.13** | **Assemblies/Components Indigenised** | : | **Not specified** |
| **2.14** | **Labelling/identification plate** | | |
| **2.14.1** | **Combine Harvester** | : | Metallic plate riveted on behind the operator seat at grain tank. |

| **AHLAWAT AGRO IMPLEMENTS OPP. ANAJ MANDI SAMPLA (HR)** | | |
|---|---|---|
| Name of Manufacturer | : | AHLAWAT AGRO IMPLEMENTS |
| Model Name | : | VR-HR77 |
| Chassis no. | : | VTC 849 09 AA 0051 |
| Engine make & model | : | ZHEJIANG / 4D35ZT |
| Engine serial no. | : | S22212563 |
| Month & year MFG. | : | Oct, 2023 |
| **Country of Origin:- India** | | |

**2.15 Hardness of knife blade, knife guard and knife back**

| Cutter bar/knife blade | Hardness (HRC) | | |
|---|---|---|---|
| | Requirement as per IS: 6025-1982 | As observed | Remarks |
| Hardened zone | 48 to 58 | 56.0 (Average) | Conforms |
| Remainder zone | 20 to 35 | 23.3 (Average) | Conforms |
| **Component** | **Hardness (HB)** | | |
| | **Requirement as per IS: 6024-1983** | **As observed** | **Remarks** |
| Knife guard | 163 (Max) | 170 (Average) | **Does not conform** |
| **Component** | **Hardness (HB)** | | |
| | **As observed** | | |
| Knife back | 190 (Average) | | |

**2.16 Chemical composition**

**i) Chemical composition cutter bar/knife blade**

| Sr. no. | Element | Chemical composition as per IS: 6025-1982 (%) | Chemical composition as observed (%) | Remarks |
|---|---|---|---|---|
| 1. | Carbon | 0.70 – 0.95 | 0.61 | **Does not conform** |
| 2. | Manganese | 0.30 – 0.50 | 0.67 | **Does not conform** |
| 3. | Silicon | - | 0.55 | -- |
| 4. | Phosphorus | - | 0.02 | -- |
| 5. | Sulphur | - | 0.05 | -- |

**ii) Chemical composition of cutter bar knife guard**

| Sr. no. | Element | Chemical composition (%) |
|---|---|---|
| 1. | Carbon | 0.00 |
| 2. | Silicon | 3.97 |
| 3. | Manganese | 0.46 |
| 4. | Phosphorus | 0.25 |
| 5. | Sulphur | 0.09 |

**iii) Chemical composition of cutter bar knife back**

| Sr. no. | Element | Chemical composition as per IS: 10378-1982 (%) | Chemical composition as observed (%) | Remarks |
|---|---|---|---|---|
| 1. | Carbon | 0.35 (min.) | 0.19 | **Does not conform** |
| 2. | Manganese | - | 0.69 | - |
| 3. | Silicon | - | 0.42 | - |
| 4. | Phosphorus | - | 0.02 | - |
| 5. | Sulphur | - | 0.05 | - |

**2.17 Hardness of threshing drum component**

Due to design constraints of peg tooth, it was not possible to determine chemical composition and hardness of peg tooth.

## 3. RUNNING-IN

The combine was run-in for 1.00 hour in paddy crop prior to start of the test for preliminary setting as per recommendation of the manufacturer.

## 4. FUEL AND LUBRICANTS

**4.1 Fuel** : The high speed diesel oil, commercially available, having specific gravity of 0.840 g/ml at 15 ° C was used during the engine test.

**4.2 Lubricants:**

| Sr. No. | Particulars | As recommended by the applicant | As used during the test |
|---|---|---|---|
| 1. | Engine oil | **Not specified** | As recommended |
| 2. | Hydraulic oil | **Not specified** | Oil originally filled was not changed during test |
| 3. | Transmission/Gear box | **Not specified** | |
| 4. | Grease | **Not specified** | Multipurpose Grease |

## 5. ENGINE PERFORMANCE TEST

Date of test : 11.03.2023 to 13.03.2023
Dynamometer : SAJ, AG-350, Eddy current
Dynamometer constant : 9549.305

**Table1- : ENGINE PERFORMANCE TEST (NATURAL AMBIENT)**

| Brake power, kW | Engine speed, rpm | Fuel consumption | | | Specific energy, kWh/l |
|---|---|---|---|---|---|
| | | l/h | kg/h | Specific, kg/kWh | |
| **a) Maximum power- 2 hours test: -** | | | | | |
| 71.5 | 2300 | 20.21 | 16.90 | 0.236 | 3.54 |
| 69.3 | 1950 | 17.66 | 14.76 | 0.213 | 3.92* |
| **b) Power at rated engine speed:** (2600 rpm) | | | | | |
| 64.0 | 2600 | 20.23 | 16.91 | 0.234 | 3.17 |
| **c) Varying load test: -** | | | | | |
| **i) Torque corresponding to maximum power:** | | | | | |
| 71.5 | 2300 | 20.21 | 16.90 | 0.236 | 3.54 |
| 69.3 | 1950 | 17.66 | 14.76 | 0.213 | 3.92* |
| **ii) 85% of torque obtained at maximum power:** | | | | | |
| 67.0 | 2535 | 20.43 | 17.08 | 0.255 | 3.28* |
| 60.4 | 2000 | 15.44 | 12.90 | 0.214 | 3.91* |
| **iii) 75% of torque defined in (ii):** | | | | | |
| 54.7 | 2757 | 18.73 | 15.66 | 0.286 | 3.92 |
| 45.8 | 2063 | 12.34 | 10.32 | 0.225 | 3.71* |
| **iv) 50% of torque defined in (ii):** | | | | | |
| 36.7 | 2769 | 14.03 | 11.73 | 0.320 | 2.62 |
| 31.1 | 2063 | 9.30 | 7.77 | 0.250 | 3.34* |
| **v) 25% of torque defined in (ii):** | | | | | |
| 18.7 | 2817 | 10.61 | 8.87 | 0474 | 1.77 |
| 8.2 | 2175 | 5.11 | 4.28 | 0.521 | 1.61* |
| **vi) Unloaded:** | | | | | |
| 1.9 | 2852 | 7.13 | 5.96 | 3.087 | 0.27 |
| 0.8 | 2200 | 3.82 | 3.19 | 3.799 | 0.22* |

***High idle at No load was 2200 rpm recommended for field operation**

**Table 2- : ENGINE TEST (HIGH AMBIENT)**

| Brake power, kW | Engine speed, rpm | Fuel consumption | | | Specific energy, kWh/l |
|---|---|---|---|---|---|
| | | l/h | kg/h | Specific, kg/kWh | |
| **a) Maximum power-** | | | | | |
| 70.0 | 2300 | 20.00 | 16.80 | 0.240 | 3.49 |
| **b) Power at rated engine speed:** (2600 rpm) | | | | | |
| 63.3 | 2601 | 19.42 | 16.17 | 0.257 | 3.26 |

