

(यह परीक्षण रिपोर्ट 30/04/2024 तक वैध है। / THIS TEST REPORT IS VALID UP TO : 30/04/2024)



TAFE LTD., MF 241 DI V21 TRACTOR



सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय
कृषि, सहकारिता एवं किसान कल्याण विभाग
मशीनीकरण एवं प्रौद्योगिकी प्रभाग

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

(Department of Agriculture, Cooperation & Farmers Welfare, Mechanization & Technology Division)

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001 - 2015 Certified Institute)

Tractor Nagar, Budni (M.P.) 466 445

E-mail fmnti-mp@nic.in

Website : <http://www.fmnttibudni.gov.in>

Telephone : 07564 - 234729, 234743

T-1535/2063/2021

TAFE LTD., MF 241 DI V21 TRACTOR -Commercial (Initial)
THIS TEST REPORT IS VALID UPTO: 30/04/2024



Manufacturer : M/s Tractors and Farm Equipment Limited,
Post Box No. 3302, Old - 35 (New 77)
Mahatma Gandhi Road,
Nungambakkam, Chennai - 600 034

Month: April

Test Report No. T- 1535/2063/2021

Year: 2021



GOVERNMENT OF INDIA
CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE
TRACTOR NAGAR, BUDNI (MADHYA PRADESH) 466445, INDIA

E-mail: fmti-mp@nic.in

Web site: fnttibudni.gov.in

Telephone: 07564-234729, 234743



T-1535/2063/2021

Type of Test : **COMMERCIAL (Initial)**
 Test code/Procedure : IS: 5994-1998 (Reaffirmed in 2014),
 IS: 9253-2013 and IS: 12207-2019
 Period of Test : September, 2021 to April, 2021
 Test Report No. : **T- 1535/2063/2021**
 Month/Year : **April, 2021**

- 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 machine selected by the applicant for tests.
- iii) The results presented in this report do not in any way attribute to the durability of the machine.
- iv) This report should not be reproduced in part or full without prior permission of the Director, Central Farm Machinery Training and Testing Institute, Budni (M.P.)
- v) This report forms Part-I and User Survey report forming Part – II will be released later.

SELECTED CONVERSIONS

SELECTED CONVERSIONS			
Sl. No	Units	Conversion Factor	
1	Force:		
	1 kgf	9.80665 N	
		2.20462 lbf	
2	Power:		
	1 Mechanical horse power	1.01387	Metric horse power
		745.7 W	
	1 Metric horse power	735.5 W	
	1 kW	1.35962	Metric horse power
3	Pressure:		
	1 psi	6.895 kPa	
	1 kgf/cm ²	98.067 kPa = 735.56 mm of Hg	
	1 bar	100 kPa = 10 N/cm ²	
	1 mm of Hg	1.3332 m-bar	

ABBREVIATIONS	
apa	As per applicant
TDC	Top Dead Centre
IS	Indian Standard
Hg	Mercury
LHS /RHS	Left Hand Side/ Right Hand Side
Temp.	Temperature
N.R.	Not recorded
rpm	Revolutions per minute
O.D / I.D	Outer diameter/ Inner diameter
N.A.	Not available/Not applicable
PTO	Power take-off
R.H.	Relative Humidity
SIP	Seat Index Point



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T-1535/2063/2021

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Manufacturer : M/s Tractors and Farm Equipment Limited,
Post Box No. 3302, Old – 35 (New 77),
Mahatma Gandhi Road, Nungambakkam,
Chennai – 600 034

Location of manufacturing plant : i) **M/s Tractors and Farm Equipment**
Kalladipatti Plant, 10/205, Kalladipatti
(PO), Pincode – 624 201, Dindigul Dist.
(TN)

ii) **M/s Tractors and Farm Equipment,**
Doddapallapur Plant Plot No. – 1,
KIADB Industrial Estate, Doddapallapur,
Bangaluru (KA)

Test requested by (applicant) : The manufacturer
Selected for test by : The manufacturer
Place of running-in : At manufacturer's work place
Duration of said running-in, (h):
- Engine : 12
- Transmission : 24
Method of Selection : The tractor was submitted directly by the
Applicant for test, as the Ministry has
exempted random selection of tractors.

1. SPECIFICATIONS

- 1.1 Tractor:**
- Make : TAFE, LTD.
Model : MF 241 DI V21
Brand Name : None
Variants, if any : None
Type : Four wheeled, Rear wheel driven, Unit
Construction, General purpose, Agricultural
tractor.
Month & Year of manufacture : 08 / 20
Chassis number : MEA8D061HL2304773
Country of origin : India
- 1.2 Engine:**
- Make : Simpson & Co. Ltd.
Model : T III A S325.1 - F2
Type : Four stroke, Liquid cooled, Naturally
aspirated, Direct injection, Diesel engine.
Serial number : S325.1K99654
- 1.2.1 Engine speed(Manufacturer's recommended production setting), (rpm):**
- Maximum speed at no load : 2100 to 2200
- Low idle speed : 600 to 800
- Speed at maximum torque : 1100 to 1400
- Rated speed, (rpm):**
- For PTO use : 2000
- For drawbar use : 2000



- 1.3 Cylinder & Cylinder Head:**
 - Number : Three
 - Disposition : Vertical, inline
 - Bore/stroke, (mm) : 91.4 / 127.0
 - Capacity as specified by the applicant, (cc) : 2500
 - Compression ratio : 18.5 : 1
 - Type of cylinder head : Monoblock,
 - Type of cylinder liners : Dry, replaceable
 - Type of combustion chamber : Direct injection, Re-entrant cavity torroidal on piston crown
 - Arrangement of valves : Inline, Overhead
 - Valve clearance (cold/hot):**
 - Inlet valve, (mm) : 0.30 / 0.25
 - Exhaust valve, (mm) : 0.30 / 0.25

- 1.4 Fuel System:**
 - Type of fuel feed system : Gravity and force feed
- 1.4.1 Fuel tank:**
 - Capacity, (l) : 44.50
 - Location : Above engine, under the bonnet
 - Provision for draining of sediments/ water : **Not provided**, however A drain plug is provided in water separator.
 - Material of fuel tank : Metallic
- 1.4.2 Water Separator:**
 - Make : Hilux
 - Type : Transparent, Inverted funnel gravity separation
 - Location : On LHS of engine between fuel tank & feed pump
 - Capacity, (l) : 0.45
- 1.4.3 Fuel feed pump:**
 - Make : Bosch, India
 - Type : Plunger with hand primer
 - Model/Group combination No. : FP/KSG22AD104, F 002 A50 038
 - Provision of sediment bowl : Provided
 - Method of drive : Through cam shaft of fuel injection pump
- 1.4.4 Fuel filters:**
 - Make : Bosch, India
 - Model/Group combination No. : F 002 H20 151
 - Number : Two
 - Type of element:
 - Primary : Cloth
 - Secondary : Paper
 - Capacity of final stage filter, (l) : 0.40
- 1.4.5 Fuel Injection pump:**
 - Make : Bosch, India
 - Model/Group combination No. : F 002 A0Z 778, PES3A80D320RS2000
 - Type : Inline, Plunger
 - Serial number : 07555689
 - Method of drive : Through timing gears
 - Location : On LHS of engine



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- 1.4.6 Fuel injectors:**
- Make : Bosch, India
 - Model/Group combination No.: F002 C70 018
 - Holder number : DSLA 154 P 5514
 - Injector nozzle No. : Multi hole (Five holes)
 - Type : 25.0 – 25.8
 - Manufacturer's production pressure setting, (MPa) : 14* + 0 / - 2 degree before TDC
 - Injection timing : 1 – 2 – 3
 - Firing order
- 1.4.7 Governor:**
- Make : Bosch, India
 - Model/Group combination No. : RSV375...1000A4C1617R
 - Type : Mechanical, Centrifugal, Variable speed
 - Governed range of engine speed, (rpm) : 600 to 2200
 - Rated engine speed, (rpm) : 2000
- 1.5 Air intake system:**
- 1.5.1 Pre-cleaner:**
- Make : TAFE LTD. (apa)
 - Type : Centrifugal, transparent dust collector
 - Location : On top of main air cleaner inlet tube
- 1.5.2 Air cleaner:**
- Make : TAFE LTD. (apa)
 - Type : Oil bath
 - Location : On RHS of engine, under the bonnet
 - Range of suction pressure at maximum power, (kPa) : 3.5 to 3.6
 - Oil capacity, (l) : 0.50
 - Oil change period : Change after every 10 hours of operation in dusty condition or after every 50 hours of operation.
- 1.6 Exhaust System:**
- Type of silencer : Updraft (cylindrical)
 - Position of silencer outlet with respect to SIP, (mm):
 - Upwards : 1000
 - Longitudinal : 1160
 - Lateral : 350 (on LHS) - Range of exhaust gas pressure at maximum power, (kPa) : 7.2 to 9.6
 - Provision of spark arresting device : **Not provided**
 - Provision against entry of rain water : A bend is provided at the outlet of silencer.
- 1.7 Lubricating system:**
- Type : Forced feed-cum-splash
 - Oil sump capacity,(l) : 6.50
 - Total lub oil capacity, (l) : 7.50
 - Oil change period : First change after 50 hours and subsequently after every 200 hours of operation.
 - Cooling device, (if any) : Not provided



	Filters:	
	Type	: Full flow, spin on, paper element
	Number	: One
	Pump:	
	Type	: Rotary, lobe
	Method of drive	: Through timing gears
	Manufacturer Pressure release setting, (kPa)	: 343 to 448 (apa)
	Minimum permissible pressure, (kPa)	: 88.0 (apa)
1.8	Cooling system:	
	Type	: Forced circulation of coolant and water.
	Coolant as recommended	: M/s. Total India
	Coolant water ratio	: Not specified
1.8.1	Details of Pump	: Centrifugal, semi open impeller having six number of vanes of 69.9 mm outer diameter and driven through crankshaft pulley by a cogged "V" belt common to alternator.
1.8.2	Details of fan	: Suction type, having seven numbers of polypropylene blades of 395.0 mm outer diameter and mounted on water pump shaft
	Means of temperature control	: Thermostat
	Bare radiator capacity, (l)	: 2.70
	Total coolant capacity, (l)	: 8.50
	Expansion tank capacity (l)	: 1.00
	Radiator cap pressure, (kPa)	: 88.0
1.9	Starting System:	
	Type	: 12V, DC, electrical
	Aid for cold starting	: None
	Any other device provided for easy starting	: None
1.10	Electrical System:	
1.10.1	Battery:	
	Make	: Amco
	Model	: 95D31RMF
	Number	: One
	Type	: Lead Acid
	Capacity and rating	: 12V, 80 Ah at 20 hour discharge rate
	Location	: Rear of engine, under the bonnet
1.10.2	Starter:	
	Make	: Autolek
	Model	: M-14
	Type	: Pre-engaging, solenoid operated
	Power rating	: 12V, 2.2 kW
	Serial number	: Not available
1.10.3	Generator (Alternator):	
	Make	: Autolek
	Model	: ALT4004D
	Type	: Alternator
	Output rating	: 12V, 36 Amp
	Serial number	: Not available
	Method of drive	: Through crankshaft pulley by a cogged "V" belt common to alternator.



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1.10.4 Voltage regulator : In-built with alternator

1.10.5 Details of lights:

Description	No. & capacity of bulb	Height of the centre of beam above ground level, (mm)	Size, (mm)	Distance between centre of the beam and outside edge of tractor at standard rear track setting, (mm)
Front Lights:				
- Head lights	2, 12V, 60/55W	1020	125 Ø	690
- Parking lights	2, 12V, 5W	1340	55 x 45	225
- Turn-cum-hazard Indicator light	2, 12V, 21W	1340	110 x 45	145
Rear lights:				
- Stop-cum-tail light	2, 12V, 21/5W	1330	90 x 75	210
- Turn-cum-hazard Indicator light	2, 12V, 21W	1330	90 x 75	125
- Reflectors (Red)	2	1330	45 x 50	170
- Plough light	1, 12V, 55 W	1450	130 x 70	350
- Registration plate light	1, 12V, 5W	1140	20 x 85	850

1.10.6 Main switch : Key turn type, having Three position viz:
 i) OFF,
 ii) Circuit ON
 iii) Start

1.10.7 Light switch : Rotary type having six positions
 i) Off
 ii) Parking light + Dashboard light
 iii) Head lights (short beam) + Position II
 iv) Head lights (long beam) + Position II
 v) Turn indicator light switch
 vi) Horn push button

1.10.8 Horn:
 Make : Addon
 Type : 12V, DC, 2B, Electromagnetically vibrated diaphragm

Location : In front of radiator, under the bonnet
1.10.9 Fuse box : It contains Five number of fuses with following capacities;

Capacity	5A	10A	15A	25A
Numbers	01	01	02	01

1.10.10 Details of other electrical accessories:

1.10.10.1 Flasher Unit:

Make : BGLI
 Capacity:
 - Turn signal : 12V, 21W x 2 + 2W x 1
 - Hazard signal : 12V, 21W x 4 + 2W x 2
 Flashes/min. : 85

1.10.10.2 Seven pin trailer socket : Provided

1.10.10.3 Safety against accidental start of engine : Provided, Starter will not operate unless high / low range selection lever is in neutral position.

