व्यावसायिक परीक्षण रिपोर्ट संख्या/No. : T- 1250/1777/2019

COMMERCIAL TEST REPORT (1st Batch) माह/Month : **June, 2019**

(यह परीक्षण रिपोर्ट **30/06/2024** तक वैध है। / **THIS TEST REPORT IS VALID UPTO:30/06/2024)**

ACE, DI 550 NG TRACTOR

सत्यमेव जयते

भारत सरकार

कृषि एवं किसान कल्याण मंत्रालय

कृषि, सहकारिता एवं किसान कल्याण विभाग

मशीनीकरण एवं प्रोद्योगिकी प्रभाग

GOVERNMENT OF INDIA

MINISTRY OF AGRICULTURE AND FARMERS WELFARE

DEPARTMENT OF AGRICULTURE, CO-OPERATION AND 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

Phone: 07564-234729, 234743 E-mail: fmti-mp@nic.in Website: http://fmttibudni.gov.in

Manufacturer : **M/s. Action Construction Equipment Ltd.**
Plant-II, Dudhola Link Road, Dudhola
Palwal, Haryana - 121 102

Applicant : **M/s. Action Construction Equipment Ltd.,**
Jajru Road, 25th Mile Stone, Mathura Road, Ballabgarh, Faridabad, Haryana – 121 004

Month: June	Test Report No. T- 1250/1777/2019	Year : 2019

GOVERNMENT OF INDIA
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Type of Test	:	**COMMERCIAL (Batch)**
Test code/Procedure	:	IS: 5994-1998 (Reaffirmed in 2014), IS:9253-2013 and IS: 12207-2014.
Period of Test	:	December, 2018 to June, 2019
Test Report No.	:	**T- 1250/1777/2019**
Month/Year	:	**June, 2019**

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 was selected randomly from production line by the representative of testing authority 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 is the first batch test report and therefore, should be read in conjunction with the Test Report of base model i.e. **"ACE, DI 550 NG"** Tractor bearing report no**. T- 922/1439/2014** released on **June, 2014**.

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
LHS /RHS	Left Hand Side/ Right Hand Side
Hg	Mercury
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

C O N T E N T S

Manufacturer	:	**M/s. Action Construction Equipment Ltd., Plant-II, Dudhola Link Road, Dudhola Palwal, Haryana - 121 102**
Test requested by (Applicant)	:	**M/s. Action Construction Equipment Ltd., Jajru Road, 25th Mile Stone, Mathura Road, Ballabgarh, Faridabad, Haryana – 121 004**
Selected for test by	:	The testing authority
Place of running-in	:	At manufacturer's works
Duration of said running-in, (h):		
- Engine	:	25
- Transmission	:	25
Method of Selection	:	The test sample was selected randomly out of Five tractors from the production line by the representative of testing authority.

1. SPECIFICATIONS

1.1 Tractor:

Make	:	ACE
Model	:	DI 550 NG
Brand name	:	None
Variants, if any	:	Yes

S No.	Variant model*	Variant Features
1.	ACE, DI 550 NG 4WD	Four wheel drive

Remark (*): The variant model had been submitted for test verification at this institute bearing test report No. T- 1168/1695/2018 released in June, 2018

Type	:	Four wheeled, rear-wheel driven, unit construction, standard, general purpose, Agricultural Tractor
Year of manufacture	:	RAH (i.e. June, 2018)
Chassis number	:	RAH550032129
Country of origin	:	India

1.2 Engine:

Make	:	ACE
Model	:	A50
Type	:	Four stroke, liquid cooled, naturally aspirated, direct injection, diesel engine
Serial number	:	TRAH0007170
Year of manufacture	:	2018
Country of origin	:	India

1.2.1 Engine speed (rpm), (Manufacturer's recommended production settings):

- Maximum speed at no load	:	2250 to 2350
- Low idle speed	:	650 to 750
- Speed at maximum torque	:	1100 to 1300
Rated speed, (rpm):		
- For PTO use	:	2100
- For drawbar use	:	2100

1.3 Cylinder & Cylinder Head:

Number	:	Three
Disposition	:	Vertical, Inline
Bore/stroke, (mm)	:	105/118 (apa)
Capacity as specified by the applicant, (cc)	:	3066
Compression ratio	:	18.5 : 1
Type of cylinder head	:	Individual
Type of cylinder liners	:	Wet, replaceable
Type of combustion chamber	:	Re entrant type
Arrangement of valves	:	Overhead, inline
Valve clearance (cold/hot):		
- Inlet valve, (mm)	:	0.30 / 0.30
- Exhaust valve, (mm)	:	0.40 / 0.40