**Table-3: FIVE HOURS RATING TEST**

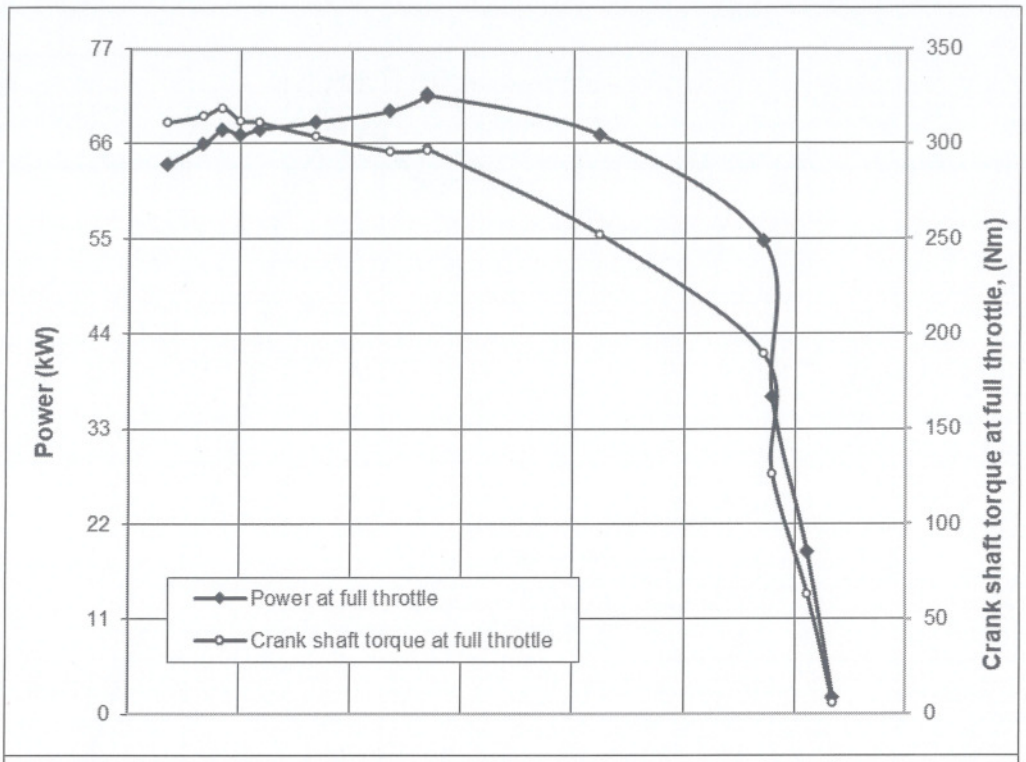
| Sr. No. | Time of the day | Engine speed (kW) | Engine power (rpm) | Fuel consumption | | | Specific Energy (kWh/l) |
|---|---|---|---|---|---|---|---|
| | | | | (l/h) | (kg/h) | Specific (kg/kWh) | |
| | 14.50 | **a) Test started and engine loaded to 90% of maximum power:** | | | | | |
| 1. | 15.20 | 67.0 | 2444 | 19.46 | 16.27 | 0.243 | 3.44 |
| 2. | 15.50 | 67.0 | 2444 | 19.41 | 16.23 | 0.242 | 3.45 |
| 3. | 16.20 | 67.0 | 2443 | 19.39 | 16.21 | 0.242 | 3.46 |
| 4. | 16.50 | 67.0 | 2445 | 19.40 | 16.22 | 0.242 | 3.46 |
| 5. | 17.20 | 67.1 | 2447 | 19.42 | 16.24 | 0.242 | 3.46 |
| 6. | 17.50 | 66.9 | 2439 | 19.36 | 16.19 | 0.242 | 3.45 |
| 7. | 18.20 | 66.9 | 2440 | 19.39 | 16.21 | 0.243 | 3.45 |
| 8. | 18.50 | 66.9 | 2440 | 19.36 | 16.19 | 0.242 | 3.46 |
| | **Average** | **67.0** | **2443** | **19.40** | **16.22** | **0.242** | **3.45** |
| | | **b) Engine loaded to its maximum power** | | | | | |
| 9. | 19.05 | 70.0 | 2300 | 20.22 | 16.80 | 0.240 | 3.49 |
| 10. | 19.20 | 70.2 | 2300 | 20.06 | 16.85 | 0.240 | 3.50 |
| 11. | 19.35 | 70.2 | 2300 | 20.09 | 16.88 | 0.240 | 3.49 |
| 12. | 19.50 | 70.1 | 2300 | 20.10 | 16.88 | 0.241 | 3.49 |
| | **Average** | **70.1** | **2300** | **20.06** | **16.85** | **0.240** | **3.49** |

**Table-4 Engine performance parameters**

| **Parameters** | | **Natural ambient (full throttle)** | **Natural ambient (field speed)** | **High ambient** | |
|---|---|---|---|---|---|
| | | | | **High Ambient** | **Five hours rating test at high ambient** |
| No load engine speed, rpm | : | 2852 | 2200 | 2843 | -- |
| Max. power, kW | : | 71.5 | 69.3 | 70.0 | 70.1 |
| Rated rpm, kW | : | 64.0 | -- | 63.3 | -- |
| Fuel consumption at max power, kg/hr | : | 16.90 | 14.76 | 16.89 | 16.85 |

| | | | | | |
|---|---|---|---|---|---|
| Crankshaft torque at max. power, Nm | : | 296.8 | 339.3 | 290.4 | 291.2 |
| Max. crankshaft torque, Nm | : | 318.9 | 346.0 | 309.0 | -- |
| Engine speed at max. crankshaft torque, rpm | : | 2025 | 1859 | 2099 | -- |
| Torque back-up, % | : | 7.45 | 1.94 | 6.40 | -- |

| | | | | | |
|---|---|---|---|---|---|
| **Range of atmospheric conditions:** | | | | | |
| Temperature, $^{o}$C | : | 26 to 28 | 27 to 31 | 41 to 45 | 41 to 44 |
| Pressure, kPa | : | 98.2 to 98.5 | 98.1 to 98.3 | 98.4 to 98.5 | 98.5 |
| Relative humidity, % | : | NR | NR | NR | NR |
| **Max. temperature, $^{o}$C** | | | | | |
| Engine oil | : | 91 | 80 | 104 | 99 |
| Coolant | : | 80 | 77 | 96 | 83 |
| Fuel | : | 42 | 38 | 49 | 42 |
| Air intake | : | 32 | 27 | 24 | 26 |
| Exhaust gas | : | 415 | 438 | 424 | 401 |
| **Pressure at max. power:** | | | | | |
| Intake air, kPa | : | 0.0 | 0.0 | 0.0 | 0.0 |
| Exhaust gas, kPa | : | 0.80 | 0.13 | 0.40 | 0.40 |
| Smoke density at 80 % of max. power (Bosch no.) | : | 0.04 $m^{-1}$ | -- | -- | -- |
| **Consumptions** | | | | | |
| Lub. oil, g/kWh | : | -- | -- | | 0.62 |
| Coolant water (% of total coolant capacity) | : | -- | -- | | 0.63 |



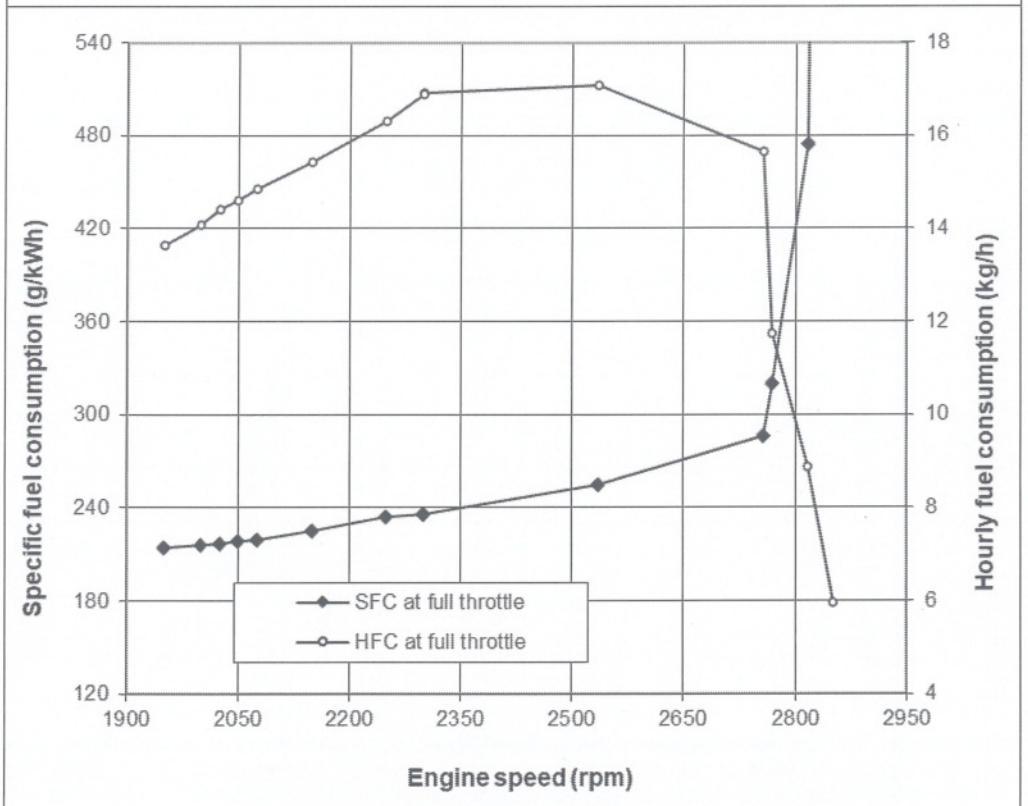
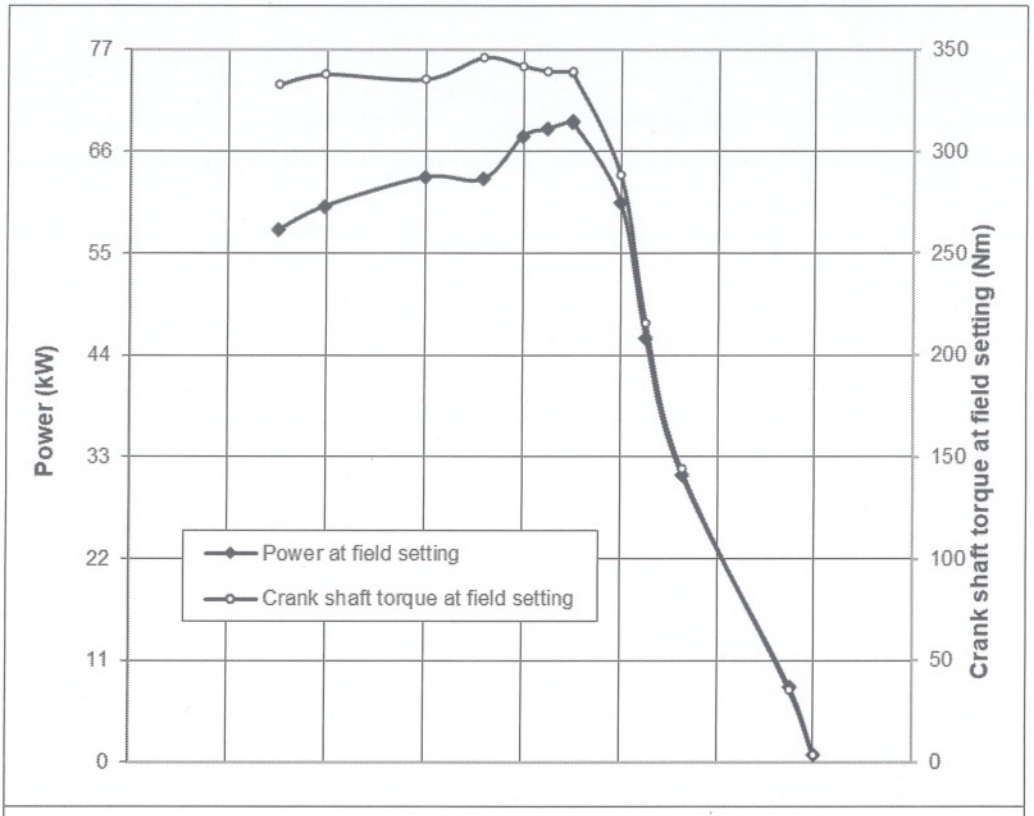