- 1.11 Instrument panel details:**
- i) Engine speed-cum- cumulative digital run-hour-meter (0-30) x 100.
 - ii) Coolant temperature gauge (with colour zones)
 - iii) Fuel level gauge (with colour zones)
 - iv) Lubricating oil pressure indicator lamp
 - v) Light switch (Rotary type)
 - vi) Main switch (key-turn type)
 - vii) Battery charging warning indicator lamp
 - viii) Battery voltmeter gauge (8-16 V)
 - ix) Head light long beam on indicator
 - x) Turn / hazard Light indicator
 - xi) Hazard light switch
 - xii) Mobile charging socket
 - xiii) Hand accelerator lever
 - xiv) Fuel cut-off knob
 - xv) Steering control wheel
 - xvi) Rear view mirror

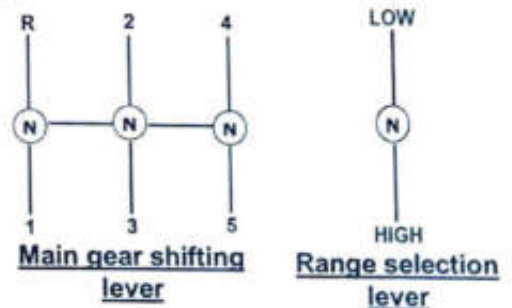
1.12 Transmission System:

1.12.1 Clutch:

- | | |
|----------------------------|---|
| Make | : Amrep |
| Type | : Dual, Dry friction plates |
| No. of friction plate(s) | : Two |
| Size (OD/ID)mm: | |
| - Transmission | : 301.8 / 196.7 Ø |
| - PTO | : 253.8 / 171.9 Ø |
| Material of clutch lining: | |
| - Transmission & PTO | : F510 / F470 (apa) |
| Method of operation: | |
| - Transmission | : By depressing foot operated clutch pedal halfway, provided on LHS of operator's seat |
| - PTO | : By depressing same foot operated clutch pedal fully, provided on LHS of operator's seat |

1.12.2 Gear box:

- | | |
|----------------------------------|---|
| Make | : TAFE |
| Type | : Mechanical, combination of constant & sliding mesh gears with epicyclic reduction unit for high / low range selection |
| Location of gear shifting levers | : Centre shift |
| Main Gear shift lever | : In front of operator's seat |
| Range selection lever | : In front of the operator's seat. |
| No. of speeds: | |
| - Forward | : 10 |
| - Reverse | : 02 |
| Gear shifting pattern | : |





- Oil capacity (l) : 26.0 (Common with differential, rear axle housing and hydraulic system).
- Oil changing period : First change after 200 hours and subsequently after every 750 hours of operation.

1.12.3 Nominal Speed:

Movement	Gear No.	No. of engine revolutions for one revolution of driving wheel	Nominal speed at rated engine speed when fitted with 13.6-28 size tyres of 610 mm radius index, (kmph)	Computed nominal speed at rated engine speed when fitted with 12.4-28 size tyres of 590 mm radius index, (kmph)
			Standard fitment	Optional fitment
Forward	L1	199.79	2.30	2.22
	L2	136.34	3.37	3.26
	L3	88.58	5.19	5.02
	L4	74.36	6.19	5.99
	L5	60.50	7.60	7.35
	H1	49.90	9.22	8.92
	H2	34.05	13.49	13.05
	H3	22.15	20.78	20.10
	H4	18.56	24.76	23.95
	H5	15.12	30.38	29.38
Reverse	LR	184.50	2.49	2.41
	HR	46.10	9.98	9.65

1.12.4 Rear differential unit:

- Type : Crown wheel & bevel pinion with differential unit accommodated inside the differential housing.
- Reduction through crown wheel & bevel pinion : 5.571 : 1 (39/07T)
- Oil capacity of final drive, (l) : 26.0 (Common with gearbox, rear axle, housing and hydraulic system).
- Oil changing period : First change after 200 hours and subsequently after every 750 hours of operation.
- Rear differential lock: : Not provided**

1.12.5 Rear axle & rear final drive:

- Type : No separated final reduction unit is provided, however crown wheel & bevel pinion with differential unit acts as final drive
- Oil capacity of final drive, (l) : 26.0 (Common with gear box, differential and hydraulic system).
- Oil changing period : First change after 200 hours and subsequently after every 750 hours of operation.

1.13 Power lift (Hydraulic System):

- Make : TAFE
- Type : Open center, live, ADDC
- No. and type of cylinder : One, single acting
- Type of linkage lock for transport : Response control knob in fully closed position acts as a transport lock.
- No. & Type of filter : One, fine wire mesh strainer into the transmission housing.



Hydraulic oil capacity. (l)	:	26.0 (Common with transmission system)
Oil change period	:	First change after 200 hours and subsequently after every 750 hours of operation.
Provision for external tapping	:	Provided
Method of draft sensing	:	Through top link

1.13.1 Hydraulic pump:

- Make	:	TAFE
- Type	:	Scotch yoke (piston pump)
- Location	:	Inside the transmission housing
- Drive	:	Through counter shaft of gear box.

Details of control levers:

- i) Position control lever
- ii) Draft control lever
- iii) Response control knob on distributor

1.13.2 Three point linkage:

Sl. No.	Observations	As per IS:4468-1997 (Part-I) (Reaffirmed in October, 2017), (Cat.I / Cat.II), (mm)	As measured (mm)	Remarks
I.	Upper hitch points:			
a)	Dia of hitch pin hole	19.30 to 19.50 / 25.70 to 25.90	19.42 / 25.74	Conforms to Cat. I & II
b)	Width of ball	44.0 (max.) / 51.0 (max)	42.50 / 43.95	Conforms to Cat. I
II.	Lower hitch points:			
a)	Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.00	22.63 / 29.00	Conforms to Cat. I & II
b)	Width of ball	34.8 to 35.0 / 44.8 to 45.0	44.26 / 44.70	Does not conform
III.	Lateral distance from lower hitch point to centre line of tractor	359 / 435	364	Does not conform
IV.	Lateral movement of lower hitch points	100 (min) / 125 (min)	175	Conforms to Cat. I & II
V.	Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position)	450 to 575 / 550 to 625	515	Conforms to Cat. I
VI.	Transport height	820 (min) / 950 (min)	835	Conforms to Cat. I
VII.	Power range (Without force)	560 (min) / 650 (min)	670	Conforms to Cat. I & II
VIII.	Leveling adjustment	100 (min) / 100 (min)	330	Conforms to Cat. I & II
IX.	Lower hitch point tyre clearance	100 (min) / 100 (min)	195	Conforms to Cat. I & II
X.	Lower hitch point height	200 (max) / 200 (max)	165	Conforms to Cat. I & II



1.13.3 Linkage geometry dimensions [Refer Fig.1(A)]:

The following are dimensions observed, corresponding to 610 mm as tyre dynamic radius index:

Sl. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
1.	Length of lower link	A	850	850
2.	Length of lift arm	B	270	270
3.	Length of lift rods	C	560	560
4.	Length of top link	D	595 to 785	710
5.	Distance of lift rod connection point from pivot point of lower link.	F	430	430
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	E	35, forward	35, forward
	-Vertically	G	115, below	115, below
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	140, behind	140, behind
	-Vertically	J	270, above	270, above
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	190, forward	190, forward
	-Vertically	L	235, above	235, above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	225	225
	- In low position	N	445	445
10.	Height of lower link hitch points when locked in transport position	--	Any height within lift range	

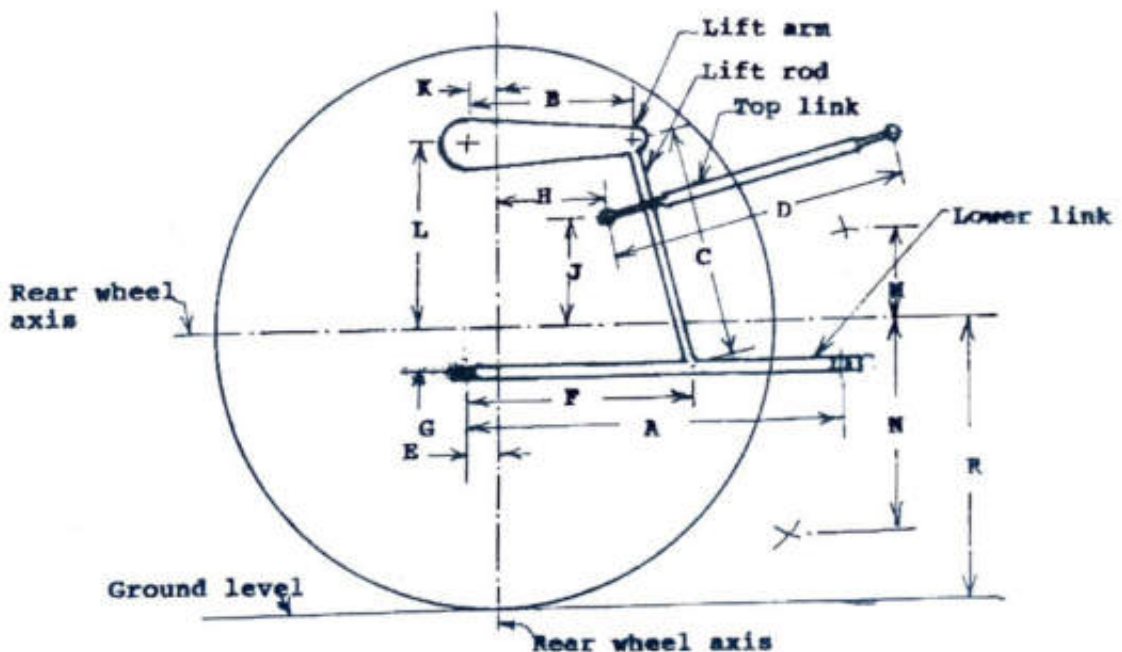


Fig.1 (A): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

1.13.4 Drawbar:
 1.13.4.1 Linkage Drawbar [Refer Fig. 1 (B)]:

Notation	As per IS: 12953-1995 (Reaffirmed in October, 2017), (Cat. I/Cat.II) (mm)	As measured, (mm)	Remarks
A	$683 \pm 1.5 / 825 \pm 1.5$	683.0	Conforms to Cat. I
B	75 (min) / 75 (min)	80.72	Conforms to Cat. I & II
C	30 (min) / 30 (min)	30.60	Conforms to Cat. I & II
D \varnothing	21.79 to 22.00 / 27.79 to 28.00	21.93	Conforms to Cat. I
E	39.0 (min) / 49.0 (min)	51.64	Conforms to Cat. II
F \varnothing	12.0 (min) / 12.0 (min)	12.56	Conforms to Cat. I & II
G	15.0 (min) / 15.0 (min)	15.51	Conforms to Cat. I & II
H \varnothing	$25 \pm 1 / 25 \pm 1$	24.89	Conforms to Cat. I & II
J	$80 \pm 1.5 / 80 \pm 1.5$	80.60	Conforms to Cat. I & II
No. of holes	7 / 9	07	Conforms to Cat. I

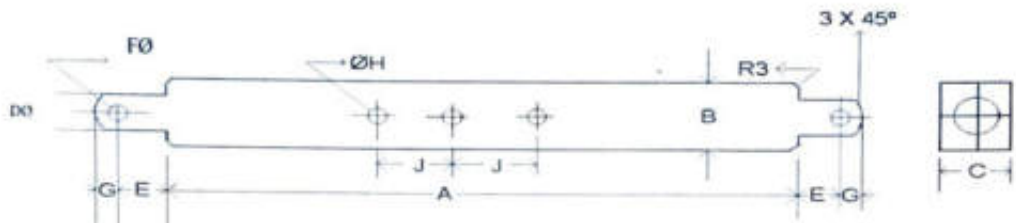


Fig. 1 (B): DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

- | | | |
|----------|---|--|
| 1.13.4.2 | Swinging drawbar | : Not provided |
| 1.13.4.3 | Provision to attach trailer brake valve | : Not provided |
| 1.14 | Power take-off shaft: | |
| | Type | : Type-I, Semi Independent |
| | Method of engaging | : (i) Standard PTO speed by a hand lever (marked as Multi/Ground-Live) provided on LHS of operator's seat
(ii) Multispeed and ground PTO speed by another hand lever (marked as N-E) provided on LHS of operator's seat |
| | No. of shaft(s) | : One |
| | PTO speed corresponding to rated engine speed, (rpm) | : 566 |
| | Distance behind rear axle, (mm) | : 300 |
| | Engine to PTO speed ratio | : 3.533 : 1 |
| | Whether the PTO shaft is capable of transmitting the full power of engine | : Yes |
| | Other speeds, (rpm) if any | : 1680 and
Clockwise –
In Low gears: 75, 110, 170, 202 & 248
In high gears: 301, 441, 679, 810 & 995
Anticlockwise –
In Low gear: 82
In high gears: 326 |



- 1.14.1 Power take-off proportional to ground speed:**
 Indicate 540 or 1000 rev/min : 540 rev/min
 Travelling distance for one revolution of take-off shaft, (m) : 0.428
 Number of power take-off shaft revolutions for one revolution of (rear) driving wheels : 8.95
 Direction of rotation with forward gear engaged (viewed from behind tractor) : Clockwise

Remark: Multispeed and ground PTO speed of same speed (rpm) of PTO shaft can be achieved in stationary and in dynamic condition by disengaging and engaging differential shaft by a hand lever (marked as N-E) provided on LHS of operator's seat.

1.14.2 Specifications of Power Take-Off Shaft:

Specification	As per IS:4931-1995 (Type-I) (Reaffirmed in 2014),	As observed	Remarks
Nominal speed (rpm)	540 ± 10	540 rpm of PTO shaft corresponds to 1908 rpm of engine.	Conforms
No. of splines	6	6	Conforms
Direction of rotation	Clockwise	Clockwise	Conforms
Location	The position of the centre of the end of PTO shaft shall be within 50 mm to right or left of the centre line of the tractor	In the centre line of tractor	Conforms
Dimensions (mm) [Refer Fig. 2]:			
D∅	34.79 ± 0.06	34.83	Conforms
d∅	28.91 ± 0.05	28.87	Conforms
B∅	29.4 ± 0.1	29.43	Conforms
A∅ (Optional)	8.3 ± 0.5	Not available	Not applicable
W	8.69 – 0.09 – 0.16	8.60	Conforms
a	7	7	Conforms
b (Optional)	25 ± 0.5	Not available	Not applicable
c	38	38	Conforms
X	30°	30°	Conforms
B	76 (min)	86.48	Conforms
h	450 to 675	485	Conforms

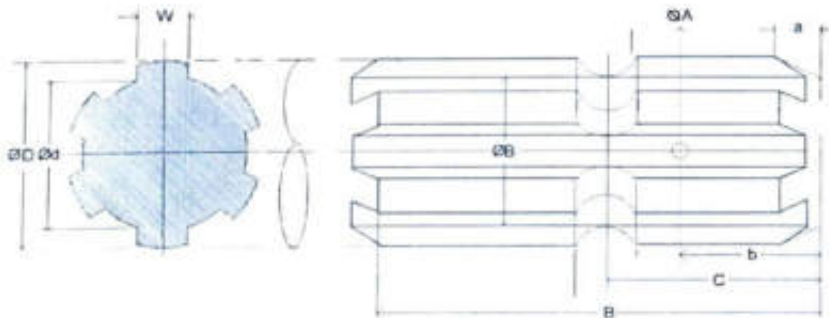


Fig. 2: DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT



- 1.14.2 Power Take-off shaft Master Shield : Not provided**
- 1.15 Towing hitch:**
- 1.15.1 Front:**
- Type : Clevis
 Location : At front, on front bumper
Height above ground level, (mm) : 660 (fixed)
 Type of adjustment : None
 Dia of pin hole, (mm) : 30.75
 Width of clevis, (mm) : 53.60
- 1.15.2 Rear:**
- Type : Clevis
 Location : At the rear of differential housing
 Height above ground level, (mm):
 - Maximum : 705
 - Minimum : 480
 No. of position : 12
 - Type of adjustment : By changing and reversing the position of hitch on its mounting bracket
- Distance of hitch point,(mm):
 - From rear axle centre : 425
 - From power take-off shaft end : 125
 Dia of pin hole, (mm) : 32.90
 Width of clevis, (mm) : 70.24
- 1.16 Steering system:**
- Make : Rane
 Type : Mechanical, re-circulating ball and nut, having double drop arm
 Location : Above gearbox housing
 Method of operation : Manual, by steering control wheel
 Diameter of steering control wheel, (mm) : 450
 Lubricant capacity (l) : 0.89
 Oil change period : Change after every 1200 hours of operation.
- 1.17 Brakes:**
- 1.17.1 Service Brake:**
- Make : TVS Girling
 Type : Mechanical, dry discs
 Location : On rear axle shaft, inside the trumpet housing
 No. of disc (s) : Two (on each wheel side)
 Area of liners. (cm²) : 905.2 (on each wheel side)
 Material of liners : TVS AF 3456 (apa)
 Method of operation : Independent or combined pedal operation by right foot.



