

व्यावसायिक परीक्षण रिपोर्ट (प्रारंभिक)
COMMERCIAL TEST REPORT (Initial)

संख्या/No. : T-1698/2229/2023

माह/Month : January, 2023

Application Reference No. 28/2022-23/3

(यह परीक्षण रिपोर्ट 31/01/2028 तक वैध है / THIS TEST REPORT IS VALID UPTO 31/01/2028)



MAHINDRA, YUVO TECH+ 475 DI TRACTOR



सत्यमेव जयते
भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
(कृषि एवं किसान कल्याण विभाग)

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE
(DEPARTMENT OF AGRICULTURE AND FARMERS WELFARE)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान
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1. SPECIFICATIONS

- 1.1 Tractor:**
- Make : Mahindra
Model : YUVO TECH+ 475 DI
Brand Name : Not available
Type : Rear Wheel Drive, Standard Agricultural Tractor.
Month & year of manufacture : 02/22
Chassis number : MBNPF AJBENNL00264
Country of origin : India
- 1.2 Engine:**
- Manufacturer's address : M/s. Mahindra & Mahindra Limited
(Farm Equipment Sector)
i) Akurli road, Kandivali (E), Mumbai - 400101
ii) MIDC, Hingna Road, Nagpur - 440028
iii) Khatima Panipat Highway, Rudrapur, Udhamasinghnagar, Pin - 263153
iv) Jaipur Ajmer Road Jaipur, Pin - 303007
v) Near Bidar "T" Junction, Mahindra Nagar, Zaheerabad- 502 220
vi) Mahindra Research Valley, Mahindra World City, Plot no. 41/1, Anjur P.O., District Chengalpattu - 603004.
- Make : Mahindra
Model : MTDHI30NA044B3A
Type : Four strokes, liquid cooled, direct injection, naturally aspirated, compression ignition, diesel engine.
Serial number : NNL2JEE0002
Country of origin : India
- 1.2.1 Engine speed (rpm), (Manufacturer's recommended production settings):**
- Maximum speed at no load : 2175 to 2375
 - Low idle speed : 750 to 850
 - Speed at maximum torque : 1100 to 1400
- Rated speed, (rpm):**
- For PTO use : 2000
 - For drawbar use : 2000
- 1.3 Cylinder & Cylinder Head:**
- Number : Four
Disposition : Vertical, Inline
Bore/stroke, (mm) : 88.9/120
Capacity as specified by the applicant, (cc) : 2979
Compression ratio : 20.0 : 1
Type of cylinder head : Monoblock
Type of cylinder liners : Wet, replaceable
Type of combustion chamber : Re-entrant bowl cavity on piston head
Arrangement of valves : Overhead, inline

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17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 On the basis of test conducted the performance results have been summarized as evaluative (mandatory) / Non-evaluative (Non-mandatory) parameters applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2019 for acceptance of the tractor for the purpose of subsidies/NABARD financing are summarized as under:

Sl. No.	Characteristic	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the requirements (Yes/No)
1	2	3	4	5	6	7
17.1.1	PTO Performance :					
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: $\pm 5\%$ for PTO power and or engine power > 26 kW. $\pm 10\%$ for PTO power and or engine ≤ 26 kW.	30.2	29.1	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	30.2	29.1	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10% max.	240	244	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	185	176.1	Yes
e)	Back-up torque, percent	Evaluative	12 percent	21 (D) 12 (R)	26.6	Yes
f)	Maximum operating temperature, ($^{\circ}\text{C}$)					
	1) Engine oil	Evaluative	The declared value should not exceed the max. value specified by the oil company and the observed value under high ambient condition should not exceed the declaration.	130	104	Yes
	2) Coolant	Evaluative	The declared value should not exceed the boiling temperature of coolant under the pressurized or otherwise and the observed value under high ambient condition should not exceed the declaration.	110	95	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. Power under High ambient conditions.	2.40 Maximum (R)	0.084	Yes
h)	Smoke level, m^{-1}	Evaluative	Maximum light absorption coefficient of 3.25 per meter or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR).	3.25 Maximum (R)	0.31	Yes