**Fig. 8: ENGINE PERFORMANCE CHARACTERISTICS (Natural ambient)**



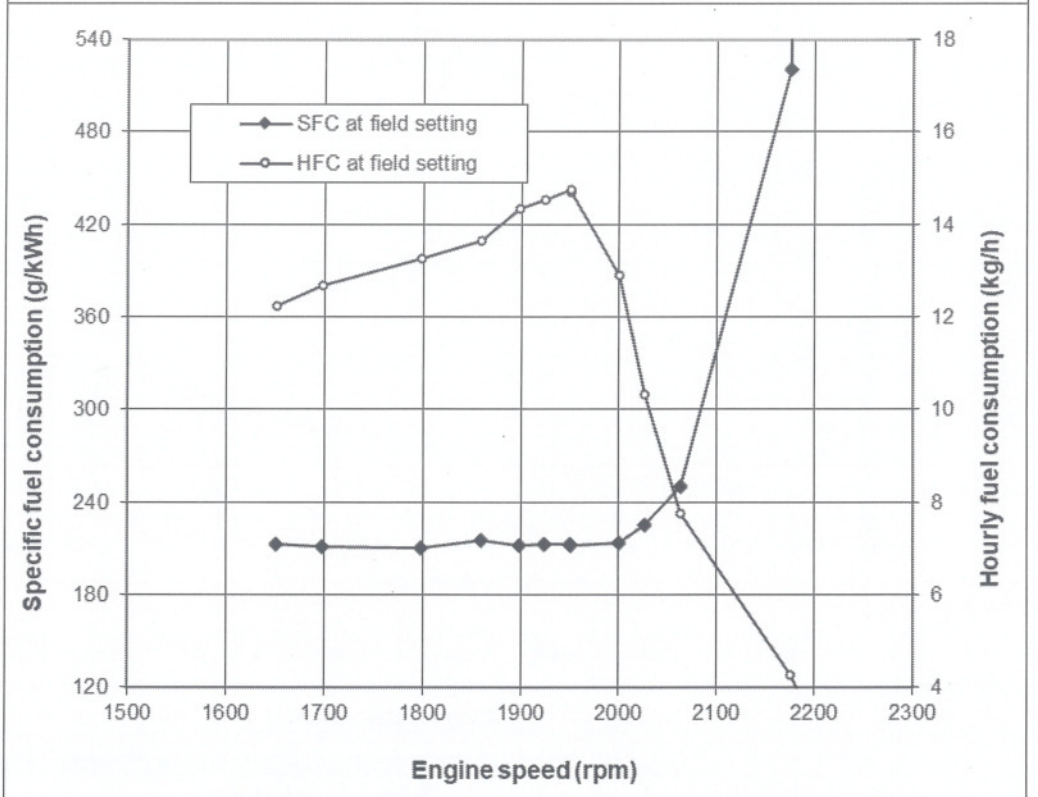




**Fig. 9: ENGINE PERFORMANCE CHARACTERISTICS (Natural ambient at field setting)**

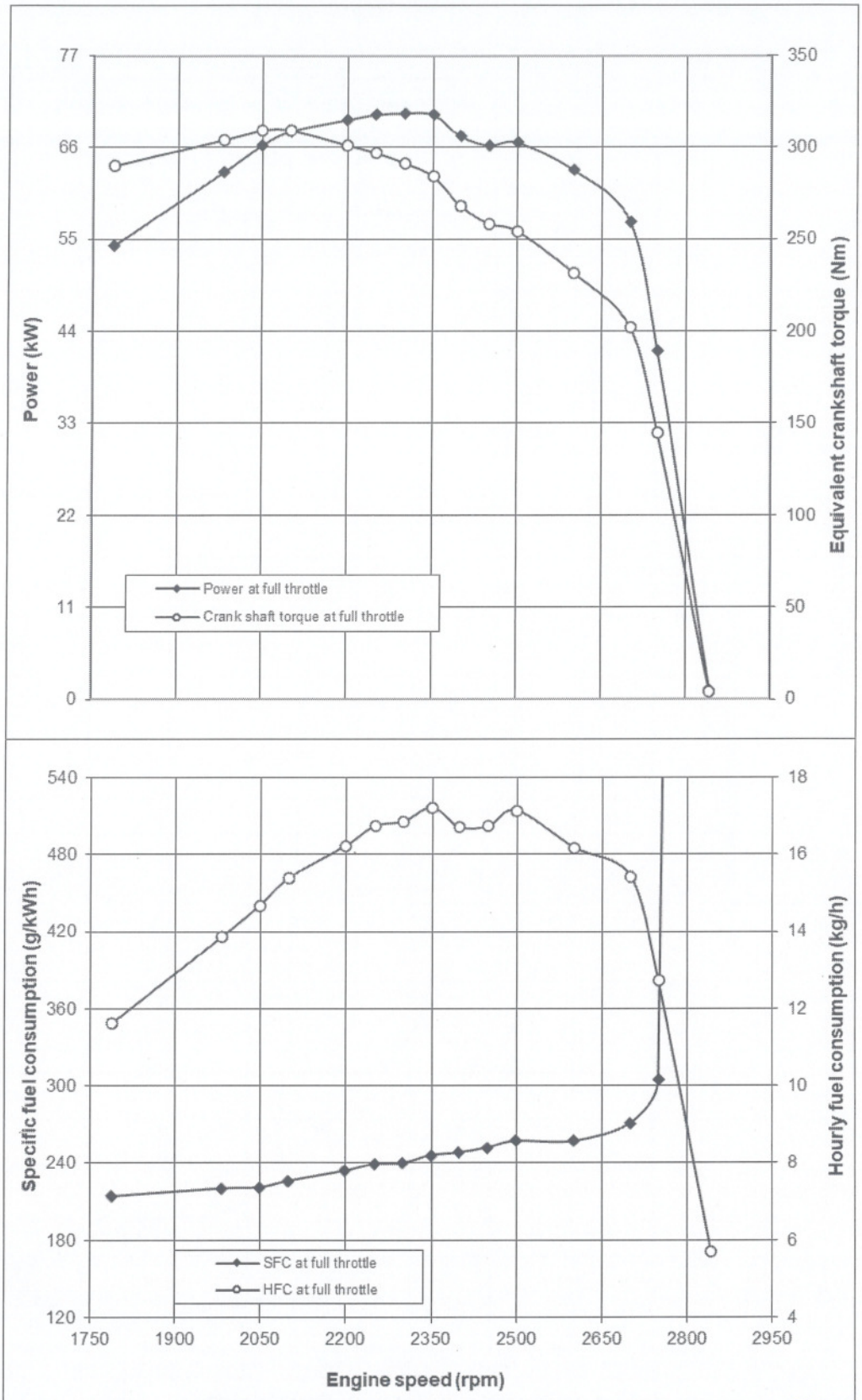



**Fig. 10: ENGINE PERFORMANCE CHARACTERISTICS (High ambient)**

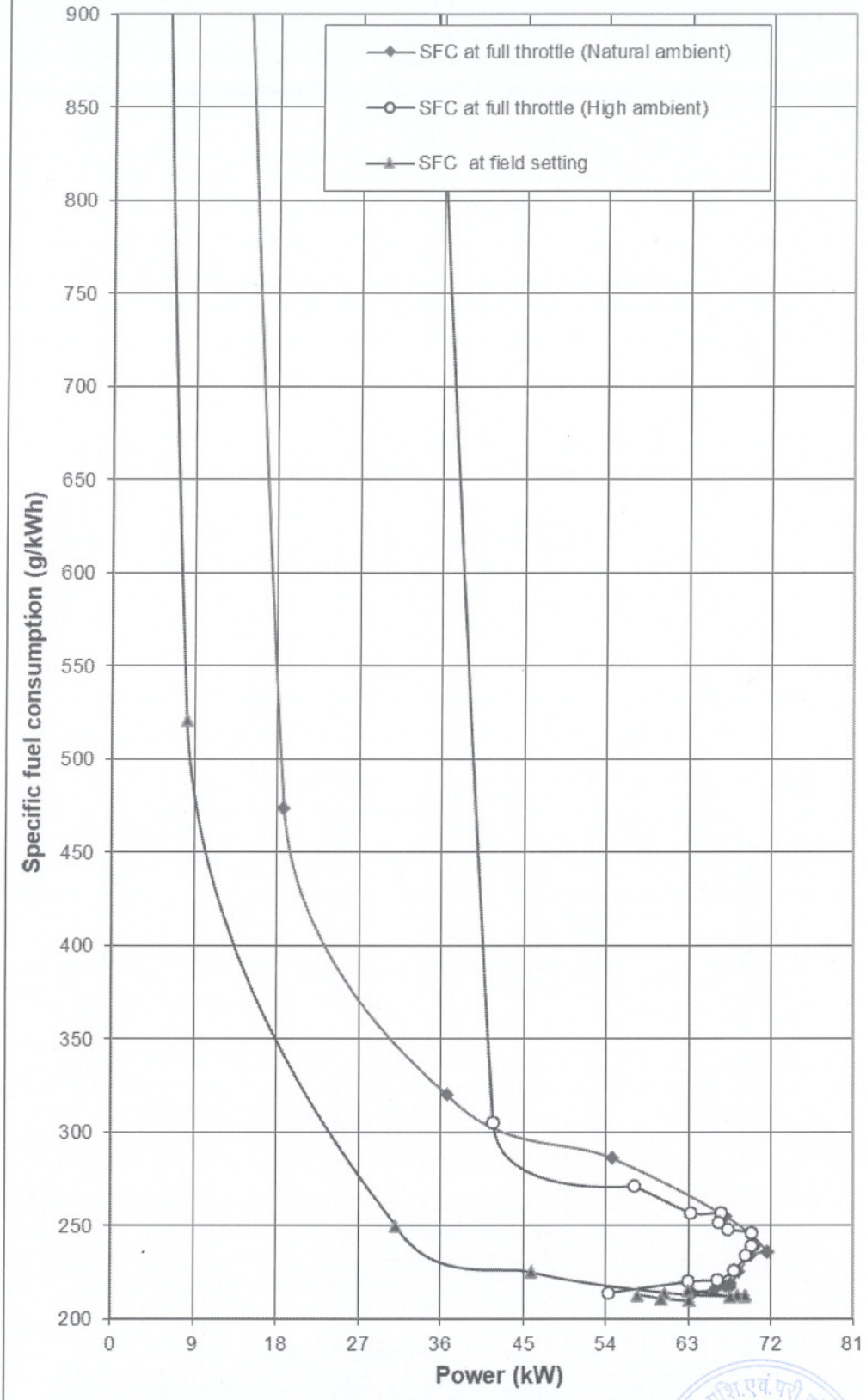



Fig. 11: ENGINE PERFORMANCE CHARACTERISTICS

## 6. NOMINAL SPEED TEST

As there is "CONTINUOUS VARIABLE TRANSMISSION, wherein HST unit drives the drive sprocket shaft through gear box, nominal speed test is deemed to have been conducted by checking the maximum ground speed.

| Sr. no. | Gear position | Speed (kmph) |
|---|---|---|
| 1 | 1 | 5.12 |
| 2 | 2 | 6.42 |
| 3 | 3 | 9.35 |

## 7. HEADER LIFTING TEST

Date of test : 11.01.2024
Recommended no load engine speed for field work, rpm : 2200
Operating conditions, ambient temp., °C : 7.6 to 8.8
Temperature of hydraulic fluid at the start of test, °C : 60

| Sr.no. | No. of cycles | Temperature of hydraulic fluid (°C) |
|---|---|---|
| 1. | 100 | 66 |
| 2. | 200 | 72 |
| 3. | 300 | 71 |
| 4. | 400 | 69 |
| 5. | 500 | 69 |
| 6. | 600 | 69 |
| 7. | 700 | 68 |
| 8. | 800 | 70 |
| 9. | 900 | 74 |
| 10. | 1000 | 77 |
| Leakage of hydraulic fluid from any part of hydraulic system | | None |
| Working of hydraulic system | | No noticeable defect was observed |

## 8. TURNING ABILITY TEST

Date of test : 03.01.2024

**Details of track laying equipments**

Track distance/spacing, mm : 1250

Length of track on ground, mm : 1850

| Diameter of turning circle, m | | Diameter of turning space, m | |