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- 1.17.2 Parking Brake:**
Type : Pawl and ratchet arrangement
Method of operation : Service brake act as parking brakes, when locked in position by a hand lever provided on LHS of operator's seat.
- 1.18 Wheel Equipment:**
- 1.18.1 Steering Wheel(s):**
Make : J.K. Tyre
Number : Two
Type of tyre : Pneumatic, ribbed
Size : 6.00 – 16
Ply rating : 08
Maximum permissible load on each tyre at inflation pressure recommend for road work, (kgf) : 450 @ 230 kPa (As per tyre manufacturer)
Recommended inflation pressure, kPa :
- for field work : 200
- for transport : 230
Track width, (mm) : 1340 (std.) & 1540,
Method of changing track width : By reversing wheel disc on offset rim lugs
Make & size of rim : WIL & 4.50 x 16
- 1.18.2 Driving wheel:**
Make : J.K. Tyre
Number : Two
Type of tyre : Pneumatic, traction
Size : 13.6-28
Ply rating : 12
Maximum permissible load on each tyre at inflation pressure recommend for road work, (kgf) : 1180 at 130 kPa (As per ITTAC manual)
Recommended inflation pressure, (kPa) :
- for field work : 98
- for transport : 110
Track width, (mm) : 1345 (Std.), 1435, 1535, 1575, 1675, 1775 & 1875
Method of changing track width : By reversing and changing position of wheel disc on offset rim lugs
Make & size of rim : WIL & W11 x 28
- 1.18.3 Wheel base (mm)** : 1930
Method of changing the wheel base, if any : None
- 1.19 Operator's seat:**
Make : Harita Seating System Ltd
Type : Cushioned seat with back rest
Type of suspension : Two helical coil springs
Type of dampening : Hydraulic shock absorber
Range of adjustment,(mm):
- Vertical : Nil
- Lateral : Nil
- Longitudinal : ± 75



- 1.20 Provision for safety and comfort of operator:**
- 1.20.1 Conformity with IS: 12343-1998 (Reaffirmed in 2014)**
All parameters meet the minimum requirements of IS: 12343-1998, (Re-affirmed in 2014), **except the following:**
- Inclination of backrest is measured as 17 degree against the requirement of 10 ± 5 degree
 - Vertical distance from seat index point to centre of steering control wheel is measured as 160 mm against the requirement of 175 to 385 mm..
 - Lateral distance from seat index point to centre of clutch pedal is measured as 340 mm against the requirement of 75 to 300 mm..
- 1.20.2 Conformity with IS: 6283 (Part-1) – 2006 (Re-affirmed in 2014) & IS: 6283 (Part-2) – 2007 (Re-affirmed in 2014):**
All the controls are identifiable with symbols as per IS: 6283 (Part-1) – 2006 (Re-affirmed in 2014) & IS: 6283 (Part-2) – 2007 (Re-affirmed 2014)), **except the following:**
- Oil lubricant, type and frequency chart has not been provided on the tractor.
- 1.20.3 Conformity with IS:8133-1983 (Re-affirmed in 2014), except the following:**
Location and movement of various controls meets the requirement of IS:8133-1983 (Re-affirmed in 2014).
- 1.20.4 Conformity with IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017):**
Meets the all requirements of IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017), **except the following:**
- Width of foot step is measured as 190 mm against the minimum requirement of 200 mm.
 - Spark arrester has not been provided in exhaust system
- 1.20.5 Conformity with IS:12239 (Part-2)-1999 (Re-affirmed in 2014):**
Meets the requirements of IS:12239 (Part-2)-1999 (Re-affirmed in 2014)), **except the following:**
- Master shield around the PTO shaft has not been provided.
 - Working clearance between hydraulic position control and draft control lever is measured as 30 mm against the minimum requirement 70 mm.
- 1.20.6 Conformity with IS: 14683 – 1999 (Re-affirmed in 2014) :**
All lighting arrangements meet the requirements of IS: 14683-1999 (Re-affirmed in 2014)
- 1.20.7 Rear view mirror:**
Rear view mirror has been provided
- 1.20.8 Slow moving emblem:**
Slow moving vehicle emblem has been provided.
- 1.21 Labelling of tractor as per IS: 10273-1987 (Reaffirmed in March, 2014):**
Locations of labelling plate:- It is riveted on LHS of scuttle assembly and provides the following information.

Name of Manufacturer	:	TRACTORS AND FARM EQUIPMENT LIMITED, Chennai, Tamil Nadu, India
Make	:	TAFE
Model	:	MF 241 DI V21
Month & Year of manufacture	:	08 / 20
Engine Serial Number	:	S325.1K99654
Chassis Serial Number	:	MEA8D061HL2304773
Maximum PTO Power, kW	:	27.2
Specific fuel consumption, g/kWh	:	265



1.22 Ballast Mass (kg):

Particular		As used during drawbar test	As used during field test		As used during haulage test
			Dry land operation	Wet land operation	
Front	C.I. weight	50	50	Nil	50
	Water	Nil	Nil	Nil	Nil
Rear	C.I. weight	270	270	Full cage wheel of 145 kg each	270
	Water	230	230		230
	Additional weight, if any		Nil	Nil	

1.22.1 Standard ballast, if any:

Particulars	Front	Rear
C.I. weight, (Kg)	60	70
Location	Bumper on front acts as standard ballast mass On centre of rear wheels	

1.23 Masses:

Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	With standard ballast	670	1190	1860
ii)	With ballast as used during drawbar performance test	740	1670	2410
iii)	With ballast as used during dry land field operation test (including trailer hitch, canopy & linkage drawbar)	740	1670	2410
iv)	As used during wet land operation test (including canopy & linkage drawbar)	660	1115	1775
v)	With ballast as used during haulage test (including trailer hitch, canopy & linkage drawbar)	740	1670	2410

1.24 Overall dimensions:

Condition	Length, (mm)	Width, (mm)	Height, (mm)		Ground Clearance, (mm)
			With exhaust pipe	Without exhaust pipe	
With standard ballast	3320	1700	2240	1700 (At top of pre air cleaner)	340 (Below transmission housing drain plug)

1.25 Number of external lubricating points:

- Oiling : Nil
- Grease nipples : 16
- Grease cups : 02

1.26 Colour of tractor:

- Chassis & engine : Charcoal grey
- Sheet metal- Mudguard & Bonnet : Red
- Rim & disc : Silver



1.27 Optional features:

1.27.1 Steering system

- Make : Danfoss
- Type : Hydrostatic, power steering
- Location : Above clutch housing
- Make of distributor : Danfoss
- Type : Hydrostatic, open center
- Location : Above clutch housing
- Make of pump : Danfoss
- Type & location : Gear & on RHS of engine
- Method of drive : Through timing gears
- Make, type & No. of hydraulic cylinder : Rane, double acting, single connecting & Two
- Location : On backside, LHS & RHS front axle,
- Oil capacity, (l) : 1.8
- Oil change period : Not specified

1.27.2 Drive wheel (s)

- Size and ply rating : 12.4 – 28 & 8PR
- Maximum permissible load on each tyre at inflation pressure recommend for road work, (kgf) : 1030 at 110 kPa (As per ITTAC manual)

2. FUEL AND LUBRICANTS

- 2.1 Fuel** : The High-speed diesel oil supplied by M/s Indian Oil Corporation Limited having density of 0.836 g/cc at 15°C was used.

2.2 Lubricants:

S. No.	Particulars	As recommended by the manufacturer	As used during the test
1.	Engine and air cleaner oil	SAE 20W40	As recommended
2.	Gear box, differential, rear axle housing, final drive and hydraulic system oil	Tract Elf SF3 I	Oil originally filled in the tractor systems were not changed
3.	Steering system oil	Power Tract Elf SF3	--do--
4.	Grease	Servo Grease MP	MP Grease



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3. PTO PERFORMANCE TEST

Date(s) of test : 02.11.2020 & 03.11.2020

Tractor run at the Institute prior to start of PTO test (h) : 8.52

PTO test (h)

Type of dynamometer bench used : Fuchino ESF 1000S, Eddy Current

- 3.1 The results of power take-off performance test are tabulated in Table-1 and graphically represented in Fig. 3, 4 and 5.

Table – 1

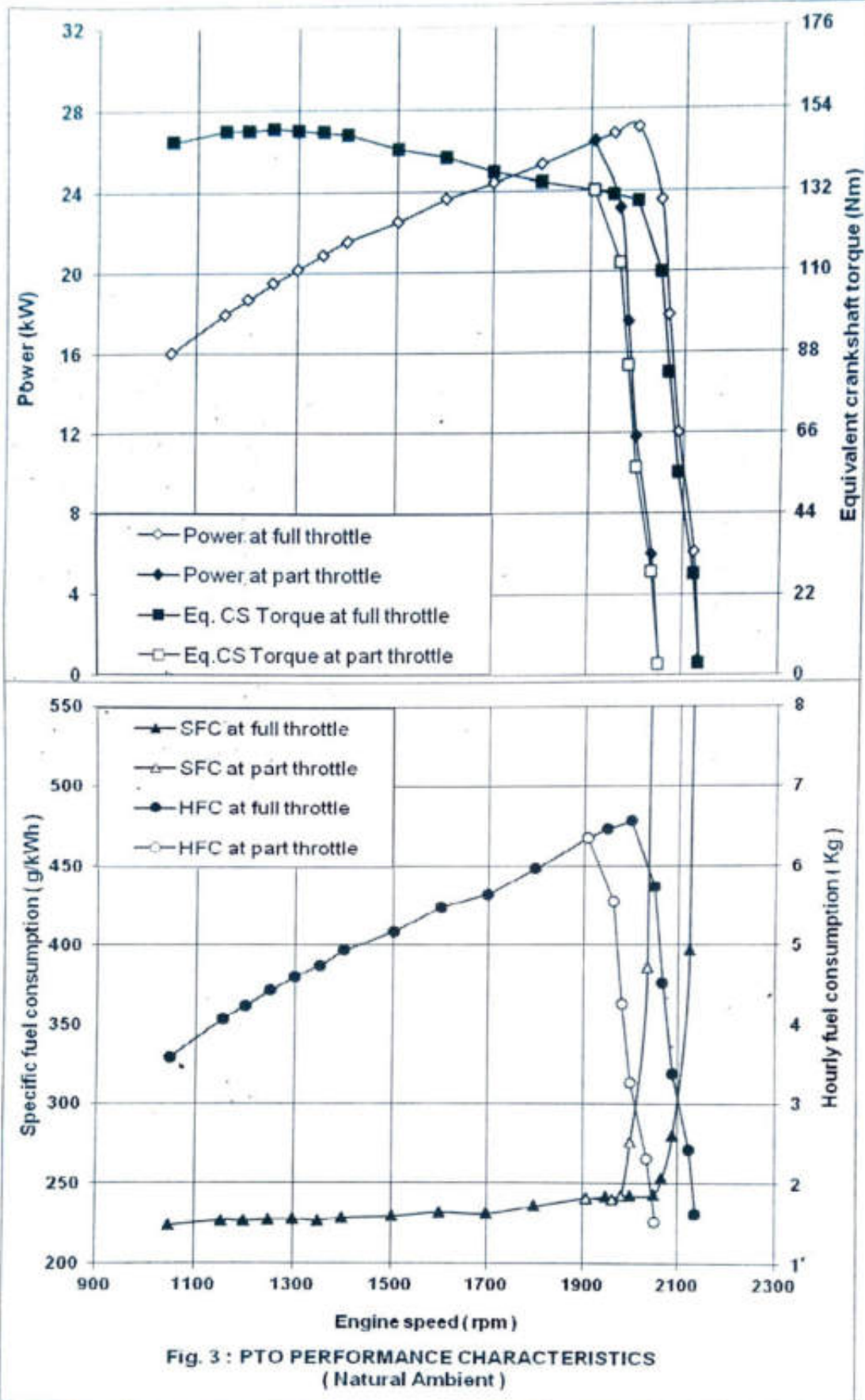
Power, (kW)	Speed (rpm)		Fuel consumption			Specific energy (kWh/l)
	PTO	Engine	(l/h)	(kg/h)	Specific, (kg/ kWh)	
1	2	3	4	5	6	7
a) Maximum power – 2 hours test:						
27.1	566	2000	7.85	6.56	0.242	3.45
26.2	566	2000	7.61	6.36	0.243	3.44*
b) Power at rated engine speed (2000 rpm):						
27.1	566	2000	7.85	6.56	0.242	3.45
26.2	566	2000	7.61	6.36	0.243	3.44*
c) Power at standard power take-off speed (540 ± 10 rpm):						
26.4	540	1908	7.60	6.35	0.241	3.47
25.7	540	1908	7.34	6.14	0.239	3.50*
d) Varying loads at rated engine speed: (2000 rpm)						
i) Torque corresponding to maximum power available at rated engine speed:						
27.1	566	2000	7.85	6.56	0.242	3.45
ii) 85% of the torque obtained in (i):						
23.6	580	2049	6.85	5.73	0.243	3.45
iii) 75% of the torque obtained in (ii):						
17.8	585	2067	5.41	4.52	0.254	3.29
iv) 50% of the torque obtained in (ii):						
12.0	591	2088	4.03	3.37	0.281	2.98
v) 25% of the torque obtained in (ii):						
6.1	601	2123	2.89	2.42	0.397	2.11
vi) Unloaded:						
0.7	605	2137	1.93	1.61	2.300	0.36
e) Varying loads at Standard PTO Speed: (540 ± 10 rpm)						
i) Torque corresponding to maximum power available at standard PTO speed:						
26.4	540	1908	7.60	6.35	0.241	3.47
ii) 85% of the torque obtained in (i):						
23.1	556	1964	6.64	5.55	0.240	3.48
iii) 75% of the torque obtained in (ii):						
17.5	561	1982	5.08	4.25	0.243	3.45
iv) 50% of the torque obtained in (ii):						
11.8	566	2000	3.90	3.26	0.276	3.03
v) 25% of the torque obtained in (ii):						
6.0	576	2035	2.76	2.31	0.385	2.17
vi) Unloaded:						
0.6	581	2053	1.82	1.52	2.533	0.33