1.4 Fuel System:

Type of fuel feed system	:	Gravity and force feed

1.4.1 Fuel tank:

Capacity, (l)	:	55.0
Location	:	Above Flywheel housing
Provision for draining of sediments/ water	:	Provided
Material of fuel tank	:	Metallic

1.4.2 Water separator:

Make	:	Hilux
Type	:	Inverted funnel, gravity separation
Location	:	Mounted on LHS of engine in between fuel tank and fuel feed pump.
Capacity, (l)	:	0.45

1.4.3 Fuel feed pump:

Make	:	Bosch, India
Type	:	Plunger
Model/Group combination No.	:	FP/KSG22AD105, F002A50040
Provision of sediment bowl	:	Provided (metallic)
Method of drive	:	Through camshaft of Fuel Injection Pump

1.4.4 Fuel filters:

Make	:	Bosch, India
Model/Group combination No.	:	9 450 030 118
Number	:	Two
Type of elements:		
- Primary	:	Cloth
- Secondary	:	Paper
Capacity of final stage filter, (l)	:	0.43

1.4.5 Fuel Injection pump:

Make	:	Bosch, India
Model/Group combination No.	:	F 002 AOZ 948, PES3A90D320RS3500
Type	:	Plunger, Inline
Serial number	:	85348189
Method of drive	:	Through timing gears

1.4.6 Fuel injectors:

Make	:	Bosch, India
Model/Group combination No.:		
Holder Number	:	F 002 C70 552
Nozzle Number	:	DSLA 140 P 5600
Type	:	Multiholes (five holes)
Manufacturer's production pressure setting, (MPa)	:	25.0 to 25.8
Injection timing	:	10 ± 2 degree before TDC
Firing order	:	1-3-2

1.4.7 Governor:

Make	:	Bosch, India
Model/Group combination No.	:	RSV350…1050A1C1732R
Type	:	Mechanical, centrifugal, variable speed
Rated engine speed, (rpm)	:	2100
Governed range of engine speed, (rpm)		650 to 2350

1.5 Air intake system:

1.5.1 Pre-cleaner : Not provided

1.5.2 Air cleaner:

Make	:	Donaldson
Type	:	Dry
Location	:	In front of radiator, under the bonnet
Range of suction pressure at maximum power, (kPa)	:	3.2 to 3.3

Details of elements:		**Secondary element**	**Primary element**
- Size (OD/ID), (mm)	:	78.0 / 64.9	127.0 / 82.0
- Length, (mm)	:	300	310
- Type	:	Polyester felt	Cellulose fiber paper
- No. of elements	:	One	One

Air flow restriction indicator	:	Provided on dash board
Dust unloading valve	:	Provided
Maintenance schedule	:	i) Cleaning of primary element if required in arduous condition or at every 300 hours of operation. ii) Replace primary element at every 900 hours of operation or 3 cleaning of primary filter element. iii) Replace secondary element change at every 2700 hours or 3 replacement of primary filter element.

1.6	**Exhaust System:**		
	Type of silencer	:	Updraft, elliptical
	Position of silencer outlet with respect to SIP, (mm):		
	- Vertical	:	965
	- Longitudinal	:	1430
	- Lateral	:	560 (on LHS)
	Range of exhaust gas pressure at maximum power (kPa)	:	7.7
	Provision of spark arresting device	:	**Not provided**
	Provision against entry of rain water	:	A bend is provided at the top of silencer
1.7	**Lubricating system:**		
	Type	:	Force feed cum splash
	Oil sump capacity,(l)	:	7.25
	Total lub oil capacity, (l)	:	7.95
	Oil change period	:	First change after 50 hours and subsequently after every 250 hours of operation
	Type of cooling device, (if any)	:	**Not Provided**
1.7.1	**Filters:**		
	Make	:	ACE
	Type	:	Full flow, Spin-on, paper element
	Number	:	One
1.7.2	**Pump:**		
	Type	:	Gear
	Method of drive	:	Through timing gears
	Pressure release setting, (kPa)	:	450 (apa)
	Minimum permissible pressure, (kPa)	:	49 (apa)
1.8	**Cooling system:**		
	Type	:	Forced circulation of liquid
	Brand name of the coolant	:	Pee Kay International
	Coolant water ratio	:	10 : 1
1.8.1	**Details of Pump**	:	Centrifugal with semi open impeller of 89.5 mm diameter having twelve vanes and driven through crankshaft pulley by a cogged 'V'-belt common to alternator.
1.8.2	**Details of fan**	:	Suction type having seven polypropylene blades having 420 mm outer diameter, and mounted on water pump shaft.
	Means of temperature control	:	Thermostat
	Bare radiator capacity, (l)	:	6.10
	Coolant expansion tank capacity,(l)	:	1.00
	Total coolant capacity, (l)	:	13.00
	Radiator cap pressure, (kPa)	:	88
1.9	**Starting System:**		
	Type	:	12 V, DC, Electrical
	Aid for cold starting	:	None
	Any other device provided for easy starting	:	None