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1	2	3	4	5	6	7	
17.1.2	Drawbar performance :						
a)	Max. drawbar pull with ballasted corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 70% of static mass of tractor with ballast.	17.38 (D) 17.44 Minimum (R)	21.20	Yes	
b)	Max. drawbar pull with Unballast corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 70% of static mass of tractor without ballast or with standard ballast, as the case may be.	13.08 (D) 13.11 (R) Minimum	16.24	Yes	
c)	Maximum drawbar power with Unballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in SI No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in SI No. i) a) of PTO performance in case of light weight tractors having ≤1500 kg total static mass of tractor Minimum 75 % of the engine power as referred in SI No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	24.16 (D) 23.3 (R) Minimum	26.1	Yes	
d)	Maximum transmission oil temperature, (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	120 (D)	84	Yes	
17.1.3	Power lift and hydraulic pump performance :						
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	Evaluative	Tolerance of ± 10%	16.67 (D)	15.67	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 24 kg/PTO kW. and it should be 21.5 kg/engine kW where the tractor is not provided with a PTO shaft.	13.24 (D) 6.8 (R) Minimum	11.14	Yes
b)	Maximum drop in the height of the point of application of the force after each 5 minutes interval for a total duration of 30 Minutes, (mm)	Non Evaluative	The observed value should not exceed 50 mm	50 (D) Maximum	05	Yes	

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1	2	3	4	5	6	7	
17.1.4	Brake performance at 25 kmph:						
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):						
	1)	Cold brake	Evaluative	10	10 (R)	7.26	Yes
	2)	Hot brake	Evaluative	10	10 (R)	7.38	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² , (N)		Evaluative	600	600 (R) Maximum	134 to 182	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal (s) or 400 N at hand lever		Evaluative	Yes / No	Yes	Yes	Yes
17.1.5	Noise measurement :						
a)	Maximum ambient noise emitted by the tractor, dB(A)		Evaluative	As per CMVR	88 (R)	82	Yes
b)	Maximum noise at operator's ear level, dB(A)		Evaluative	As per CMVR	96 (R)	91	Yes
17.1.6	Amplitude of mechanical vibrations at:						
	1)	Left foot rest	Non Evaluative	100 microns (max.)	100(R)	183	No
	2)	Right foot rest				128	No
	3)	Seat (with driver seated)				170	No
	4)	Steering wheel				202	No
17.1.7	Air cleaner:						
	Maximum air cleaner oil pull over, (%)		Evaluative	0.25 (Max.)	Dry type air cleaner is provided		Not applicable
17.1.8	Haulage requirements :						
a)	Gross mass of the trailers, (tones):						
	Two wheel		Non Evaluative	As specified by the manufac- turer	5.0 (D)	5.0	Yes
Four wheel		Non Evaluative	8.0 (D)		8.0	Yes	
b)	Distance travelled / liter of fuel consumption, (km/l):						
	Two wheel		Non Evaluative	As specified by the manufac- turer	4.0 to 5.0 (D)	5.59 to 5.67	No
Four wheel		Non Evaluative	4.0 to 5.0 (D)		5.11 to 5.30	No	
c)	Fuel consumption, (ml/km/tonne):						
	Two wheel		Non Evaluative	As specified by the manufac- turer	25 to 30 (D)	35.3 to 35.8	No
Four wheel		Non Evaluative	25 to 30 (D)		23.6 to 24.5	No	

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1	2	3	4	5	6	7	
17.1.9	Wetland cultivation :						
	Sealing for the following assemblies:		Evaluative	The identified assemblies should essentially meet the requirement of IS: 11082. No water ingress in the identified assembly given in column-2. If tractor does not meet the requirements of wetland cultivation, it may be recommended for dry land operation only.	There should be no ingress of water and/or mud (R)	No ingress of water and / or mud was reported	Yes
	1)	Clutch assembly	-do-				
	2)	Brake housings	-do-				
	3)	Front axle hubs	-do-				
	4)	Engine Oil	-do-				
5)	Transmission Oil	-do-					
17.1.10	Safety features :						
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulleys, silencer, hydraulic pipes (As per IS 12239 (Part2)	Meets the requirement	Yes		
b)	Lighting arrangement	Evaluative	As per CMVR	Meets the requirement	Yes		
c)	Seating requirements (Tractors having more than 1150 mm rear track width)	Non Evaluative	Should meet the requirements of IS: 12343 (As amended from time to time)	Does not meet the requirement	No		
d)	Technical requirements for PTO shaft	Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)	Meets the requirement	Yes		
e)	Dimensions of three point linkage	Non Evaluative	Should meet the requirements of IS: 4468 (Part-I) (As amended from time to time)	Does not meet the requirement	No		
f)	Specifications of linkage drawbar	Evaluative	Should meet the requirements of IS: 12953 (As amended from time to time)	Meets the requirement	Yes		
g)	Swinging drawbar (wherever fitted)	Evaluative	Should meet the requirement of IS: 12362 (Part 3) (As amended from time to time)	Not provided	Not applicable		
h)	1)	Maximum travelling speed at rated engine speed in reverse gears, kmph	Evaluative	Should not exceed 20 kmph	10.72 (Meets the requirement)	Yes	
	2)	Audible warning signal on tractor	Evaluative	As soon as the travelling speed in reverse gear reaches to 20 kmph, an audible warning signal on tractor shall be activated. The safety aspects about the operation of shuttle technology shall be brought in operation and manufacturer /dealer shall ensure the training on this aspect to operator before the delivery of tractor.	Not fitted	Not applicable	