* Under high ambient conditions



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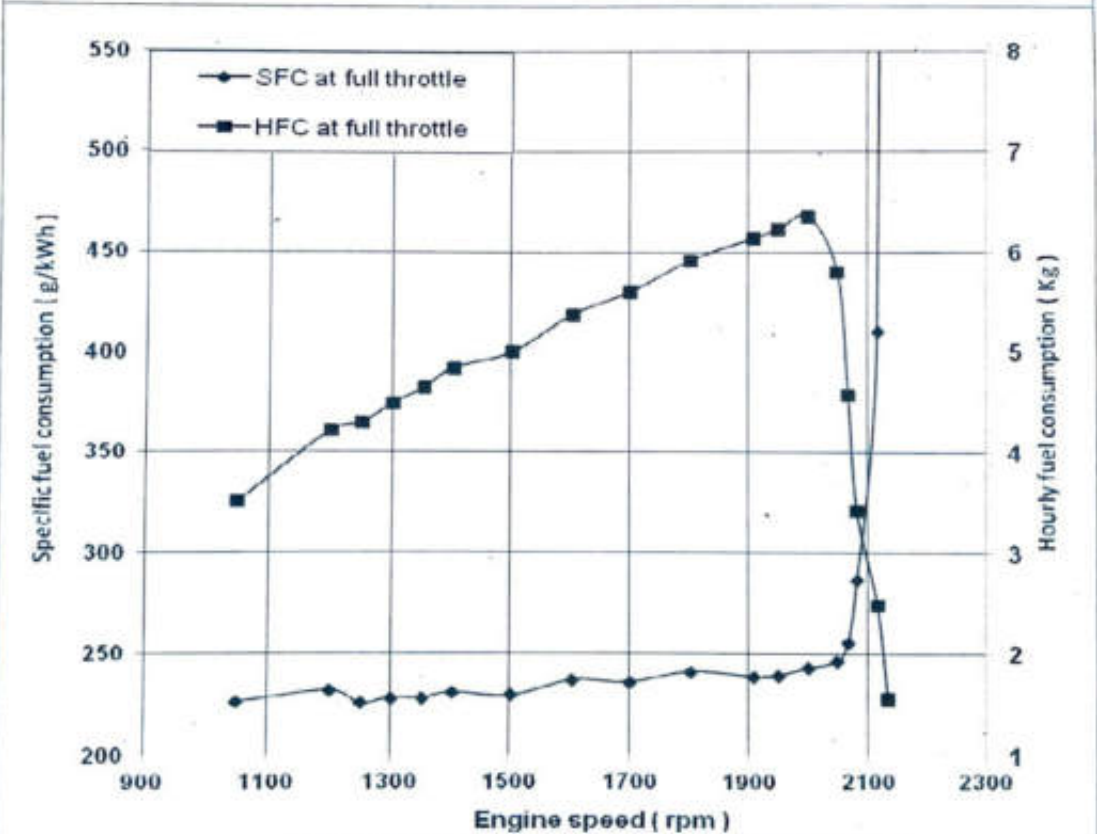
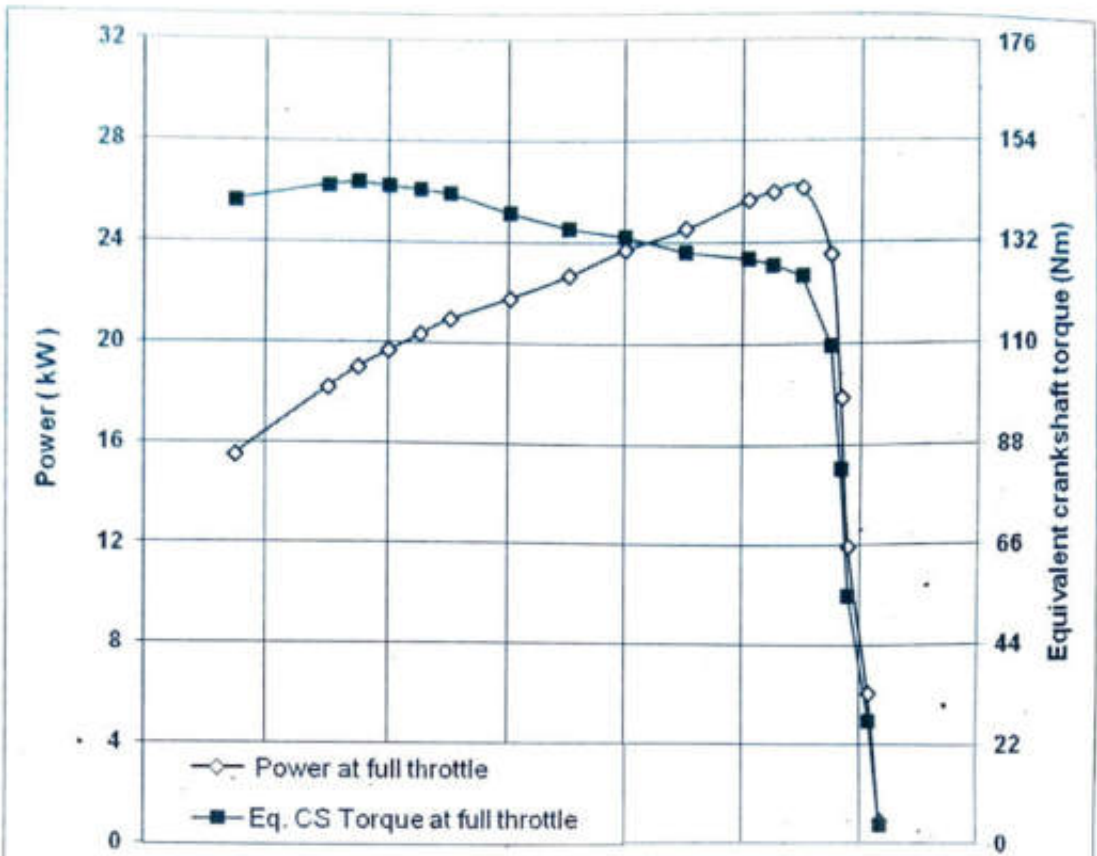
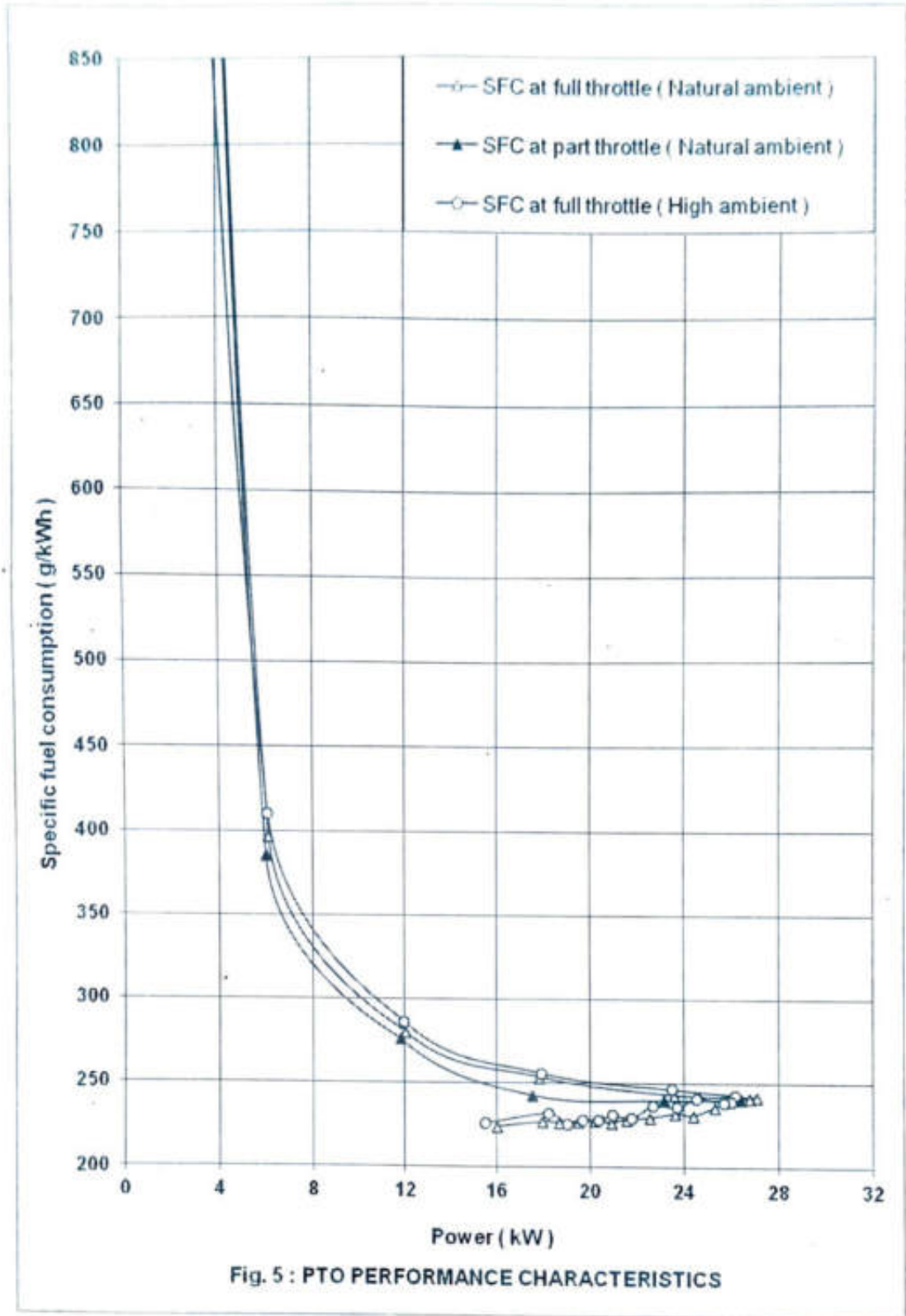


Fig. 4 : PTO PERFORMANCE CHARACTERISTICS (High Ambient)





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Sl. No.	Parameters	Natural Ambient	High Ambient
i)	No load maximum speed, (rpm)	2137	2134
ii)	Equivalent crankshaft torque at maximum power, (Nm)	129.4	124.9
iii)	Equivalent crankshaft torque at rated engine speed, (Nm)	129.4	124.9
iv)	Maximum equivalent crank shaft torque, (Nm)	148.8	145.1
v)	Engine speed at maximum equivalent crankshaft torque, (rpm)	1251	1251
vi)	Backup torque, (%)	15.0	16.2
vii)	Smoke level at 80 % of max. power, (m^{-1})	0.17	--
viii)	Range of atmospheric condition :		
	- Temperature, ($^{\circ}C$)	26 to 29	42 to 45
	- Pressure, (kPa)	98.9 to 99.5	99.9 to 100.3
	- Relative humidity, (%)	28 to 35	09 to 16
ix)	Maximum Temperature, ($^{\circ}C$):		
	- Engine oil	109	124
	- Coolant	91	107
	- Fuel	50	66
	- Air intake	38	51
	- Exhaust gas	461	465
x)	Pressure at maximum power:		
	- Intake air, (kPa)	3.5 to 3.6	4.3
	- Exhaust gas, (kPa)	7.2 to 9.6	27.2 to 34.1
xi)	Consumptions:		
	Lub. Oil (g/kWh)	--	0.33
	-Coolant (% of total coolant capacity)	--	1.17

4. DRAWBAR PERFORMANCE TEST

Date(s) of test : 08.12.2020, 10.12.2020 & 11.12.2020
Tractor run at the Institute prior to start of drawbar performance test, (h) : 19.28
Type of track : Concrete

Height of drawbar, (mm):

- With standard ballast : 600
- With ballast : 550

- 4.1 The results of drawbar performance test consisting of maximum power and pull with standard ballast, with ballast and ten hours test are tabulated in **Table – 2**. The results of the tests with ballast are also represented graphically in **Fig. 6 & 7**.