1.10 Electrical System:

1.10.1 Battery:

Make and model	:	Exide Express & MHD880
Type	:	Lead acid
Capacity and rating	:	12V, 88 Ah at 20 hours discharge rate
Location	:	On RHS of clutch housing in a separate metallic box.

1.10.2 Starter:

Make	:	Spark Minda
Model	:	AS03905
Type	:	Pre-engaging, solenoid operated
Power rating	:	12V & 2.5 kW
Serial number	:	Not available

1.10.3 Generator:

Make	:	Spark Minda
Model	:	AS0061468-V
Type	:	Alternator
Serial number	:	Not available
Output rating	:	12V, 42 A
Method of drive	:	Driven through crankshaft pulley by a cogged “V” belt common to alternator

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	1205	155 x 95	575
- Parking lights	2, 12V, 5W	1350	65 x 65	205
-Turn cum hazard light	2, 12V, 21W	1350	70 x 65	140
Reflectors (white)	2	1350	30 x 55	255
Rear lights:				
- Tail-cum-brake light	2, 12V, 21/5W	1350	65 x 65	210
-Turn cum hazard light	2,12V, 21W	1350	70 x 65	145
- Plough light (on RHS mudguard)	1, 12V, 55W	1510	120 Φ	375
- Reflectors (Red)	2	1350	30 x 55	255
- Registration plate light (RHS)	Part of rear light assembly			

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 four positions viz.
i) OFF
ii) Parking lights + Dash board light
iii) Head lights (long beam) + (ii)
iv) Head lights (short beam) + (ii)

1.10.8 Horn:

Make : Addon

Type : 12 V, 2B, Electromagnetically vibrated diaphragm

Location : In front of radiator, under the bonnet

1.10.9 Fuse box : Contains six number of fuses of following capacity:

Capacity	10A	15A
Number	04	02

1.10.10 Details of other electrical accessories:

1.10.10.1 Starting safety switch : Not provided

1.10.10.2 Flasher Unit:

Make : Vi-son

Capacity:

- Turn signal : 12V, 21W x 2 +2W x 1
- Hazard signal : 12V, 21W x 4 + 2Wx2

Flashes/min. : 85

1.10.10.3 Seven pin trailer socket : Provided

1.11 Instrument panel details:

i) Engine speed- cum- digital cumulative run hour meter (0 - 30 x 100 rpm)
ii) Lubricant oil pressure gauge (with colour zones)
iii) Coolant (water) temperature gauge (with colour zones)
iv) Battery charging gauge (with colour zones)
v) Battery charging warning indicator
vi) Fuel level gauge (with colour zones)
vii) Head light (long beam) indicator lamp
viii) Air cleaner clogging indicator light
ix) Turn cum hazard light indicator
x) Turn indicator light switch
xi) Hazard light switch
xii) Main switch (key-turn type)
xiii) Light switch (rotary type)
xiv) Horn push button
xv) Mobile charger socket
xvi) Hand accelerator
xvii) Rear view mirror
xix) Steering control wheel
xx) Fuel shut-off knob

1.12 Transmission System:

1.12.1 Clutch:

Make : Luk

Type : Dual, dry friction plate & pad type.