|---|---|---|---|
| LHS | RHS | LHS | RHS |
| 4.3 | 4.4 | 5.9 | 5.8 |

## 9. LOCATION OF CENTRE OF GRAVITY

| | |
|---|---|
| Date of test | 08.01.2024 |
| Item | Combine harvester fitted with all standard accessories & all the liquid reservoirs full, grain tank full & operator replaced by 75 kg mass on the seat and header assembly in raised position. |
| Height above ground level (mm) | 1090 |
| Distance behind the vertical plane containing the axis of the centre of drive sprocket (mm) | 841 |
| Distance from the median plane parallel to the longitudinal axis of combine bisecting the driving wheel track (mm) | 97 (toward LHS) |

## 10. OPERATOR'S FIELD OF VISION

Date of test: 09.01.2024

The visibility test was conducted to assess the visibility mainly of the header assembly from normal sitting position of the operator. The cutter bar height was maintained at 150 mm above the ground level during the test.

The height of vision during the test was maintained as 670 mm on a vertical plane from the centre of operator's seat. The results of tests are following and graphically represented in fig. 12.

i) Non visible space in front is 3.85 m which is 2.08 times the length of track of combine on ground contact.

ii) Non visible space on left side is 4.63 m which is 3.70 times the track spacing of combine.

iii) Non visible space on right side is 2.97 m which is 2.38 times the track spacing of combine.

The cutter bar assembly and platform auger are visible from operator's normal sitting position.

The visibility of cutter bar from the operator's seat is normal.