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1	2	3	4	5	6	7		
17.1.11	Labelling of tractors (Provision of labelling plate):							
	1)	Make	Evaluative	Should conform to the requirements of CMVR along with maximum PTO Power in kW and year of manufacture in numerical form. <table border="1" style="margin-left: 20px;"><tr><td>MM</td><td>YY</td></tr></table> Digit 01 – 12 in box No.1 for MM will represent the months and next two digits in box No.2 for YY will represent the year of Manufacturing.	MM	YY	Mahindra	Yes
	MM	YY						
	2)	Model	Evaluative		YUVO TECH+ 475 DI	Yes		
	3)	Month & Year of manufacture	Evaluative		02/22	Yes		
	4)	Engine number	Evaluative		NNL2JEE0002	Yes		
	5)	Chassis number	Evaluative		MBNPF AJBENNL002 64	Yes		
6)	Maximum PTO power, (kW)	Evaluative	30.2		Yes			
17.1.12	Discard limit for:							
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by the printed literature	89.13	88.904 to 88.910	Yes		
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.300	0.103 to 0.130	Yes		
(c)	Piston diameter at skirt, (mm)	Non Evaluative		88.15	88.780 to 88.803	Yes		
d)	Ring end gap (mm):							
	-	Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by the printed literature	2.50	0.25 to 0.30	Yes	
	-	2 nd comp. ring.			2.50	0.50 to 0.55	Yes	
-	Oil ring.	2.00			0.30 to 0.40	Yes		
e)	Ring groove clearance (mm):							
	-	Top comp. ring.	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.300	Tapered	Yes	
	-	2 nd comp. ring.			0.300	0.070 to 0.076	Yes	
-	Oil ring.	0.200			0.050 to 0.052	Yes		
f)	Clearance of main bearings (mm):							
	-	Diametrical clearance	Evaluative	To be specified by the manufacturer and supported by the printed literature	0.200	0.078 to 0.105	Yes	
-	Crankshaft end float	Evaluative	0.600		0.09	Yes		

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1	2	3	4	5	6	7	
(g)	Clearance of big end bearings, (mm):						
	-	Diametrical	Evaluative	-do-	0.200	0.072 to 0.111	Yes
	-	Axial	Evaluative	-do-	0.750	0.20 to 0.25	Yes
(h)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.300	0.162 to 0.226	Yes	
(i)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.300	0.172 to 0.232	Yes	
17.1.13	Literature (Submission to test agency)						
(a)	Operator manual	Evaluative	Provided / Not Provided	Provided	Provided	Yes	
(b)	Parts Catalogue	Evaluative	Provided / Not Provided	Provided	Provided	Yes	
(c)	Workshop/ Service manual	Evaluative	Provided / Not Provided	Provided	Provided	Yes	
17.1.14	Fitment of Roll Over Protective Structures (ROPS):						
	For tractor having more than 1150 mm rear track width	Evaluative	ROPS should meet the requirement of IS:1182 or OECD code or equivalent International Standard		Not fitted	Not applicable	
17.1.15	Standard Accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor		Provided	Yes	
17.1.16	Accessories (optional)	Non Evaluative	Ballast weight, if fitted, should meet the requirement of CMVR		Provided	Yes	
17.2	CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2019):						
Sl. No.	Category of break-downs	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	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.	None	Yes		
4.	Total breakdowns	Evaluative	In no case, the total number of breakdowns should exceed five, that is, (2 major + 3 minor) or (1 major + 4 minor) or 5 minor breakdowns.	None	Yes		

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17.3 Salient Observations:

17.3.1 Laboratory tests:

17.3.1.1 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies marked as (*) in Chapter – 10 of this test report is on higher side. This calls for dampening down of vibrations especially on LHS & RHS foot rest, operator's seat & steering control wheel to improve the operational comfort and service life of components.