No. of friction plate(s) : Two

Size (OD/ID), (mm):

- Transmission : 279.9 / 165.7 Φ
- PTO : 279.0 / 165.0 Φ with four Pads, area of one pad is 27.8 cm^2

Method of operation:

- Transmission : By depressing the clutch pedal halfway, provided on LHS of operator's seat
- PTO : By depressing the clutch pedal fully, provided on LHS of operator's seat

1.12.2 Gear box:

Make : ACE

Model : None

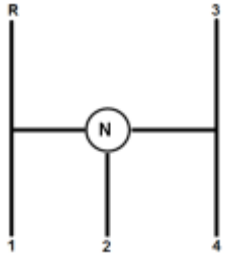
Type : Mechanical, combination of constant and sliding mesh gear with epicyclic gear reduction unit for Hi-low gear selection.

No. of speeds: In-front of operator's seat

- Forward : 08
- Reverse : 02

Location of gear shifting levers : Main gear shifting lever and range selection lever are provided on the front of operator's seat

Gear shifting pattern :



Gear selection lever

Range selection lever

Oil capacity (l) : 48.0 (common with differential, rear axle, rear final drive & hydraulic system)

Oil changing period : First change after 750 hours of operation subsequently changes after every 1000 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 **14.9-28** size tyres **640** mm radius index, (kmph).
Forward	L1	188.28	2.69
	L2	148.85	3.40
	L3	89.57	5.65
	L4	56.78	8.91
	H1	47.86	10.59
	H2	37.79	13.40
	H3	22.75	22.27
	H4	14.41	35.23
Reverse	LR	134.43	3.76
	HR	34.14	14.84

1.12.4 Differential :

Type	:	Crown wheel and bevel pinion, with differential unit accommodated inside the differential housing.
Reduction through crown wheel & bevel pinion	:	3.231 :1 (42/13 T)
Oil capacity (l)	:	48.0 (common with gearbox, rear axle, rear final drive & hydraulic system)
Oil changing period	:	First change after 750 hours of operation subsequently changes after every 1000 hours of operation.
Differential lock	:	**Not Provided**

1.12.5 Rear axle & final drive:

Type	:	Bull gear and pinion type reduction unit accommodated inside the differential housing
Reduction through final drive	:	4.462 :1 (58/13T)
Oil capacity of final drive, (l)	:	48.0 (common with gearbox, differential & hydraulic system)
Oil changing period	:	First change after 750 hours of operation subsequently changes after every 1000 hours of operation.

1.13 Power lift (Hydraulic system):

- Make	:	ACE
- Type	:	Open centre, live, ADDC
- No. and type of internal cylinder	:	One, single acting
- Type of linkage lock for transport	:	Hydraulic response control knob in fully closed position act as transport lock

1.13.1 Hydraulic pump:

- Make & Model	:	Rexroth
- Type	:	Gear
- Location & drive	:	On RHS of engine, through timing gears.
No. & Type of filter	:	Two, one fine wire mesh strainer and one spin on throw away paper element
Hydraulic oil capacity, (l)	:	48.0 (common with transmission & hydraulic system)
Oil change period	:	First change after 750 hours of operation subsequently changes after every 1000 hours of operation.
Provision for external tapping	:	Provided
Details of control :		**i)** Position control lever “Black” **ii)** Draft control lever “Yellow” **iii)** Response control knob at distributor
Method of draft sensing	:	Through top link

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	25.80	Conforms to Cat. II
	b)	Width of ball	44.0 (max.)/ 51.0 (max)	50.90	Conforms to Cat. II
II.	**Lower hitch points:**				
	a)	Dia of hitch pin hole	22.40 to 22.65 / 28.70 to 29.00	28.97	Conforms to Cat. II
	b)	Width of ball	34.8 to 35.0 / 44.8 to 45.0	45.0	Conforms to Cat. II
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)	158	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	535	Conforms to Cat. I
VI.	Transport height		820 (min)/ 950 (min)	890	Conforms to Cat. I
VII.	Power range (Without force)		560 (min)/ 650 (min)	665 & 615	Conforms to Cat. I & II
VIII.	Leveling adjustment		100 (min)/ 100 (min)	385	Conforms to Cat. I & II
IX.	Lower hitch point tyre clearance		100 (min)/ 100 (min)	170	Conforms to Cat. I & II
X.	Lower hitch point height		200 (max) / 200 (max)	200	Conforms to Cat. I& II

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

The following are dimensions observed, corresponding to **640** mm as tyre dynamic radius index:

Sl. No.	Parameter	Notation	Dimension or range, (mm)	Setting used during test, (mm)
1	**2**	**3**	**4**	**5**
1.	Length of lower link	A	785	785
2.	Length of lift arm	B	245	245
3.	Length of lift rods	C	655 to 770	670
4.	Length of top link	D	495 to 650	535
5.	Distance of lift rod connection point from pivot point of lower link.	E	395, 445	395
6.	Distance of lower link pivot point from rear wheel axis:			
	-Horizontally	F	100, behind	100, behind
	-Vertically	G	145, below	145, below
7.	Distance of upper link pivot point from rear wheel axis:			
	-Horizontally	H	355, behind	335, behind
	-Vertically	J	260, 290 & 310, above	290, above

1	2	3	4	5
8.	Distance of lift arm pivot point from rear wheel axis:			
	-Horizontally	K	75, forward	75, Forward
	-Vertically	L	360, above	360, above
9.	Height of lower hitch points relative to the rear wheel axis:			
	- In high position	M	15 to 250	225, above
	- In low position	N	-600 to -305	440, below
10.	Height of lower link hitch points when locked in transport position		--	225, above

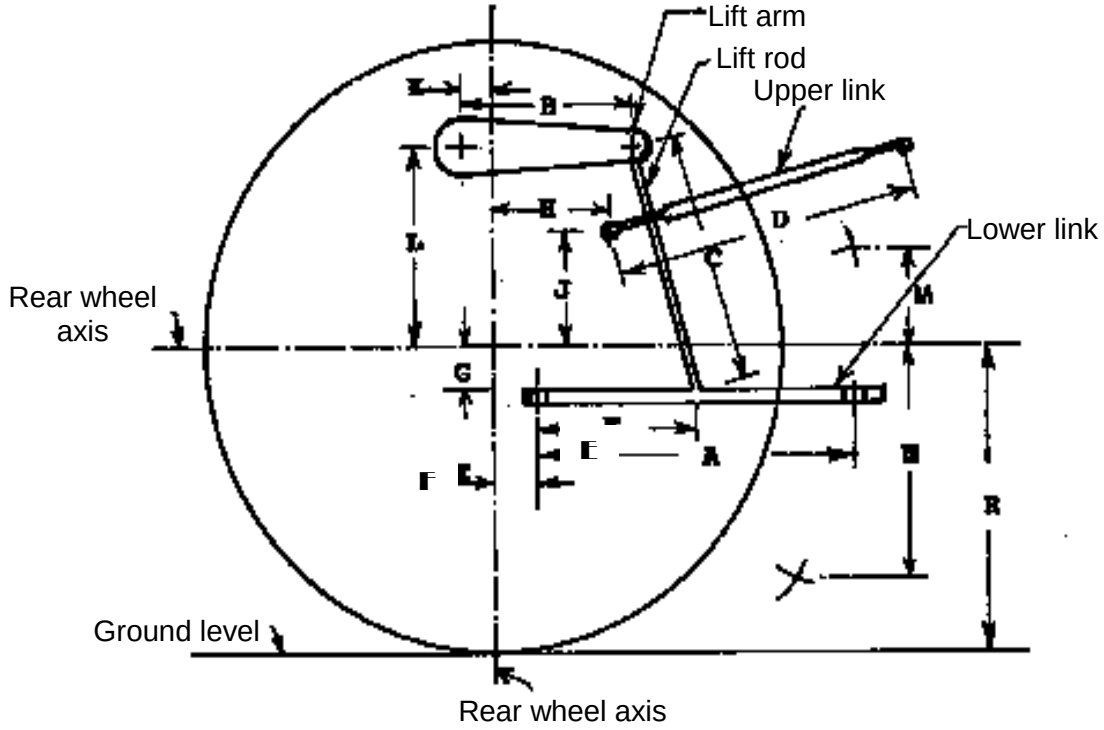


Fig.1 (A): DIMENSIONAL NOTATIONS FOR TABLE OF LINKAGE GEOMETRY

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 ± 1.5 / 825 ± 1.5	683.0	Conforms to Cat. I
B	75 (min) / 75 (min)	75.8	Conforms to Cat. I & II
C	30 (min) / 30 (min)	30.0	Conforms to Cat. I & II
D∅	21.79 to 22.00 / 27.79 to 28.00	28.0	Conforms to Cat. II
E	39.0 (min) / 49.0 (min)	54.0	Conforms to Cat. I & II
F∅	12.0 (min) / 12.0 (min)	12.0	Conforms to Cat. I & II
G	15.0 (min) /15.0 (min)	17.0	Conforms to Cat. I & II
H∅	25 ± 1 / 25 ± 1	24.5	Conforms to Cat. I & II
J	80 ± 1.5 / 80 ± 1.5	79.5	Conforms to Cat. I & II
No. of holes	7 / 9	07	Conforms to Cat. I