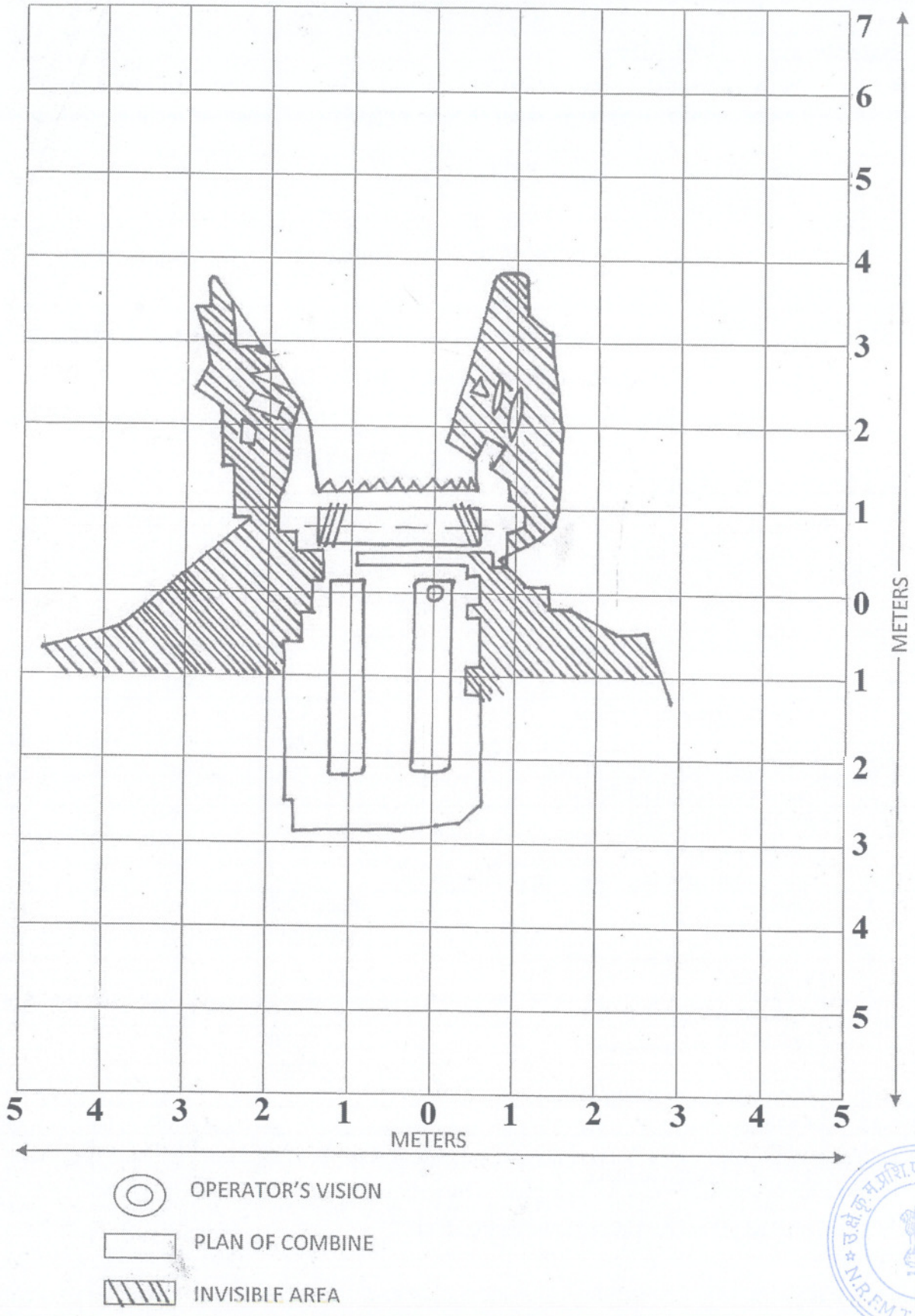



**FIG. 12 OPERATOR'S FIELD OF VISION OF AHLAWAT, VR-HR77**

## 11. BRAKE PERFORMANCE

**Date of test**: 19.01.2024

**11.1 Service brake**

The combine stops when main shift lever (HST) is brought to neutral position. Machine stops at 0.7 to 1.1 m distance at forward speed of 6.24 kmph (the maximum speed) at force of 58 to 94 N at main shift lever.

**11.2 Parking brake**

| Particulars | Combine parked on 12% up slope | Combine parked on 12% down slope |
|---|---|---|
| Parking device control force, N | 348 | 278 |
| Efficiency of brakes | Satisfactory | Satisfactory |

## 12. AIR CLEANER OIL PULL OVER TEST

Not applicable as the Combine Harvester is provided with dry type air cleaner.

## 13. MECHANICAL VIBRATION TEST

**Date of test**: 04.01.2024

The amplitude of mechanical vibration on various assemblies/ components of the combine were recorded by running the machine under the stationary condition at rated engine speed recommended for field operation on a level concrete surface and without load with all systems working. The cutter bar height was maintained at 150 mm above ground level. The amplitude of vibration was measured in horizontal and vertical positions of the accelerometer and the results are given below:

| Sr. no. | Location | Vibration (microns) | |
|---|---|---|---|
| | | HD | VD |
| 1. | Foot rest/operator platform Left | 162* | 310* |
| | Right | 257* | 255* |
| 2. | Reel height adjustment lever | 286* | 201* |
| 3. | Header unit engaging lever | 227* | 340* |
| 4. | Parking brake pedal | 360* | 180* |
| 5. | Accelerator lever | 200* | 220* |
| 6. | Speed range shifting lever/ gear shifting lever | 240* | 250* |
| 7. | Operator seat Back Rest | 183* | 150* |
| | Bottom | 210* | 240* |
| 8. | Threshing unit drive engaging lever | 250* | 240* |
| 9. | Fuel Tank | 280* | 240* |
| 10. | Grain tank unloading light | 890* | 470* |
| 11. | Front field working light Left | 260* | 170* |
| | Right | 160* | 121* |
| 12. | Backlight rear working light | 250* | 280* |
| 13. | Canopy | 520* | 680* |
| 14. | Ladder | 280* | 170* |
| 15. | LHS & RHS turning lever | 374* | 183* |

**Remarks**: The amplitude of mechanical vibration on the various assemblies and sub-assemblies as marked (*) are considered to be on higher side.

## 14. NOISE LEVEL MEASUREMENT

### 14.1 Noise at bystander's position:

| | | |
|---|---|---|
| Date of test | : | 04.01.2024 |
| Type of track | : | Concrete |
| Background noise level, dB(A) | : | 48.1 |
| **Location of microphone:** | | |
| Height of microphone above ground level, m | : | 1.2 |
| Distance of microphone from line of travel, m | : | 7.5 |
| **Atmospheric conditions:** | | |
| Temperature, ° C | : | 17.8 |
| Pressure, kPa | : | 99.5 |
| Relative humidity, % | : | 56.9 |
| Wind velocity, m/s | : | 0.6 to 1.8 |

**TEST DATA:**

| Sr. no. | Gear position | Speed at full throttle (kmph) | Silencer taking microphone, dB(A) | Silencer taking away from microphone, dB(A) |
|---|---|---|---|---|
| 1 | 1 | 5.12 | 87.7 | 82.6 |
| 2 | 2 | 6.42 | 87.8 | 83.3 |
| 3 | 3 | 9.35 | 87.9 | 85.3 |

### 14.2 Noise at operator's ear level:

| | | |
|---|---|---|
| Date of test | : | 04.01.2024 |
| Type of track | : | Concrete |
| Background noise level, dB(A) | : | 48.1 |
| Height of microphone from the foot board, mm | : | 1240 |
| **Atmospheric conditions:** | | |
| Temperature, ° C | : | 17.8 |
| Pressure, kPa | : | 99.5 |
| Relative humidity, % | : | 56.9 |
| Wind velocity, m/s | : | 0.6 to 1.8 |
| Max. noise level, dB(A) | : | 97.6 |

## 15. FIELD TEST

**15.1** Combine harvester was operated in field for 52.13 (excluding run-in of 1.00 hr) hours for paddy harvesting. During the test, available varieties of crop were harvested to assess the field performance of combine with regard to quality of work, rate of work, fuel consumption, safety and soundness of construction etc. The crop and atmospheric conditions during field test are given in **Appendix - II & III** respectively.