17.3.1.2 Operator's seat:

- i) Vertical adjustment of the seat has been provided as ± 20 against the minimum requirement of 30 mm.
- ii) Provision of adjustment of driver's mass has been provided as 50 to 120 kg against the requirement of 40 to 100 kg.
- iii) Vertical distance from Seat Index Point to the centre of accelerator pedal was measured 465 mm which is not within the required range of 230 to 460 mm.
- iv) Vertical distance from Seat Index Point to the centre of steering control wheel was measured 200 mm which is not within the required range of 265 to 385 mm.
- v) Vertical distance from Seat Index Point to foot rest was measured 535 mm which is not within the required range of 450 to 520 mm.

17.3.1.3 Operator's work place:

- i) Vertical retainer has not been provided on inner side of clutch pedal.
 - ii) Spark arresting device has not been provided in the exhaust system.
- Above parameters does not meet the requirement of IS: 12239 (Part-I) 2018. This should be looked into for necessary corrective action at production level.

17.3.1.4 PTO master shield:

PTO master shield has not been provided on tractor. This should be looked into for necessary corrective action.

17.3.1.5 Three Point linkage:

- i) The dimension viz. diameter of hitch pin & width of ball of upper hitch points, diameter does not meet the requirements of IS: 4468 (Part I)-1997
- ii) The dimension viz. diameter of hitch pin & width of ball of lower hitch points does not meet the requirements of IS: 4468 (Part I)-1997
- iii) Lateral distance from the lower hitch point to center line of tractor does not meet the requirements of IS: 4468 (Part I)-1997

Theses should be looked into for necessary corrective action.

17.3.2 Haulage Test:

- i) Specific fuel consumption with two wheel trailer and four wheel trailer were observed as 35.3 to 35.8 cc/km/ton and 23.6 to 24.5 respectively against the declaration of 25 to 30 cc/km/ton. This should be looked into for necessary corrective action.

17.4 Maintenance / Service Problems:

No noticeable maintenance or service problem was observed during the test.

17.5 Recommendation with regard to safety on tractor:

The following requirements, inter alia, may be considered for incorporation on the tractor:

- i) The working clearance around Position control lever and Draft control lever has been measured as 60 mm should be provided as per the requirement of IS: 12239 (Part-2) - 1999, (Reaffirmed in January, 2019).
- ii) The working clearance around Draft control lever & RHS fender has been measured as 45 mm should be provided as per the requirement of IS: 12239 (Part-2) - 1999, (Reaffirmed in January, 2019).

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- iii) The working clearance around foot accelerator lever & RHS fender has been measured as 50 mm should be provided as per the requirement of IS: 12239 (Part-2) - 1999, (Reaffirmed in January, 2019).
- iv) Fuel shut off knob should does not remains in stop as per the requirement of IS: 8133-2021.
- v) Identification of hand control by colour coding should be provided as per the requirement of IS: 8133-2021.
- vi) Identification of "Neutral" position in range selector gear lever and main gear lever should be provided as per of IS: 6283 (Part 1&2) – 1998 (Re-affirmed in January, 2019).
- vii) Color codes for engine revolution gauge, fuel level, water temperature, and foe hazard warning single signals have not been provided as per relevant standard.

17.6 Adequacy of Literature supplied with machine:

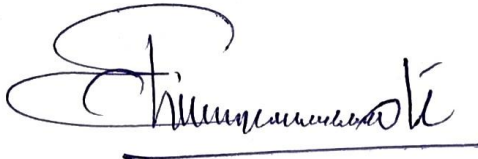
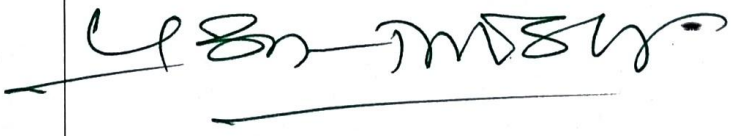
17.6.1 The following literatures were supplied with the test tractor for reference during the test:-

- a) Operator Manual for "Mahindra Yuvo Tech+ 475 DI" tractor model.
- b) Parts catalogue for "Mahindra Yuvo Tech+ 475 DI" tractor model.
- c) Service manual for "Mahindra Yuvo Tech+ 475 DI" tractor model.