Table - 2

DRAWBAR PERFORMANCE TEST

G r a d e	Travel Speed (km/h)	Draw bar power (kW)	Draw bar pull (kN)	Engine Speed (rpm)	Wheel Slip (%)	Fuel consumption		Specific Energy (kW/h)	Atmospheric conditions			Temperature (°C)		Max amb air temp (°C)		
						(kg kWh)	(l/h)		Temp (°C)	Hum idity (%)	Wind speed (m/s)	Wind dir (°)	Eng ine oil temp (°C)			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i) Maximum power test (Tractor with standard ballasted condition):																
L1	2.10	9.8	16.87	2079	15.2	0.350	4.10	2.39	31	99.0	47	38	78	79	93	17.63
L2	3.06	14.3	16.78	2063	15.0	0.324	5.54	2.58	31	99.1	39	39	78	81	96	17.46
L3	4.58	21.5	16.92	2001	15.0	0.313	8.05	2.67	30	99.2	42	37	77	85	99	17.35
L4	5.88	23.0	14.08	2001	8.4	0.292	8.03	2.86	30	99.3	43	37	63	84	103	16.36
L5	7.40	23.3	11.33	2001	6.2	0.287	8.00	2.91	29	99.3	37	36	58	84	98	13.34
H1	9.09	24.0	9.51	2000	4.9	0.280	8.04	2.99	28	99.4	40	34	52	84	91	11.40
ii) Maximum power test (Tractor with ballasted condition):																
L1	2.09	11.8	20.33	2072	15.0	0.344	4.86	2.43	28	98.9	36	35	78	80	97	21.08
L2	3.01	17.1	20.40	2049	15.1	0.320	6.55	2.61	29	99.0	35	36	78	82	101	21.28
L3	4.88	23.0	16.94	2001	8.5	0.291	8.01	2.87	28	99.1	38	35	75	85	100	19.96
L4	5.98	24.1	14.50	2002	6.0	0.281	8.10	2.98	27	99.2	39	34	61	82	96	16.80
L5	7.44	23.9	11.56	2002	4.8	0.282	8.06	2.96	26	99.2	48	33	56	83	93	13.59
H1	9.10	24.2	9.57	1996	4.0	0.282	8.13	2.96	25	99.3	49	31	53	82	91	11.29

Table-2 Contd...



Contd..Table-2

Gear	Travel Speed (km/h)	Draw-bar power (kW)	Draw-bar pull (kN)	Engine Speed (rpm)	Wheel Slip (%)	Fuel consumption		Specific Energy (kWh/l)	Atmospheric conditions			Temperature (°C)			Max. ambient pull (kN)	
						(kg/kWh)	(l/h)		Temp (°C)	Pressure (kPa)	RH (%)	Fuel	Trans. oil	Coolant (water)		Eng. oil
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
iii) Five hours test at 75 percent of pull obtained at max. Power (Ballasted wheeled tractor):																
L3	5.20	18.4	12.72	2057	5.7	0.298	6.62	2.78	20	99.2	40	26	52	79	91	--
iv) Five hours test at pull corresponding to 15 percent wheel slip (Ballasted wheeled tractor):																
L2	3.09	17.5	20.41	2054	---	0.315	6.69	2.62	21	99.0	45	26	64	77	91	---

v) The coolant (water) and lubricating oil consumption during 10 hours test were observed as 5.0 ml/h & Nil respectively.

vi) Tyre Creeping. (mm):
 - LHS : 65
 - RHS : 65

vii) Maximum temperatures during entire drawbar test, (°C):
 -Engine oil : 103
 -Coolant (water) : 90
 -Transmission oil : 83
 -Fuel : 39



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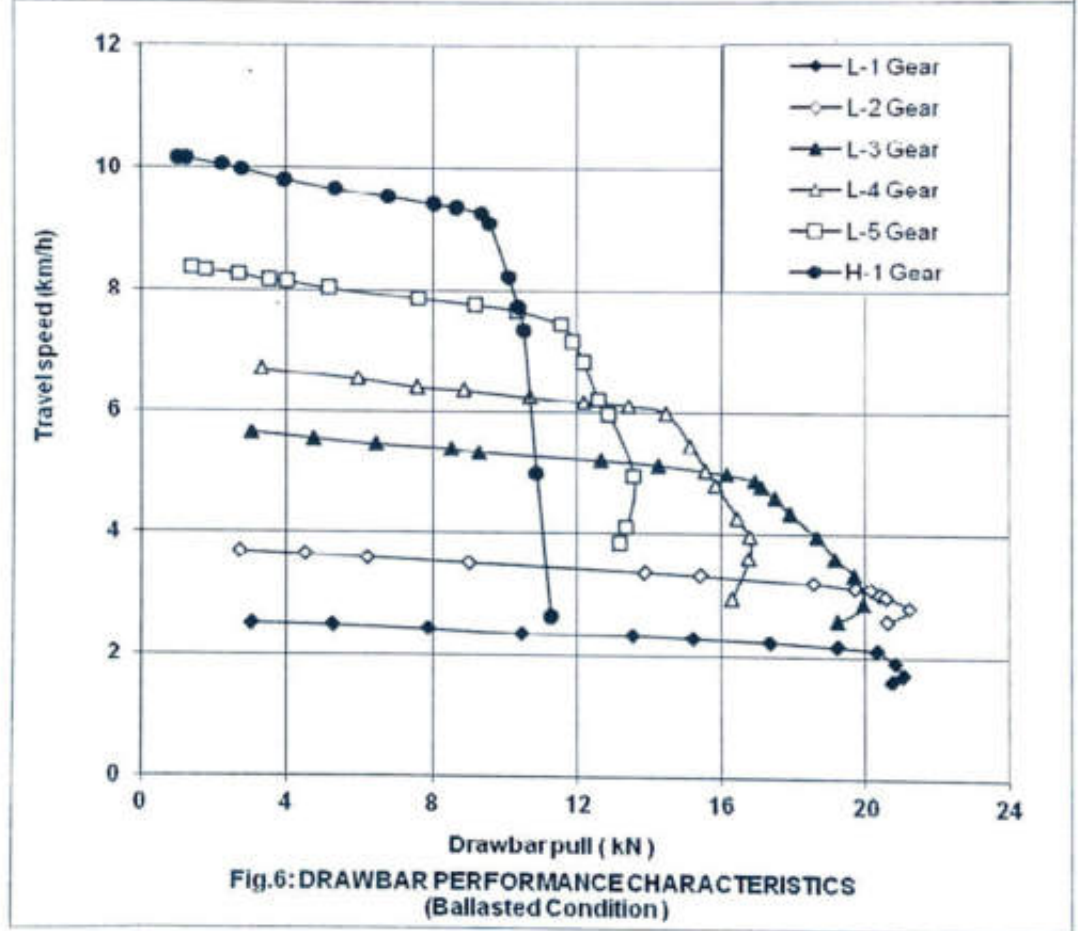
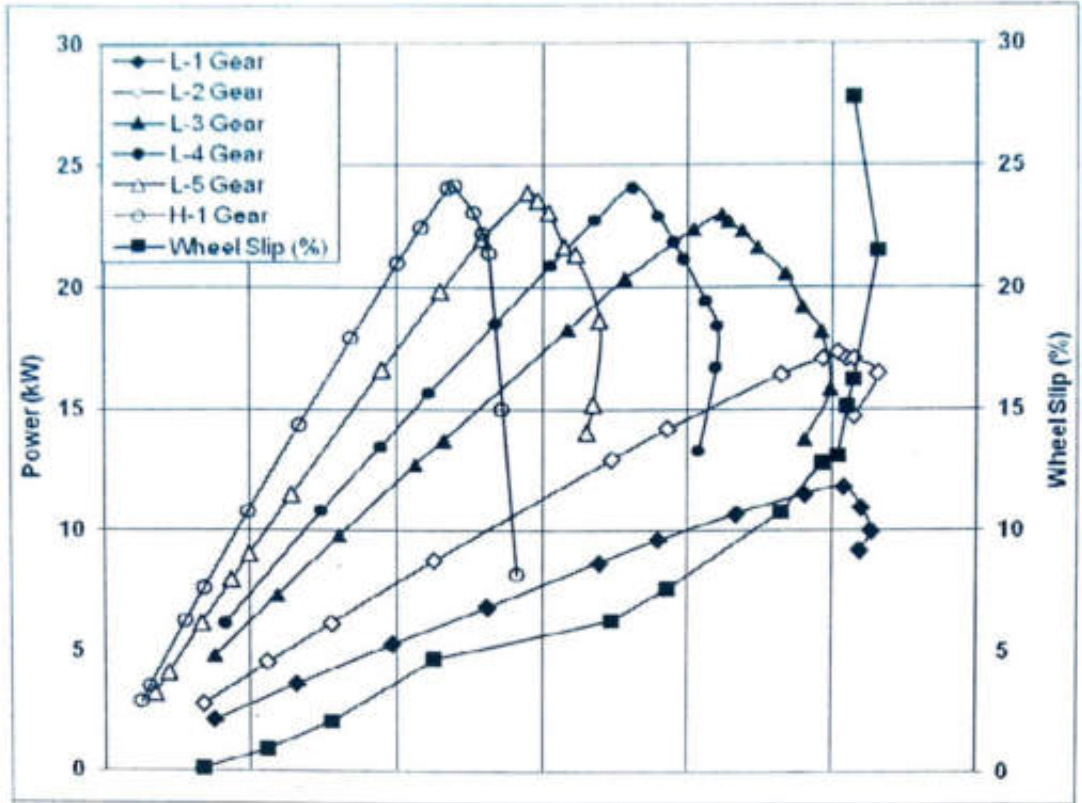
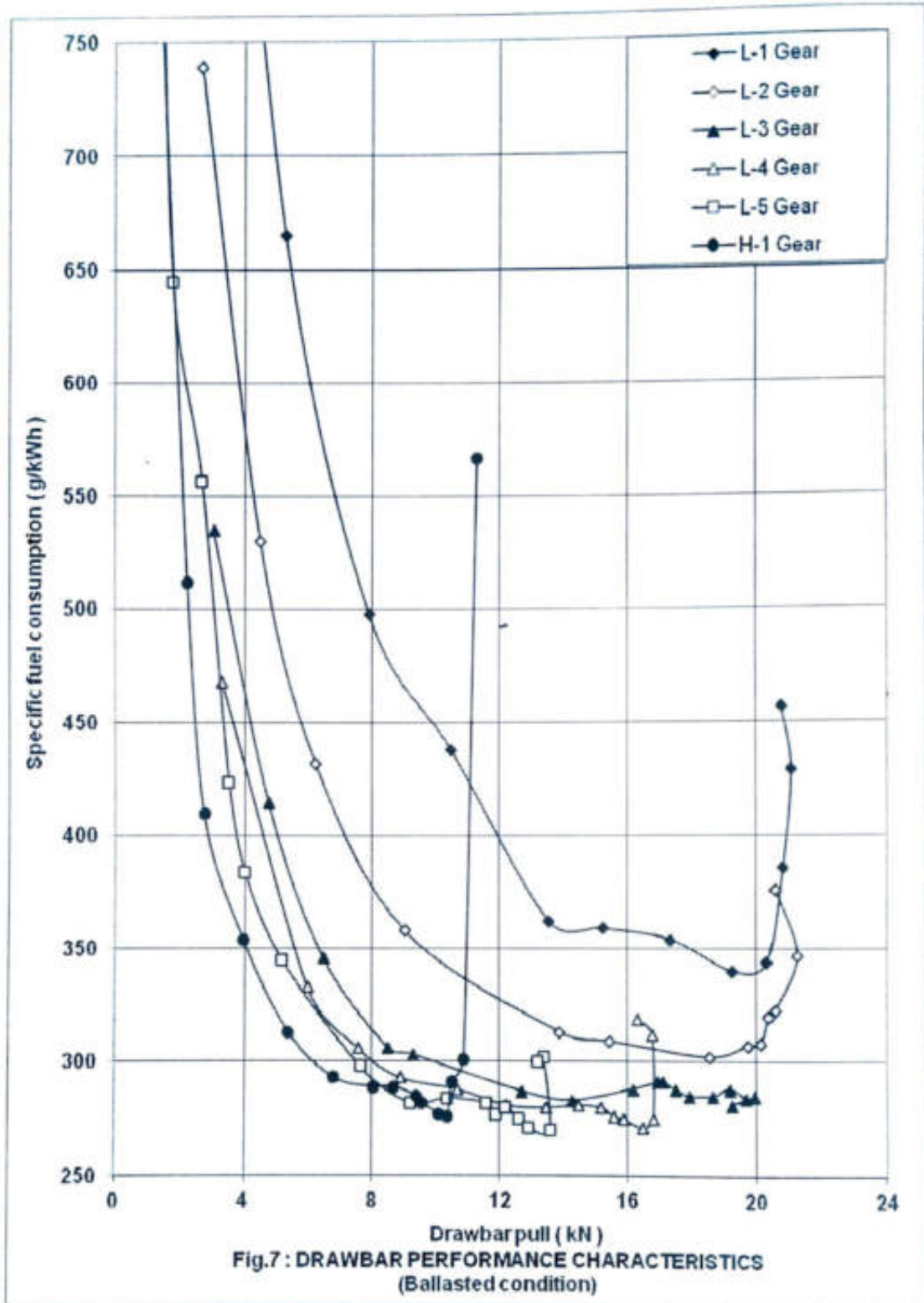


Fig.6: DRAWBAR PERFORMANCE CHARACTERISTICS (Ballasted Condition)



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5. POWER LIFT & HYDRAULIC PUMP PERFORMANCE TEST

Date (s) of test : 12.12.2020
 Tractor run at the Institute prior to start of hydraulic test, (h) : 37.61
 Pump speed at rated engine speed (rpm) : 566

5.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed, (l/min) : 15.75
 Maximum hydraulic power, (kW) : 4.0
 Pump delivery rate at maximum hydraulic power, (l/min) : 13.65
 Pressure at maximum hydraulic power, (MPa) : 17.5
 Sustained pressure of the open relief valve, (MPa) : 19.5
Tapping point:
 a) Relief valve test : External circuit
 b) Pump performance test : External circuit
 Temperature of hydraulic fluid, (°C) : 60 to 62

5.2 Lifting capacity test :

Test	Height of lower hitch point above ground in down position, (mm)	Vertical movement with lifting forces, (mm)	Maximum corrected force exerted through full range, (kN)	Corresponding pressure, (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical (Degree)
At hitch points	165	580	13.52	17.55	9.94	--
On the standard frame	165	575	10.97	17.55	14.75	10.9

5.3 Maintenance of lift load:

Force applied at the frame, (kN) : 9.87
 Temperature of hydraulic fluid at the start of test, (°C) : 60

Test data:

Elapsed time (minute)	05	10	15	20	25	30
Cumulative drop in height of lift, (mm)	10	20	25	30	35	40