The crop parameters recorded during the test for all crops are as given below: -

**Crop Parameters**

| Sr. no. | Parameters | | Observations |
|---|---|---|---|
| | | | Paddy |
| 1. | Plant height, cm | : | 90 to 105 |
| 2. | Number of tillers/$m^2$ | : | 215 to 544 |
| 3. | Length of ear head, cm | : | 21 to 34 |
| 4. | Straw/grain ratio | : | 1.1 to 1.4 |
| 5. | Moisture, % | | |
| | - Grain | : | 15.2 to 24.1 |
| | - Straw | : | 59.7 to 67.3 |

The results of field performance test of paddy crops harvesting are summarised in Table – 5 and presented in detail in **Appendix – II to III.**

**Table- 5: SUMMARY OF LOSSES & EFFICIENCIES OBSERVED DURING FIELD PERFORMANCE TEST.**

| Crop variety | Collectable losses (%) (Max.) | Non-collectable losses (%) (Max.) | Total processing losses (%) (Max.) | Threshing efficiency (%) (Min.) | Cleaning efficiency (%) (Min.) | Grain breakage in main tank (%) (Max.) | Forward speed (kmph) | Area covered (ha/h) | Fuel consumption (l/h) | Fuel consumption (l/ha) | Grain out put (kg/h) | Crop through-put (t/h) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PADDY** | | | | | | | | | | | | |
| Pusa-1847 | 1.90 | 0.60 | 2.20 | 98.10 | 96.30 | 0.03 to 0.73 | 3.23 to 3.75 | 0.480 to 0.635 | 6.28 to 7.71 | 10.83 to 14.56 | 3322 to 4667 | 7.74 to 10.61 |

**15.2 Unloading of grains**

The time to unload the grain tank ranged from 99 to 126 second in paddy operation.

**15.3 Time required for daily maintenance**

The average labour required for daily maintenance was approximately two-man hours.

**15.4 Harvesting of any other crop**

Not done, as not recommended

## 16. DEFECTS, ADJUSTMENTS, BREAKDOWNS AND REPAIRS

No noticeable defect or breakdown was observed during the test.

## 17. INSPECTION AND ASSESSMENT OF WEAR

**17.1 Transmission system**

**17.1.1 HST unit**

Visual condition of the components of complete assembly. : No noticeable defect was observed

**17.1.2 Gear box**

Visual condition of the components of complete assembly. : No noticeable defect was observed

**17.1.3 Track system**

Visual condition of the components of complete assembly. : No noticeable defect was observed

**17.2 Steering system/ (Hydraulic direction control unit)**

Visual condition of the components of complete steering assembly. : No noticeable defect was observed

**17.3 Starter motor & alternator**

Presence of oil in housing : None

Condition of bearings and other components : No noticeable defect was observed

**17.4 Chains, sprockets and belts**

Visual condition of components of combine : No noticeable defect was observed

**17.5 Bearings**

Visual condition of components of combine : No noticeable defect was observed

**17.6 Wear of the peg teeth bar of threshing cylinder**

The wear of the peg teeth bar of the threshing cylinder was measured. The percentage wear on mass basis was computed and the results are given below:

| Sr. no. | Original mass before test (g) | Mass after 53.13 hrs. of test (g) | Percent wear by weight (%) |
|---|---|---|---|
| 1. | 4960 | 4940 | 0.40 |
| 2. | 4940 | 4920 | 0.40 |
| 3. | 4960 | 4940 | 0.40 |

## 18. SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMENDATIONS

**18.1 Engine performance test:**

| Brake power, kW | Engine speed, rpm | Fuel consumption | | | Specific energy, kWh/l |
|---|---|---|---|---|---|
| | | l/h | kg/h | Specific, kg/ kWh | |
| **i) Maximum power – Two-hour test:** | | | | | |
| 71.5 | 2300 | 20.21 | 16.90 | 0.236 | 3.54 |
| 69.3 | 1950 | 17.66 | 14.76 | 0.213 | 3.92* |
| **ii) Power at rated engine speed: (2600 rpm)** | | | | | |
| 64.0 | 2600 | 20.23 | 16.91 | 0.234 | 3.17 |

***High idle at No load was 2200 rpm recommended for field operation**

**Table 5- : ENGINE TEST (HIGH AMBIENT)**

| Brake power, kW | Engine speed, rpm | Fuel consumption | | | Specific energy, kWh/l |
|---|---|---|---|---|---|
| | | l/h | kg/h | Specific, kg/ kWh | |
| **a) Maximum power-** | | | | | |
| 70.0 | 2300 | 20.00 | 16.80 | 0.240 | 3.49 |
| **b) Power at rated engine speed: (2600 rpm)** | | | | | |
| 63.3 | 2601 | 19.42 | 16.17 | 0.257 | 3.26 |

**18.2 Field test**

**18.2.1 Summary of field tests**

The results of the field test are summarized below:-

| Sr. no. | Parameters | Observed range |
|---|---|---|
| | | Paddy harvesting |
| 1. | Speed of operation, kmph | 3.23 to 3.75 |
| 2. | Area covered, ha/h | 0.480 to 0.635 |
| 3. | Fuel consumption:<br>l/h<br>l/ha | <br>6.28 to 7.71<br>10.83 to 14.56 |
| 4. | Crop throughput, tonne/h | 7.74 to 10.61 |
| 5. | Grain breakage in main grain outlet, % | 0.03 to 0.73 |
| 6. | Header losses, % | 0.07 to 0.25 |
| 7. | Total non-collectable losses, % | 0.10 to 0.60 |
| 8. | Total collectable losses, % (un threshed + broken from main outlet) | 0.50 to 1.90 |
| 9. | Total processing losses, % | 0.50 to 2.20 |
| 10. | Threshing efficiency, % | 98.1 to 99.7 |
| 11. | Cleaning efficiency, % | 96.3 to 99.8 |

**18.3 Conformity to Indian Standard**

**(i)** IS: 6025-1982 (Reaffirmed 2014)-Specification for knife section for harvesting machine. : **Does not conform in toto**

**(ii)** IS: 6024-1983 (Reaffirmed 2014)-Specification for guards for harvesting machines. : **Does not conform in toto**

**(iii)** IS: 10378-1982 (Reaffirmed 2016)-Specification of knife back for harvesting machine. : **Does not conform in toto**

**(iv)** IS: 6283 (Part I & Part II)-2007(Reaffirmed 2014)-Tractors and machinery for agriculture and forestry-symbol for operator controls and other displays. : Conforms

**(v)** IS: 8133-1983 (Reaffirmed 2014)-Guidelines for location & operation of operator controls on agricultural tractors and machinery. : Conforms