17.6.2 The operator manual may be brought out for the guidance of users and service personnel as per IS: 8132-1999, incorporating, inter alia, the following

- i) Safe hitch height while using double axle trailer.
- ii) Brand name of coolant and its ratio.

TESTING AUTHORITY:

C.V. CHIMOTE TEST ENGINEER	
P. K. PANDEY DIRECTOR	

Draft test report is compiled by: **Nitesh Kumar Verma**, Agricultural Engineer.

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18. Applicant's comments

Para no.	Our reference	Applicant's comments
18.1	17.3.1.5, 17.3.2, 17.5 (i, ii, iii, vii)	Parameters will be studied and necessary action will be initiated.
18.2	17.6.2	Product literature will be studied & necessary action will be initiated.

ANNEXURE-I

BRIEF SPECIFICATION OF TRAILER DECLARED AS MATCHING TRAILER BY APPLICANT

SI No.	Item	Trailer	Trailer
1.	Make	Kisan Engineering Works, MIDC, Awadhan Dhule, (M.S.)	
2.	Model	Kisan 1062	Not available
3.	Type of trailer	Semi - Trailer	Semi – Trailer
4.	Number of axles	Single	Double
5.	Un laden Weight of Trailer, (kg)	1670	2800
6.	Fully laden Weight of Trailer, Tons, (kg)	5000	8000
7.	Overall dimensions of Trailer, (mm):		
	Overall Width	1920	2140
	Overall Length	4250	5785
	Overall Height	2025	2110
	Wheel Base	Not applicable	2835
8.	Dimension of fitted Platform, (mm):		
	Length	3210	4225
	Width	1905	2135
	Height from ground	1165	1305
9.	Brakes of Trailer	Not Provided	Not Provided

ANNEXURE-II

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S. No.	Parameters	Disc Plough	Rotavator	Puddler
1	Make	Farmking	Mahindra	Not available
2	Type	Mounted	Mounted	Mounted
3	No. of Discs / Blades	Two	36 in 7 flanges	12 (6 in 2 gangs)
4	Type of Discs / Blades	Plain concave	Hatchet	Notched concave
5	Size of Discs / Blades, (mm)	655	265 x 85 x 8	460
6	Spacing of Discs /Flanges, (mm)	495	325	165
7	Lower hitch point span, (mm)	760	785	680
8	Mast height, (mm)	480	595	500
9	Overall Dimensions, (mm):			
	Length	1480	970	1190
	Width	1060	1690	1810
	Height	1180	1105	1330
10	Gross Mass, (kg)	200	450	240
11	Working width, (cm)	2 x 30	145	210

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ANNEXURE-III

BRIEF SPECIFICATION OF HALF CAGE WHEEL

S. No.	Parameters	Specification
1	Type	Half cage wheel
2	Outer dia. (mm)	1200
3	Width (mm)	360
4	No. & Type of Lugs	14, straight lugs made of MS angle section welded to angle iron frame
5	Size of angle section, (mm)	50 x 50 x 5
6	Length of lug, (mm)	360
7	Spacing of lug, (mm)	260
8	Weight of each cage wheel (kg)	100

ANNEXURE - IV

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	56.0
2.	PTO performance test	13.92
3.	Power lift and hydraulic pump performance test	3.66
4.	Drawbar performance test	19.27
5.	Turning ability	0.50
6.	Location of centre of gravity	0.17
7.	Operator's field of vision	Nil
8.	Brake test	2.00
9.	Noise measurement	2.00
10.	Mechanical vibration test	1.00
11.	Nominal speed test	1.00
B.	FIELD TEST:	
1.	Disc ploughing	10.58
2.	Rotavation	10.21
3.	Puddling (including water proof test)	10.30
C.	HAULAGE TEST:	5.26
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	22.57
TOTAL:		158.44