6. BRAKE TEST

6.1 Service brake:

6.1.1 Cold brake test:

Date of test: : 11.09.2020, 14.09.2020 & 14.12.2020
 Type of track : Concrete
 Maximum attainable speed (kmph):
 - standard ballasted Tractor : 33.44
 -Road Ballasted Tractor : 33.44

		At maximum attainable speed			
Standard ballasted tractor	Braking device control force, (N)	518	465	411	358
	Mean deceleration, (m/sec ²)	3.66	3.14	2.87	2.50
	Stopping distance, (m)	11.78	13.75	15.06	17.26
With road Ballasted tractor	Braking device control force, (N)	534	483	431	380
	Mean deceleration, (m/sec ² .)	3.49	3.19	2.94	2.50
	Stopping distance, (m)	11.81	13.53	14.70	17.26

		At 25 kmph travel speed			
Standard ballasted tractor	Braking device control force, (N)	507	458	409	360
	Mean deceleration, (m/sec ²)	3.50	2.97	2.73	2.50
	Stopping distance, (m)	7.18	8.11	8.84	9.65
With road Ballasted tractor	Braking device control force, (N)	560	502	444	387
	Mean deceleration, (m/sec ² .)	3.35	3.02	2.70	2.50
	Stopping distance, (m)	7.34	8.00	8.94	9.65

6.1.2 Brake fade test:

		At maximum attainable speed			
With road Ballasted tractor	Braking device control force, (N)	592	529	465	402
	Mean deceleration, (m/sec ²)	3.52	3.42	2.99	2.50
	Stopping distance, (m)	11.80	12.60	14.43	17.26

		At 25 kmph travel speed			
With road Ballasted tractor	Braking device control force, (N)	596	544	491	439
	Mean deceleration, (m/sec ²)	3.29	3.11	2.77	2.50
	Stopping distance, (m)	7.48	7.75	8.71	9.65

Maximum deviation of tractor from its original course, (m) : None
 Abnormal vibration : None
 The brakes were heated by : Self braking

6.2 Parking brake test:

Particulars	Parked on 18 percent slope		Parked on 12 percent slope with trailer of 1.86 tones.	
	Facing up	Facing down	Facing up	Facing down
Braking device control force, (N)	248	209	320	385
Efficacy of parking brake	----- Effective -----			



7. NOISE MEASUREMENT

7.1 Noise at bystander's position:

Date of test	: 09.09.2020
Type of track	: Concrete
Background noise level, dB (A)	: 50
Atmospheric conditions:	
Temperature, (°C)	: 36
Pressure, (kPa)	: 97.0
Relative humidity, (%)	: 64
Wind velocity, (m/s)	: 1.7

TEST DATA:

S. No.	Gear	Travelling speed before acceleration, (kmph)	Noise level, dB (A)
(i)	L1	1.88	79
(ii)	L2	2.81	79
(iii)	L3	4.26	79
(iv)	L4	5.09	79
(v)	L5	6.28	78
(vi)	H1	7.57	78
(vii)	H2	11.08	78
(viii)	H3	17.09	77
(ix)	H4	20.44	78
(x)	H5	24.91	79

7.2 Noise at operator's ear level:

Date of test	: 08.12.2020
Type of track	: Concrete
Background noise level, dB(A)	: 54
Atmospheric conditions:	
Temperature, (°C)	: 31
Pressure, (kPa)	: 99.0
Relative humidity, (%)	: 46
Wind velocity, (m/s)	: 1.2

TEST DATA:

S. No.	Gear	Drawbar pull at which the tractor develops the maximum noise level, (kN)	Corresponding travelling speed, (kmph)	Noise level dB (A)
(i)	L1	9.47 to 11.40	2.39 to 2.33	89
(ii)	L2	7.57 to 16.78	3.54 to 3.06	89
(iii)	L3	10.63 to 16.92	5.19 to 4.58	90
(iv)	L4	14.14 to 14.08	5.88	92
(v)	L5*	11.42	7.37	91
(vi)	H1	9.34 to 9.44	9.21 to 9.10	91

* Gear corresponds to the nominal travelling speed nearest to 7.5 kmph.



8. MECHANICAL VIBRATION MEASUREMENT

Date of test : 18.02.2021
 Type of test surface : Concrete

Sl. No.	Measuring points		Vibration, microns			
			At no load		At load corresponding to 85% of maximum PTO power	
			HD	VD	HD	VD
i)	Foot rest	Left	36	36	81	89
		Right	144*	185*	125*	170*
ii)	Steering control wheel		23	70	62	70
iii)	Seat	Bottom	23	25	24	58
		Back	28	24	30	25
iv)	Mudguard	Left	35	88	33	72
		Right	39	109*	49	85
v)	Head light	Left	69	82	57	75
		Right	63	59	66	75
vi)	Battery base, centre		34	22	30	40
vii)	Tail light	Left	99	85	76	111*
		Right	119*	145*	110*	87
viii)	Plough light		162*	275*	144*	237*
ix)	Gear shifting lever		58	33	69	90
x)	Accelerator lever	Hand	83	93	54	93
		Foot	58	61	86	94
xi)	Brake pedal	Left	51	59	46	79
		Right	43	78	55	98
xii)	Clutch pedal		31	51	33	78
xiii)	Main hydraulic control lever		34	49	48	37
xiv)	PTO engaging lever		36	32	30	29

*The amplitude of mechanical vibration is on higher side.

9. AIR CLEANER OIL PULL OVER TEST

Date of test : 08.09.2020
Atmospheric conditions
 Temperature, (°C) : 31 to 33
 Pressure, (kPa) : 96.6 to 96.7
 Relative humidity, (%) : 64 to 66
 Mass of oil before test, (g) : 418.43



Sl No	Position of tractor	Loss of oil (g)	Oil pull over (%)	Engine oil pressure
i)	Tractor parked on level ground	0.20	0.05	Normal
ii)	Tractor tilted to 15 deg laterally with RHS up	0.20	0.05	Normal
iii)	Tractor tilted to 15 deg laterally with LHS up	0.10	0.02	Normal
iv)	Tractor tilted to 15 deg longitudinally with front end up	0.40	0.10	Normal
v)	Tractor tilted to 15 deg longitudinally with rear end up	0.30	0.07	Normal

10. LOCATION OF CENTRE OF GRAVITY

Condition	Particulars	Coordinates
Tractor under standard ballasted condition but with all the liquid reservoirs full & the operator replaced by a 75 kg mass on the seat	Height above ground, (mm)	701
	Distance forward from the vertical plane containing the axis of rear wheels, (mm)	683
	Distance from the median plane parallel to the longitudinal axis of tractor bisecting the track, (mm)	07 (towards LHS)

11. TURNING ABILITY

Steering type	Characteristics	Minimum turning diameter, (m)		Minimum clearance diameter, (m)	
		LHS	RHS	LHS	RHS
Mechanical steering	Brake applied	6.67	6.78	7.13	7.24
	Brakes released	6.09	6.29	6.56	6.78
Hydrostatic, power steering	Brake applied	7.24	7.27	7.74	7.77
	Brakes released	6.37	6.39	6.87	6.89

11.1 Steering Effort, (N):

Steering type	Clock wise, (Avg.)	Anti Clockwise, (Avg.)
Mechanical steering	70.75	76.85
Hydrostatic, power steering	78.75	86.16

12. OPERATOR'S FIELD OF VISION

The operator's field of vision to the front and rear from the operator's seat is represented in Fig. 8 as per the following details.

- 1 The non visible space in front is **5915 mm** which is **3.06 times** of its wheel base (i.e. 1930 mm)
- 2 The non visible space in LHS & RHS is **2665 mm** which is **1.98 times** of its rear standard track width (i.e. 1345 mm).
- 3 Silence creates masking effect.

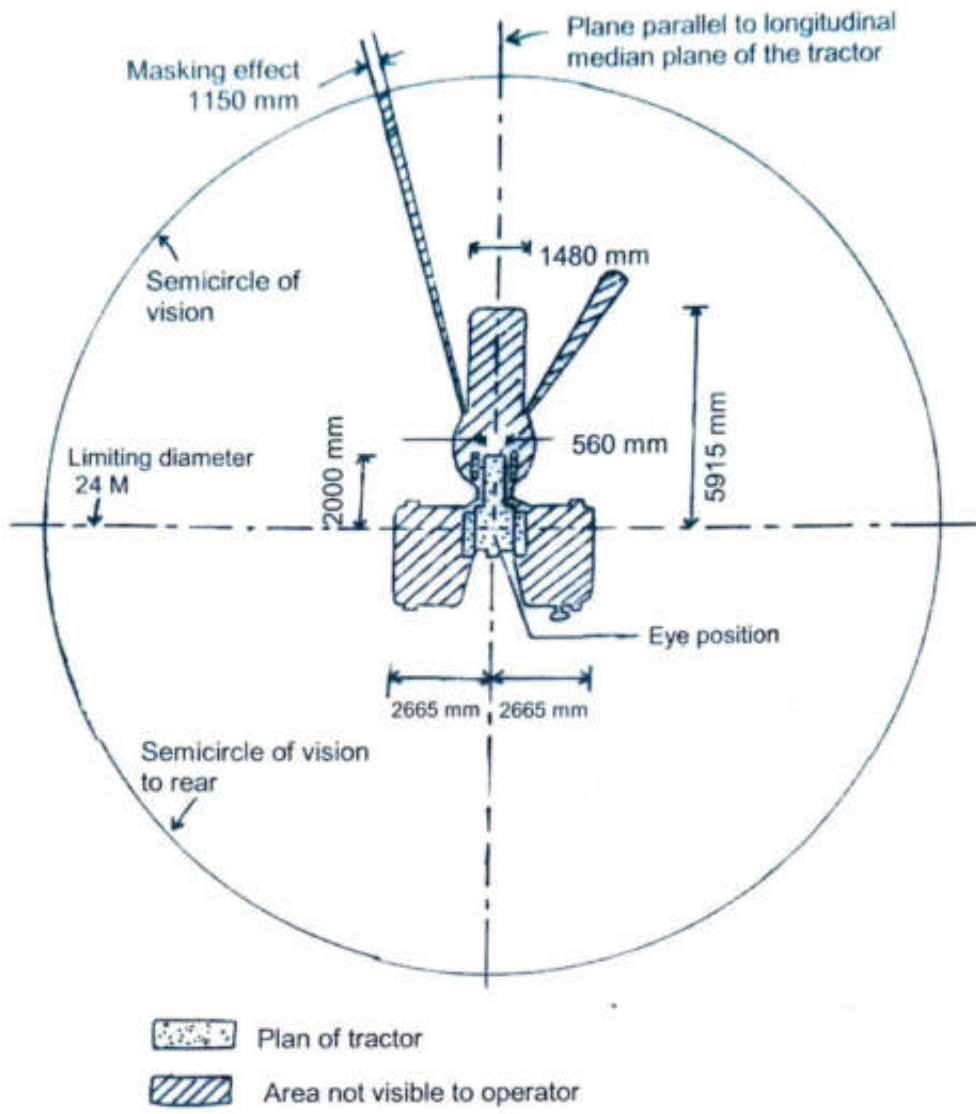


Fig. 8: OPERATOR'S FIELD OF VISION

13. FIELD TEST

- 13.1 The field tests comprising of disc ploughing, rotavation and puddling including water proof test were conducted for 11.11, 10.31 and 15.15 hours respectively. All the field tests were conducted at the full accelerator settings, when the no load speed of the engine was 2130 to 2150 rpm.
- 13.2 The brief specifications of the implements used during field tests are given in ANNEXURE-I & II.
- 13.3 The summary of field test observations with Disc plough, Rotavator and puddling is given in Table - 3.

Table – 3

SUMMARY OF FIELD PERFORMANCE TEST

S. No.	Parameter/operation	Disc Ploughing	Rotavation	Puddling
i)	Type of soil (refer IS: 7926-1975)	Heavy	Heavy	Heavy
ii)	Av. soil moisture, (%) / Av. depth of standing water (cm)	16 to 20	13 to 18	10 to 13
iii)	Bulk density of soil, (g/cc)	1.70	1.80 to 2.00	--
iv)	Cone index, (kgf/sq.cm) / Puddling index, (%)	9.4 to 10.4	6.3 to 7.3	82.3 to 83.3
v)	Gear used	L-1		L-2
vi)	Av. speed of operation, (kmph)	2.16 to 2.24	2.43 to 2.45	3.53
vii)	Av. wheel slip, (%) / Av. Travel reduction, (%)	11.5 to 13.6	-2.8 to -1.2	3.0 to 3.1
viii)	Av. depth of cut, (cm) / Av. Depth of puddles, (cm)	20 to 21	8 to 9	30
ix)	Av. working width, (cm)	77	129 to 136	--
x)	Area covered, (ha/h)	0.140 to 0.141	0.277 to 0.279	--
xi)	Fuel consumption:			
	- (l/h)	2.80 to 2.87	5.41 to 5.82	2.80 to 3.01
	- (l/ha)	19.82 to 20.55	19.53 to 20.83	--
xii)	Av. draft of implement, (kN)	8.14	--	--

Remarks: The average lub. oil and coolant (water) consumptions during the entire field tests were observed to be **1.58 ml/h** and **3.16 ml/h** respectively.

13.4 Wet land cultivation (Puddling):

13.4.1 The tractor was fitted with full cage wheel for conducting the puddling operation. The brief specification of full cage wheel used is given in **ANNEXURE –II**

13.4.2 After completion of puddling test and water proof test, the tractor was partially dismantled to check effectiveness of sealing provided against ingress of water and / or mud in various assemblies / components as per requirements of IS : 11082 – 1984 (Reaffirmed in October, 2017) (Technical requirement of Agriculture tractors for wet land cultivation). The observations recorded were as under.