**(vi)** IS: 15806-2018 (Combine Harvester recommendation on selected performance and other characteristics) : Conforms

## 19. SELECTED PERFORMANCE AND OTHER CHARACTERISTICS

| 19.1 | Acceptance criteria for performance characteristics as per clause 4.1 of IS 15806:2018 | | | | | |
|---|---|---|---|---|---|---|
| **Sr. no** | **Characteristics** | **Category (Evaluative/ Non evaluative)** | **Requirement (R)/ Declaration (D)** | **Tolerance** | **Observed** | **Remarks** |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| **I.** | **Prime mover performance** | | | | | |
| | a) Max. power (absolute) - Average max. power observed during 2 h. Max. power test in natural ambient condition, kW | Evaluative | 73.5 **(D)** | ±5% of declared value | 71.5 | Conforms |
| | **b)** Max. power observed during test after adjusting the no load engine speed as per recommendation of the manufacturer for field work, kW | Evaluative | 72.5 **(D)** | ±5% of declared value | 69.3 | Conforms |
| | **c)** Power at rated engine speed, kW (under natural ambient condition) | Non-evaluative | 72.5 **(D)** | ±5% of declared value | 64.0 | **Does not conform** |
| | **d)** Specific fuel consumption corresponding to average maximum power under 2 h maximum power test, g/kWh. | Evaluative | 231 **(D)** | +5% of declared value | 236 | Conforms |
| | **e)** Max. smoke density (Bosch no.) at 80% load between the speed at max. power & 55% of speed at max. power or 1000 rpm whichever is higher | Evaluative | As per central motor vehicles (CMV) rules **(R)** | Nil | 0.04 $m^{-1}$ | Conforms |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **f)** | Max. crank shaft torque, Nm observed during the test after no load engine speed is adjusted as per manufacturer recommendation for field work | Evaluative | 320 **(D)** | ±8% of declared value | 318.9 | Conforms |
| | **g)** | Back up torque, % (Natural ambient) | Evaluative | 7 % (min.) **(R)** | Nil | 7.45 | Conforms |
| | **h)** | Max. operating temperature, ° C<br>i) Engine oil<br>ii) Coolant | Evaluative | <br>i) 135 **(D)**<br>ii) 109 **(D)** | Should not exceed the declared value | <br>i) 104<br>ii) 96 | Conforms |
| | **i)** | Lubrication oil consumption, g/kWh | Evaluative | 1 % of SFC at maximum power (high ambient) **(R)** | Nil | 0.62 | Conforms |
| **II. Brake performance at 24 km/h or maximum speed whichever is less** | | | | | | | |
| | **a)** | Max. stopping distance at a force equal to or less than 600 N on brake pedal (m)- (cold brake and hot brake) | Evaluative | As per requirement of CMVR **(R)** | -- | Not applicable as hydrostatic transmission does not require any separate/ regular conventional brake system. | -- |
| | **b)** | Effectiveness of parking brake at a force of 600 N at foot pedal or 400 N at hand lever | Evaluative | As per requirement of CMVR **(R)** | -- | Effective | Conforms |
| **III. Mechanical vibration** | | | | | | | |
| | **a)** | Operator's platform | Non evaluative | 120 µm (max.) **(R)** | Nil | 310 | **Does not conform** |
| | **b)** | Steering control wheel / LHS & RHS of turning lever | Non evaluative | 150 µm (max.) **(R)** | Nil | 374 | **Does not conform** |
| | **c)** | Seat with driver seated | Non evaluative | 120 µm (max.) **(R)** | Nil | 240 | **Does not conform** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **IV. Air cleaner oil pull over** | | | | | | | |
| | **a)** | Air cleaner oil pull over in % when tested in accordance with IS: 8122 part (II) 2000 | Evaluative | 0.20 (max.) **(R)** | Nil | Dry type air cleaner is provided hence test is not applicable | Not applicable |
| **V. Noise measurement** | | | | | | | |
| | **a)** | Max. ambient noise emitted by combine at by-sanders position, dB(A) | Evaluative | 88 dB(A) as per CMVR **(R)** | Nil | 87.9 | Conforms |
| | **b)** | Max. noise at operator's ear level, dB(A) | Evaluative | 98 dB(A) as per CMVR **(R)** | Nil | 97.6 | Conforms |
| **VI. Header lifting Test** | | | | | | | |
| | **a)** | Satisfactory completion of header lifting test | Evaluative | - | Nil | Satisfactorily completed | Conforms |
| | **b)** | Thickness of brake lining, mm | Evaluative | -- | -do- | **Not applicable** | -- |
| | **c)** | Thickness of clutch plate, mm | Evaluative | -- | -do- | **Not applicable** | -- |
| **VII. Discard limit** | | | | | | | |
| | **a)** | Thickness of brake lining, mm | Evaluative | -- | -do- | **Not applicable** | -- |
| | **b)** | Thickness of clutch plate, mm | Evaluative | -- | -do- | **Not applicable** | -- |
| **VIII. Field performance** | | | | | | | |
| | **a)** | Suitability for crops | Evaluative | Wheat & paddy (Wheel type) Paddy (Track type) | Nil | Wheat & paddy | Conforms |
| | **b)** | Average processing losses, % | Evaluative | Average 4% **(R)** | Nil | 2.20 (max.) | Conforms |
| | **c)** | Threshing efficiency (%) | Evaluative | ≥ 98 percent **(R)** | Nil | 98.1 (min.) | Conforms |
| | **d)** | Cleaning efficiency, % | Evaluative | ≥ 96 percent **(R)** | Nil | 96.3 (min.) | Conforms |
| | **e)** | Grain breakage in main grain tank, % | Evaluative | ≤ 2.5 percent **(R)** | Nil | 0.73 (max.) | Conforms |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **f)** | Non collectable losses, % | Evaluative | ≤ 2.5 percent **(R)** | Nil | 0.60 (max.) | Conforms |
| **IX. Safety requirement** | | | | | | | |
| | **a)** | Guards against all moving parts/ drives and hot parts | Evaluative | Belt and chain drives, pulleys hydraulic pipes (Around operators work place) **(R)** | -- | Provided | Conforms |
| | **b)** | Lighting arrangement | Evaluative | As per CMVR **(R)** | - | Provided | Conforms |
| | **c)** | Grain tank cover | Evaluative | Essential **(R)** | - | Provided | Conforms |
| | **d)** | Spark arrester in engine's exhaust in case naturally aspirated engine | Evaluative | Essential **(R)** | - | Turbo charger is provided in exhaust system | -- |
| | **e)** | Stone trap before concave bars | Evaluative | Essential **(R)** | - | Provided | Conforms |
| | **f)** | Rear view mirror | Evaluative | Essential **(R)** | - | Provided | Conforms |
| | **g)** | Fire extinguisher | Evaluative | Essential **(R)** | - | Provided | Conforms |
| | **h)** | Slip clutch at following drives –<br>i) Cutting platform<br>ii) Undershot conveyor drive<br>iii) Grain & tailing elevator | <br>Evaluative<br>Non evaluative<br>Non evaluative | <br>Essential **(R)**<br>Optional<br>Optional | - | <br>Provided<br>**Not provided**<br>**Not provided** | <br>Conforms<br>**Does not conform**<br>**Does not conform** |
| | **i)** | Anti slip surfaces at operator platform & ladder & proper gripping for the control levers. | Evaluative | Essential **(R)** | - | Provided | Conforms |
| | **j)** | Working clearance around the controls | Non evaluative | Essential 70 mm, min **(R)** | - | Provided | Conforms |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **k)** | Labelling of control and gauges | Evaluative | Essential | - | Provided | Conforms |
| **XI. Material of construction** | | | | | | | |
| | **i)** | Knife guard should conform to IS: 6024 - 1983 | Non evaluative | Should have maximum hardness 163 HB | - | 170 (Average) | **Does not conform** |
| | **ii)** | Knife blade as per IS :6025 - 1982 | Non evaluative | It must have chemical composition as C=0.70-0.95 %<br>Mn= 0.30-0.50% | - | C= 0.61<br>Mn= 0.67 | **Does not conform**<br>**Does not conform** |
| | **iii)** | Knife back should meet the requirement of IS:10378-1982 | Non evaluative | The knife back shall be manufactured from Carbon Steel having minimum carbon content of 0.35 % | -- | C=0.19 | **Does not conform** |

**19.2 Acceptance criteria in case of Breakdowns/Defects as per clause 4.2 of IS:15806-2018**

**XVII. Break down (critical, major & minor)**

| Sr. no. | Category of breakdowns | Category (Evaluative/ Non evaluative) | Requirements as per OM | As observed | Whether meets the requirements (Yes/No) |
|---|---|---|---|---|---|
| 1. | Critical | Evaluative | No critical breakdown | None | Yes |
| 2. | Major | Evaluative | Not more than two and neither of them should be repetitive in nature | None | Yes |
| 3. | Minor | Evaluative | Not more than five and frequency of each should not be more than two | 02 | **No** |
| 4. | Total breakdown | Evaluative | In no case total no of (major + minor) breakdowns exceed five | None | Yes |

## 20. COMMENTS AND RECOMMENDATIONS

### 20.1 Mechanical vibration

The amplitude of mechanical vibration of components marked as (*) in chapter 10 of this test report are observed to be on higher side. This calls for providing suitable remedial measures to dampen the vibration in order to improve the operational comfort and service life of various components & sub-assemblies.

**20.2 Header lifter test**

In reel pipe distributor's of adopter nut got seepaged during header lifting test. It was tightened and further test conducted.

**20.3 Field performance test**

No noticeable defect and breakdown was observed during operation of combine harvester.

i. The fuel consumption varied as 6.28 to 7.71 l/h and 10.83 to 14.56 l/ha.

ii. The area covered varied as 0.480 to 0.635 ha/h.

**20.4 Ease of operation and safety provisions**

No noticeable difficulties were observed during operation of combine harvester.

**20.5 Hardness and chemical composition**

**i) The hardness of knife guard is not within the limit specified in the relevant Indian standards. It should be looked into for corrective action at regular production level.**

**ii) The chemical composition of knife blade and knife back are not within the limit specified in the relevant Indian standards. It should be looked into for corrective action at regular production level.**

**20.6** The recommended oil grades for engine oil, Hydraulic oil & gearbox oil and recommended grease grade to be used in various parts of machine is not specified. It **MUST** be specified.

**20.7** No safety device is provided on following parts.

**i.** Bottom grain auger
**ii.** Grain lifting auger
**iii.** Bottom tailing auger
**iv.** Tailing lifting auger
**v.** Grain conveying auger (Bottom of grain tank)
**vi.** Grain unloading auger

All the above should be provided.

**20.8 Literature supplied with the machine.**

The following literatures are provided by the applicant during the test.

i) Operator's manual

ii) Spare parts catalogue

iii) Service manual

However, the manual needs to be updated as per IS: 8132-1999.

## TESTING AUTHORITY

| | |
|---|---|
| **Er. SANJAY KUMAR**<br>**AGRICULTURAL ENGINEER** | |
| **Dr. MUKESH JAIN**<br>**DIRECTOR** | 03.04.2024 |

## 21. APPLICANT'S COMMENTS

| Sr. No. | Our reference | Applicant comments |
|---|---|---|
| 21.1 | 20.5 (i) | We will take corrective action at regular production level in hardness of knife guard as per relevant Indian Standard. |
| | 20.5 (ii) | The chemical composition of knife blade & knife back will be specified as per available Indian Standard. |

**Appendix-I**

## COMBINE RUN HOURS DURING TEST

| A. | LABORATORY TESTS: | HOURS |
|---|---|---|
| 1. | Running-in | 1.00 |
| 2. | Radius of turning space & turning circle | 0.54 |
| 3. | Location of centre of gravity | 1.50 |
| 4. | Visibility test | 1.67 |
| 5. | Parking brake performance test | 0.50 |
| 6. | Noise measurement | 0.75 |
| 7. | Mechanical vibration test | 1.00 |
| 8. | Header lifting test | 2.20 |
| **B.** | **FIELD TEST:** | |
| 1. | Paddy harvesting | 52.13 |
| **C.** | Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test | 10.00 |
| | **TOTAL** | **71.29** |

**Appendix-II**

## OBSERVATION SHEET FOR FIELD TESTING (PADDY HARVESTING)

**Place of test:** NRFMTTI & CSF, Hisar

| Test no. | Date of test | Crop variety | Height of plants (cm) | Length of ear head (cm) | No. of grains per ear head | Plant population (No. of tillers./$m^2$) | Straw grain ratio (%) | Moisture (%) | | Atmospheric conditions at the time of test | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Grain | Straw | Amb. temp. ($^oC$) | R.H. (%) | Pressure (kPa) |
| 1. | 02.11.23 | PUSA-1847 | 90 to 102 | 24 to 26 | 120 to 167 | 360 to 401 | 1.4 | 23.1 | 67.3 | 30.4 | 48.7 | 98.7 |
| 2. | 03.11.23 | PUSA-1847 | 99 to 103 | 22 to 24 | 137 to 170 | 371 to 402 | 1.3 | 24.1 | 64.1 | 31.3 | 48.1 | 98.7 |
| 3. | 04.11.23 | PUSA-1847 | 94 to 101 | 21 to 23 | 121 to 171 | 385 to 419 | 1.4 | 19.4 | 65.4 | 32.4 | 46.4 | 98.7 |
| 4. | 06.11.23 | PUSA-1847 | 96 to 101 | 29 to 30 | 112 to 191 | 321 to 544 | 1.3 | 17.0 | 59.9 | 31.2 | 31.0 | 98.6 |
| 5. | 07.11.23 | PUSA-1847 | 99 to 104 | 31 to 32 | 117 to 196 | 219 to 238 | 1.2 | 15.2 | 63.1 | 31.8 | 32.6 | 98.7 |
| 6. | 08.11.23 | PUSA-1847 | 98 to 101 | 31 to 33 | 116 to 198 | 241 to 385 | 1.3 | 20.5 | 64.1 | 31.4 | 30.6 | 98.6 |
| 7. | 09.11.23 | PUSA-1847 | 98 to 105 | 31 to 32 | 99 to 117 | 215 to 232 | 1.1 | 16.1 | 63.0 | 32.0 | 32.1 | 98.8 |
| 8. | 10.11.23 | PUSA-1847 | 98 to 105 | 31 to 34 | 98 to 117 | 219 to 242 | 1.3 | 21.4 | 59.7 | 32.1 | 32.8 | 98.7 |

**Appendix –III**

## FIELD TEST DATA ANALYSIS SHEET (PADDY HARVESTING)

**Place of test:** NRFMTTI & CSF, Hisar

| Test no. | Date of test | Duration of test (h) | Travel speed (kmph) | Width of cut (m) | Rate of work | | | Fuel consumption | | Pre-harvest loss (kg/ha) | Crop through put (t/h) | Grain breakage in main outlet (%) (A) | Un threshed from main outlet (%) (B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Area covered (ha/h) | Grain output (kg/h) | Straw output (kg/h) | (l/h) | (l/ha) | | | | |
| 1. | 02.11.23 | 6.65 | 3.67 | 2.19 | 0.526 | 4243 | 6068 | 7.66 | 14.56 | 1.8 | 10.31 | 0.03 | 1.87 |
| 2. | 03.11.23 | 7.85 | 3.75 | 2.18 | 0.606 | 4517 | 6033 | 6.57 | 10.83 | 23.3 | 10.55 | 0.23 | 0.57 |
| 3. | 04.11.23 | 4.79 | 3.53 | 2.20 | 0.523 | 4099 | 5668 | 6.28 | 12.01 | 7.7 | 9.77 | 0.27 | 0.63 |
| 4. | 06.11.23 | 6.59 | 3.23 | 2.18 | 0.556 | 3805 | 4916 | 7.04 | 12.66 | 22.9 | 8.72 | 0.27 | 0.33 |
| 5. | 07.11.23 | 6.25 | 3.24 | 2.22 | 0.480 | 3792 | 4680 | 7.71 | 16.06 | 1.2 | 8.47 | 0.23 | 0.23 |
| 6. | 08.11.23 | 7.00 | 3.59 | 2.19 | 0.635 | 3322 | 4416 | 7.40 | 11.65 | 0.6 | 7.74 | 0.37 | 0.47 |
| 7. | 09.11.23 | 7.42 | 3.63 | 2.18 | 0.551 | 3894 | 4409 | 7.65 | 13.88 | 3.7 | 8.30 | 0.17 | 0.73 |
| 8. | 10.11.23 | 5.58 | 3.68 | 2.19 | 0.540 | 4667 | 5938 | 6.75 | 12.50 | 7.0 | 10.61 | 0.73 | 0.60 |

**Appendix –III**

## FIELD TEST DATA ANALYSIS SHEET (PADDY HARVESTING)

| Test no. | Non-collectable losses due to combine, percent by mass | | | | | Total collectable losses | Non-collectable losses | Total processing losses | Threshing efficiency | Cleaning efficiency |
|---|---|---|---|---|---|---|---|---|---|---|
| | Straw outlet (Rack) / Sieve (Shoe) losses | | | | Header loss | | | | | |
| | Threshed | Un- threshed | Broken | Total | | | | | | |
| | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) |
| | | | | (a) | (b) | (A+B) | (a−b) | (A+B+a+b) | | |
| 1. | 0.315 | 0.012 | - | 0.33 | 0.25 | 1.9 | 0.6 | 2.2 | 98.1 | 97.4 |
| 2. | 0.222 | 0.007 | 0.002 | 0.23 | 0.23 | 0.7 | 0.5 | 0.9 | 99.4 | 97.4 |
| 3. | 0.051 | 0.005 | 0.006 | 0.06 | 0.10 | 0.9 | 0.2 | 1.0 | 99.3 | 96.3 |
| 4. | 0.054 | 0.002 | 0.001 | 0.06 | 0.23 | 0.6 | 0.3 | 0.7 | 99.7 | 97.2 |
| 5. | 0.049 | 0.002 | 0.000 | 0.05 | 0.23 | 0.5 | 0.3 | 0.5 | 98.2 | 99.8 |
| 6. | 0.050 | 0.004 | 0.002 | 0.06 | 0.12 | 0.8 | 0.2 | 0.9 | 99.5 | 97.8 |
| 7. | 0.006 | 0.003 | 0.004 | 0.01 | 0.07 | 0.9 | 0.1 | 0.9 | 99.3 | 97.6 |
| 8. | 0.015 | 0.002 | 0.004 | 0.02 | 0.25 | 1.3 | 0.3 | 1.4 | 99.4 | 97.7 |

**Appendix-IV**

## DETAILS OF GREASING & OILING POINTS

| 1) | **GREASE NIPPLES** | |
|---|---|---|
| | **LOCATION** | **No. of grease nipples** |
| i) | Threshing drum bearing | 02 |
| ii) | Grain discharge auger bearing | 05 |
| iii) | Carrier roller bearing | 02 |
| iv) | Track roller bearing | 12 |
| v) | Idler roller bearing | 02 |
| vi) | Header lifting cylinder | 01 |
| | **Total** | **24** |
| 2) | **OILING POINTS** | |
| i) | Header assembly | 08 |
| | **Total** | **08** |