S. No.	Location	Whether ingress of mud and/or water	Remarks
1.	Kingpins, Centre pin and stub axles (LHS & RHS)	No	None
2.	Clutch housing	No	
3.	Engine sump, transmission, hydraulic and brake and steering system oils	No	
4.	Starter motor	No	
5.	Alternator	No	

14. HAULAGE TEST

Type of trailer	Two wheel (Single axle)	Four wheel (Double axle)
Gross mass of trailer (tonne)	5.0	5.0
Height of trailer hitch above ground level, (mm)	580	650
Gear used during the test for negotiating slopes up to 8%	H-5	H-5
Average travel speed, (kmph)	30.64 to 31.41	31.02 to 31.82
Average fuel consumption:		
- (l/h)	4.93 to 5.30	4.51 to 4.92
- (ml/km/tonne)	32.2 to 33.9	29.0 to 31.0
Average distance traveled per liter of fuel consumption, (km)	5.91 to 6.22	6.46 to 6.89
General observations:		
Effectiveness of brakes	Effective	Effective
Maneuverability of tractor-trailer combination	Satisfactory	Satisfactory

15. COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **82.48 hours** of tractor operation at this Institute.

15.1 Engine:

15.1.1 Cylinder bore:

Cylinder No	Cylinder bore dia, (mm)						Maximum permissible wear limit, (mm)
	Top position		Middle position		Bottom position		
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Thrust side	Non-thrust Side	
1	91.486	91.483	91.469	91.484	91.474	91.476	91.86
2	91.478	91.480	91.477	91.480	91.472	91.478	
3	91.490	91.481	91.476	91.480	91.482	91.475	

15.1.2 Piston:

Piston No.	Piston dia, (mm)					Clearance between piston and cylinder liner at the skirt of the piston, (mm)	
	Top (above top compression ring)		At skirt			As observed	Maximum permissible limit
	Thrust side	Non-thrust side	Thrust side	Non-thrust side	Max. permissible wear limit,		
1	90.887	90.785	91.355	**	Piston is discarded when ring groove clearance exceeds 0.25 mm with new rings	0.131	Piston is discarded when ring groove clearance exceeds 0.25 mm with new rings
2	90.885	90.791	91.356	**		0.124	
3	90.878	90.790	91.357	**		0.133	

Remark ():**- Not measured due to piston design features.



15.1.3 Ring end gap:

Rings	Ring end gap, (mm)									Max. Permissible limit, (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No. 3			
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	
1 st comp. ring	0.30	0.30	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1.50
2 nd comp ring	0.80	0.85	0.85	0.90	0.90	0.90	0.90	0.90	0.90	1.50
Oil ring	0.35	0.35	0.35	0.30	0.30	0.30	0.30	0.30	0.30	2.00

15.1.4 Ring side clearance:

Rings	Ring side clearance, (mm)			Max. Permissible clearance Limit, (mm)
	Piston-I	Piston-II	Piston-III	
1 st Compression ring	---Tapered---			--
2 nd Compression ring	0.062	0.057	0.061	0.25
Oil ring	0.058	0.056	0.049	0.25

15.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Max. permissible clearance limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.093 to 0.113	0.26	0.25	0.75
2.	0.099 to 0.127			
3.	0.096 to 0.111			
4.	0.073 to 0.089			

15.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Max. permissible clearance limit, (mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.066 to 0.099	0.30	0.50	0.75
2.	0.067 to 0.107	0.30		
3.	0.055 to 0.063	0.30		

15.1.7 Valve, guides and timing gears:

Any marked sign of overheating of valves : None
 Pitting of seat/faces of valves : None
 Any visual damage to the teeth of timing gears : None

Observation

Spring Rate, (N/mm):

-Intake valve : 12.72 to 13.11
 -Exhaust valve : 12.61 to 12.94

| Against the discard limit of 9.81 N/mm.

Clearance between valve guide and valve stem, (mm):

Intake valve : 0.08 to 0.09
 Exhaust valve : 0.09 to 0.10

| Against the discard limit of 0.17 mm

15.2 Clutch:

Any marked wear on clutch friction plates : None
 Condition of clutch release bearing : Normal
 Condition of release levers & springs : Normal
 Condition of pilot bearing : Normal
 Presence of oil in clutch housing : None
 Any marks on fly wheel/ pressure plate : None



Overall thickness of clutch plate, (mm) :		
- Transmission	: 9.57 to 9.89	Against the discard limit of wear upto rivet head
- PTO	: 7.87 to 8.03	
Height of lining over rivet head, (mm):		
- Transmission	: 1.53 to 1.73	Against the discard limit of wear upto rivet head
- PTO	: 1.60 to 1.75	

15.3 Transmission gears:

Any visual damage, pitting & chipping of any transmission gear teeth : None

Backlash between crown wheel and pinion, (mm) : 0.26

Against the discard limit of 0.75 mm

15.4 Brakes :

Description	Initial specified overall thickness of brake discs (one side only), (mm)	Measured overall thickness of brake discs after test, (mm)	Measured depth of liner above rivet head, (mm)	Discard limit for depth of liner over rivet head (mm)
Left	6.30	12.37 to 12.59	1.05 to 1.30	Wear upto rivet head
Right	6.30	12.35 to 12.55	1.14 to 1.39	

15.5 Front axle:

Any marked wear of king pins : None

Any marked wear of king pin bushes : None

Clearance between king pin and bushes, (mm) : 0.18 to 0.26

Condition of bearings for stub axles : Normal

Condition of king pin bearings : Normal

Condition of seals for stub axles and king pins : Normal

Clearance between centre pin and bushes, (mm) : 0.07 to 0.08

Against the discard limit of 0.50 mm.

Against the discard limit of 1.25 mm.

15.6 Steering system:

Visual condition of the components of complete steering assembly : Normal

15.7 Starter motor & Alternator:

Presence of soil/oil in housing : None

Condition of bearings and other components : Normal

16. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

S. No.	Adjustment / Defect / Breakdown and Repairs	Category of breakdown	Tractor run hours
--None--			



17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 On the basis of tests conducted the performance results have been summarized as evaluative (mandatory) and non-evaluation (not-mandatory) parameter 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:-

S. 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)	Max. power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: $\pm 5\%$ for PTO power or engine power >26 kW, $\pm 10\%$ for PTO power or Engine power ≤ 26 kW.	27.2 (D)	27.1	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	27.2 (D)	27.1	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Evaluative	+ 10% Max.	265 (D)	242	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	$\pm 8\%$	155 (D)	148.8	Yes
e)	Back-up torque, percent	Evaluative	12 percent, min.	12 % (R)	15.0	Yes
f)	Maximum operating temperature($^{\circ}$ 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.	132 (D)	124	Yes
	2) Coolant (liquid)	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.	112 (D)	107	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.43 (Maximum) (R)	0.33	Yes
h)	Smoke level, (m^{-1})	Evaluative	Maximum light absorption coefficient of 3.25 per metre or equivalent BOSCH No. 5.2 or 75 Hatridge value (As per CMVR)	3.25 (Maximum) (R)	0.17	Yes



1	2	3	4	5	6	7	
17.1.2 Drawbar performance:							
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 70% of static mass with ballast	20.20 (D)	20.40	Yes	
				16.55 Minimum (R)			
b)	Maximum drawbar pull with standard corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 70% of static mass of tractor without / standard ballast	13.00 (D)	16.87	Yes	
				12.77 (Minimum) (R)			
c)	Maximum drawbar power without ballast, or with standard ballast as the case may be, 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.	22.0 (D)	24.0	Yes	
				21.7 Minimum (R)			
d)	Maximum transmission oil temperature (°C)	Evaluative	The declared value should not exceed the maximum value specified by oil company	132 (D)	83	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	±10 percent	14.00 (D)	13.52	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	8.00 (D)	10.97	Yes
				6.38 Minimum (R)			
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 minute, (mm)	Non Evaluative	The observed value should not exceed 50 mm	50 (D)	40	Yes	
				50 Maximum (R)			
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 unballast, (m):						
	1)	Cold brake	Evaluative	10	10 (R)	7.34	Yes
	2)	Hot brake	Evaluative	10	10 (R)	7.48	Yes



1	2	3	4	5	6	7
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s ² (N)	Evaluative	600	600 (R)	387 to 439	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever, N	Evaluative	Yes / No	Yes (R)	385	Yes
17.1.5	Noise measurement :					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	79	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	92	Yes
17.1.6	Amplitude of mechanical vibrations at :					
1)	Left foot rest	Non Evaluative	100 microns (max)	100(R)	89	Yes
2)	Right foot rest		-do-		184	No
3)	Seat (with driver seated)		-do-		70	Yes
4)	Steering wheel		do-		58	Yes
17.1.7	Air cleaner oil pull over:					
	Maximum air cleaner oil pull over	Evaluative	0.25 % (Max.)	0.25 % (Max.) (R)	0.10	Yes
17.1.8	Haulage requirements:					
a)	Gross mass of the trailers, (tones):					
1)	Two wheel	Non	--	5.0 (D)	5.0	Yes
2)	Four wheel	Evaluative	--	5.0 (D)	5.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):					
1)	Two wheel	Non Evaluative	--	4.8 to 6.5 (D)	5.91 to 6.22	Yes
2)	Four wheel		--	4.8 to 6.5 (D)	6.46 to 6.89	Yes
c)	Fuel consumption (ml/km/tonne):					
1)	Two wheel	Non Evaluative	--	25 to 30 (D)	32.2 to 33.9	No
2)	Four wheel		--	25 to 30 (D)	29.0 to 31.0	No
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 ingresses of water and / or mud (R)	No ingress of water and / or mud was observed	Yes
1)	Clutch assembly	-do-				
2)	Brake housings	-do-				
3)	Front axle hubs	-do-				
4)	Engine Oil	-do-				
5)	Transmission Oil	-do-				



1	2	3	4	5	6	7
17.1.10	Safety features :					
a)	Guards against moving and hot parts	Evaluative	Belt drives, pulleys, silencer, hydraulics pipes(as per IS-12239 Part 2)		Meet the requirements	Yes
b)	Lighting arrangement	Evaluative	As per CMVR		Meet the requirements	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 meets the requirements	No
d)	Technical requirements for PTO shaft	Evaluative	Should meet the requirements of IS: 4931 (As amended from time to time)		Meet the requirements	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 meets the requirements	No
f)	Specifications of linkage drawbar	Evaluative	Should meet the requirements of IS 12953 (As amended from time to time)		Meet the requirements	Yes
g)	Specifications of Swinging drawbar (wherever fitted)	Evaluative	Should meet the requirements 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		9.98 kmph (Meet 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.		Not fitted	Not applicable
17.1.11	Labelling of tractors (Provision of labelling plate):					
	1) Make	Evaluative	Should conform to the requirements of CMVR along with maximum declared value of PTO power in kW and for month & year of manufacture in numerical MM YY Digit 01-12 in box No.1 for MM will represent the month and next two digit in the box No.2 for YY will represent the year of manufacturing		TAFE	Yes
	2) Model	Evaluative			MF 241 DI V21	Yes
	3) Month & Year of manufacture	Evaluative			08 / 20	Yes
	4) Engine number	Evaluative			S325.1K99654	Yes
	5) Chassis number	Evaluative			MEA8D061H L2304773	Yes
	6) Declaration of PTO power, kW	Evaluative			27.2	Yes

T-1535/2063/2021	TAFE LTD., MF 241 DI V21 TRACTOR –Commercial (Initial)
	THIS TEST REPORT IS VALID UPTO: 30/04/2024



1	2	3	4	5	6	7
17.1.12	Discard limit for:					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by Manufacturer	91.86 (D)	91.469 to 91.490	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		When ring groove clearance exceeds 0.25 mm with new ring (D)	0.124 to 0.133	Yes
(c)	Piston diameter at skirt, (mm)	Non Evaluative		91.355 to 91.357	Yes	
(d)	Ring end gap (mm):					
	- Top comp. ring.	Evaluative	-do-	1.50 (D)	0.25 to 0.30	Yes
	- 2 nd comp. ring.		-do-	1.50 (D)	0.80 to 0.90	Yes
	- Oil ring.		-do-	2.00 (D)	0.30 to 0.35	Yes
(e)	Ring groove clearance (mm):					
	- Top comp. ring.	Evaluative	-do-	--	--Tapered--	Not applicable
	- 2 nd comp. ring.		-do-	0.25 (D)	0.057 to 0.062	Yes
	- Oil ring.		-do-	0.25 (D)	0.049 to 0.058	Yes
(f)	Diametrical clearance of main bearings (mm):	Evaluative	-do-	0.25 (D)	0.073 to 0.127	Yes
(g)	Clearance of big end bearings, (mm):					
	- Diametrical	Evaluative	-do-	0.50 (D)	0.055 to 0.107	Yes
	- Axial	Evaluative	-do-	0.75 (D)	0.30	Yes
(h)	Crankshaft end float, mm	Evaluative	-do-	0.75 (D)	0.26	Yes
(j)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.50 (D)	0.18 to 0.26	Yes
(k)	Clearance between center pin and bush, (mm)	Non Evaluative	-do-	1.25 (D)	0.08 to 0.07	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 Structure (ROPS): for tractors having more than 1150 mm rear track width	Evaluative	ROPS should meet the requirement of IS:11821 or OECD code or equivalent International Standard	Provided	Not Fitted	Not Applicable
17.1.15	Standard accessories	Evaluative	Trailer hitch, front tow hook, linkage drawbar should be provided with tractor	Provided	Provided	Yes
17.1.16	Accessories (Optional)	Non Evaluative	Ballast weights if fitted should meet the requirement of CMVR.	Provided	Provided	Yes



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17.2 CATEGORY OF BREAKDOWNS / DEFECTS (As per clause 5.0 of IS:12207-2019):					
S. No.	Category of Breakdown	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2019	As observed	Whether meets the requirement (Yes/No.)
1.	Critical breakdown	Evaluative	There is no 'critical breakdown' during the course of testing	None	Yes
2.	Major breakdowns	Evaluative	There are not more than 2 major breakdowns and neither of them is of repetitive nature	None	Yes
3.	Minor breakdowns	Evaluative	There are not more than 3 minor defects during the test and the frequency of each is 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

17.2 Conformity with following IS:

- i) Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors [IS10273:1987 (Reaffirmed 2014)] : Conforms
- ii) Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 [IS:4931-1995 (Reaffirmed 2014)] : Conforms
- iii) Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468(Part-I):1997/ISO 730-1:1994 (Reaffirmed in Oct.,2017)] : **Does not conform**
- iv) Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed 2007)] : Conforms
- v) Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (Reaffirmed 2014)] : **Does not conform**
- vi) Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements: [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed Oct., 2017)] : **Does not conform**
- vii) Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (IS 12239 (PT-2) 1999) (Reaffirmed- 2014)] : **Does not conform**
- viii) Guide lines for location and operation of operator controls on agricultural tractors and machinery (IS: 8133-1983 (Reaffirmed 2014)) : Conforms
- ix) Tractors and machinery for agriculture and forestry, powered lawn and garden equipment - Symbols for operator controls and other displays Part 2 Symbols for agricultural tractors and machinery [IS:6283 (Part-1)- 2006 and IS: 6283 (Part-2)-2007 (Reaffirmed 2014)] : **Does not conform**
- x) Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2014)) : Conforms



17.3 Salient Observations:

17.3.1 Laboratory tests:

17.3.1.1 PTO Performance Test:

- i) The maximum PTO power was recorded as **27.1 kW** against the declaration of **27.2 kW**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- ii) The specific fuel consumption corresponding to maximum power was recorded as **242 g/kWh** against the declaration of **265 g/kWh**, which is within the tolerance limit of IS: 12207-2019.
- iii) The maximum equivalent crankshaft torque was recorded as **148.8 N-m** against the declaration **155.0 N-m**, which meets the requirement of IS: 12207-2019 with regard to tolerance limit.
- iv) The backup torque is **15.0 %** and meets the evaluative requirement of IS: 12207-2019.

17.3.1.2 Drawbar performance test:

During ten hours drawbar performance test, creeping of LHS & RHS rear tyre over the rims was recorded as **65 mm & 65 mm** respectively. This should be looked into for necessary corrective action.

17.3.1.3 Hydraulic performance test:

The lifting capacity with coupled frame was recorded as **10.91 kN** and the moment about rear axle was computed as **14.75 kN-m**, whereas moment about front axle is computed as **12.69 kN**. The moment about rear axle at with coupled frame is on higher side as compared to moment about front axle. It is therefore recommended that the lifting capacity of hydraulic system may be reduced suitably or standard ballast recommendation may be reviewed to avoid front lifting of tractor.

17.3.1.4 Mechanical Vibration:

The amplitude of mechanical vibration on various assemblies / components marked as (*) in **Chapter – 8** of this test report is on higher side. This calls for dampening down of vibrations especially on right foot rest to improve the operational comfort and service life of components.

17.3.1.5 Three point linkage:

- i) The dimensions of width of ball of lower hitch point and Lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS:4468- 1997 (Part-I) (Reaffirmed in October, 2017). This should be looked into for necessary corrective action at production level.
- ii) Some of the parameters of three point linkage conform to Cat. I and some of them conform to Cat.II. Keeping in view the spirit of standardization, necessary improvement may be incorporated.

17.3.1.6 Operator's seat:

- i) Inclination of backrest
- ii) Vertical distance from seat index point to centre of steering control wheel
- iii) Lateral distance from seat index point to centre of clutch

Above parameters does not meet the requirement of IS: 12343-1998, (Re-affirmed in 2014). This should be looked into for necessary corrective action at production level.



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17.3.1.7 Haulage test:

- i) Specific fuel consumption with two wheel and four wheel trailer has been recorded as **32.2 to 33.9** and **29.0 to 31.0 ml/km/tonne** against the declaration of **25.0 to 30.0** and **25.0 to 30.0 ml/km/tonne** respectively and does not meet the requirement of IS:12207-2019 with regards to tolerance limit. This should be looked into for necessary corrective action at production level.
- ii) Gross mass of trailer in case of two and four wheel be used with tractor is recommended as 5.0 tone. This is not in normal pattern of tractor as used for haulage work. This should be looked into for necessary corrective action to decide the gross mass of trailer.

17.4 Maintenance / Service Problems:

No noticeable maintenance / 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) Inclination of backrest of operator's seat is measured as 17 degree against the requirement of 10 ± 5 degree, hence it should be provided as per the requirement of IS: 12343-1998, (Re-affirmed in 2014)
- ii) Vertical distance from seat index point to centre of steering control wheel is measured as 160 mm against the requirement of 175 to 385 mm, hence it should be provided as per the requirement of IS: 12343-1998, (Re-affirmed in 2014)
- iii) Lateral distance from seat index point to centre of clutch pedal is measured as 340 mm against the requirement of 75 to 300 mm, hence it should be provided as per the requirement of IS: 12343-1998, (Re-affirmed in 2014)
- vi) Width of foot step is measured as 190 mm against the minimum requirement of 200 mm, hence it should be provided as per the requirement of IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017)
- v) Spark arrester has not been provided in exhaust system, hence it should be provided as per the requirement of IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017)
- vi) Master shield around the PTO shaft has not been provided hence. It should fulfill the requirement of IS: 4931-1995 (Re-affirmed in 2014).
- vii) Working clearance between hydraulic position control and draft control lever is measured as 30 mm against the minimum requirement 70 mm, hence it should be provided as per the requirement of IS:12239 (Part-2)-1999 (Re-affirmed in 2014)

17.6 Adequacy of Literature supplied with machine:

Following literatures of tractor models was supplied with the test sample for reference during the test.

- i) Operator's Instruction book / Manual of TAFE, MF 241 DI V21 tractor model
- ii) Parts Catalogue Book / Manual of TAFE, MF 241 DI V21 tractor model
- iii) Workshop Service Manual (Part-1 and Part-2) TAFE, MF 241 DI V21 tractor model



- 17.6.1 The supplied literature was found adequate, **except the following:-**
- Brief technical specifications of tractor are not provided in Operator's Instruction book / Manual.
 - Recommended oil / lubricant grade are not provided in Operator's Instruction book / Manual.
 - Oil change period of engine, transmission, hydraulic, brake and steering system are not provided in Operator's Instruction book / Manual.
 - Service schedule and maintenance time given in in Operator's Instruction book / Manual does not match with specifications submitted by applicant.
- 17.6.2 However, these literatures should be brought out in other vernacular languages of India for guidance of users

18. CITIZEN CHARTER

Time frame for testing & evaluation as per citizen charter	Duration of Test	Whether the report released within time frame given in the citizen charter	Remark
10 Months	08 Months (September, 2020 to April, 2021)	Yes	---

TESTING AUTHORITY:

RAJNEESH PATEL
AGRICULTURAL ENGINEER

C.V. CHIMOTE
TEST ENGINEER

P.K. PANDEY
DIRECTOR

19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
19.1	17.3.1.2, 17.3.1.3, 17.3.1.4, 17.3.1.5 - (i) & (ii), 17.3.1.6 - (i), (ii) & (iii), 17.3.1.7 - (i) & (ii), 17.5, 17.6.1 & 17.6.2	We will study and take appropriate corrective action.



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ANNEXURE - I

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S No.	Item	Disc Plough	Rotavator
1.	Make	Massey Fergusson	Agristar
2.	Type	Mounted	Mounted
3.	No. of bottom/blades	Two	30 (in 5 flanges)
4.	Type of bottom/blades	Plain concave	Hatchet shape
5.	Size of bottom/blades, (mm)	650	200 x 55 x 7
6.	Spacing of bottom/flanges, (mm)	510	225
7.	Lower hitch point span, (mm)	735	570
8.	Mast height, (mm)	540	630
9.	Overall dimensions, (mm):		
	- Length	1550	1100
	- Width	990	1490
	- Height	1110	1090
10.	Gross mass, (kg)	250	360

ANNEXURE- II

BRIEF SPECIFICATION OF FULL CAGE WHEEL

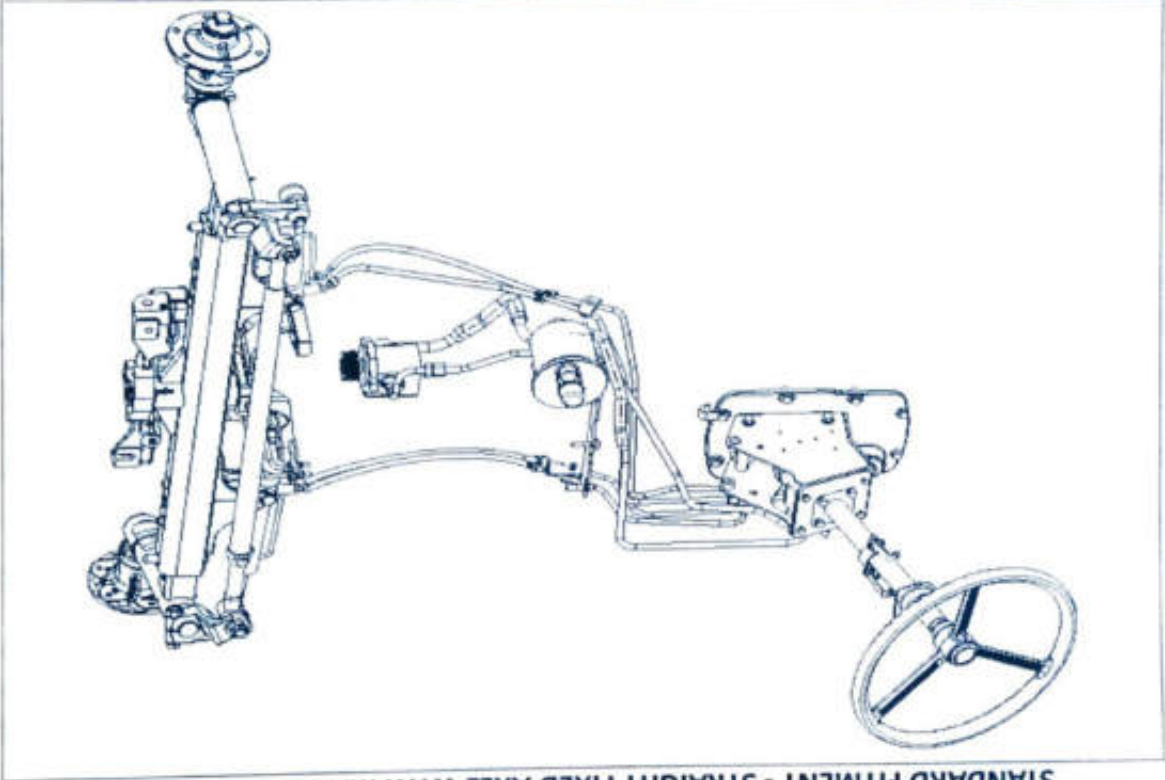
S. No.	Items	Specifications
1.	Type	Full cage wheel
2.	Diameter, (mm)	1245
3.	Width, (mm)	900
4.	No. and types of lugs	24, straight lugs made up of MS-angle section welded to angle iron frame.
5.	Size of angle section, (mm)	40 x 40 x 5
6.	Length of lugs, (mm)	444
7.	Spacing of lugs, (mm)	315
8.	Weight of each cage wheels (kg)	120

ANNEXURE -III

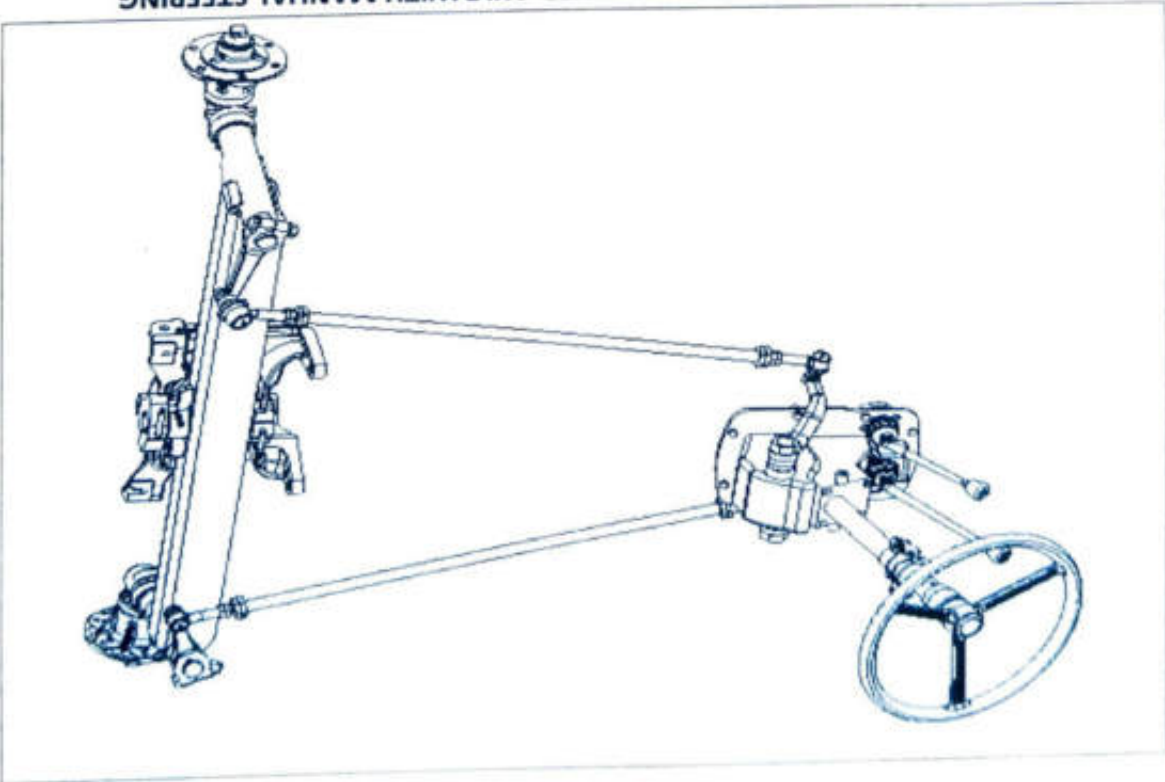
TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	36.00
2.	PTO performance test	10.59
3.	Drawbar performance test	17.28
4.	Power lift and hydraulic pump performance test	3.25
5.	Turning ability	0.25
6.	Location of centre of gravity	0.33
7.	Operator's field of vision	Nil
8.	Brake test	1.50
9.	Noise measurement	1.55
10.	Mechanical vibration test	0.75
11.	Air cleaner oil pull over	3.50
12.	Theoretical speed test	1.26
B.	FIELD TEST:	
1.	M. B. ploughing	11.11
2.	Rotavation	10.31
3.	Wet land cultivation (puddling and water proof test)	15.15
C.	HAULAGE TEST:	5.30
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	5.35
TOTAL:		118.13

OPTIONAL FITMENT - STRAIGHT ADJUSTABLE AXLE WITH POWER STEERING



STANDARD FITMENT - STRAIGHT FIXED AXLE WITH MANUAL STEERING



ANNEXURE - IV