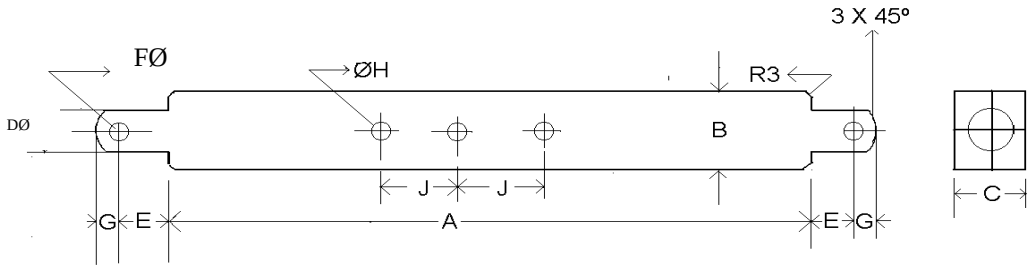


Fig. 1 (B): DIMENSIONAL NOTATIONS FOR LINKAGE DRAWBAR

1.13.4.2 Swinging drawbar : Not provided

1.14 Power take-off shaft:

Type	:	Type-I, Semi independent
Method of engaging	:	By a hand lever provided on LHS of operator's seat.
No. of shaft(s)	:	One
PTO speed corresponding to rated engine speed, (rpm)	:	643
Distance behind rear axle, (mm)	:	360
Engine to PTO speed ratio	:	3.267:1
Whether the PTO shaft is capable of transmitting the full power of engine	:	Yes

3.1.14.1 Power take-off proportional to ground speed:

		Base model	**Batch model**
Indicate 540 or 1000 rev/min	:	540 rev/min	
Travelling distance for one revolution of power take-off shaft, (m)	:	**Not provided**	0.255
Number of power take-off shaft revolutions for one revolution of (rear) driving wheels	:	**--do--**	15.75
Direction of rotation with forward gear engaged (viewed from behind tractor)	:	**--do--**	Clockwise

1.14.2 Specifications of Power Take-Off Shaft: [Refer Fig. 2]

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 1764 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 50mm to right or left of the centre line of the tractor	In the centre line of tractor	Conforms
Dimensions (mm) (See Fig. 2):			
D∅	34.79 ± 0.06	34.68	**Does not conform**
d∅	28.91 ± 0.05	29.05	**Does not conform**
B∅	29.4 ± 0.1	29.40	Conforms
A∅ (Optional)	8.3 ± 0.5	8.30	Conforms
W	8.69 – 0.09 - 0.16	8.60	Conforms
a	7	7	Conforms
b (Optional)	25 ± 0.5	25.5	Conforms
c	38	38	Conforms
X	30^o	30^o	Conforms
B	76 (min)	86	Conforms
h	450 to 675	650	Conforms

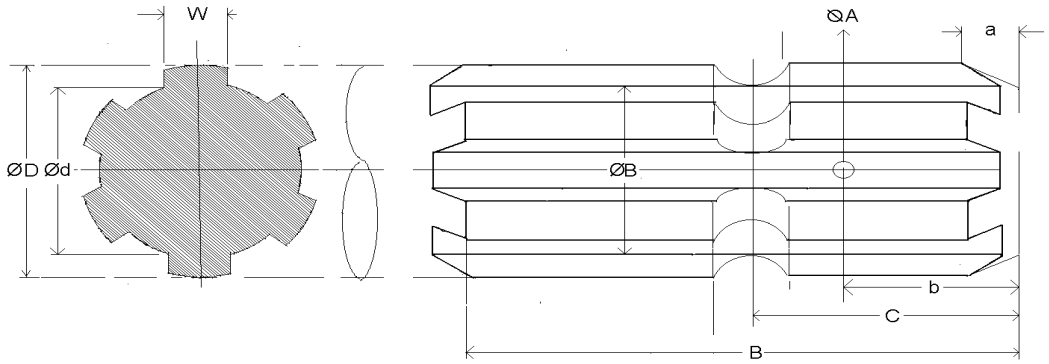


Fig. 2 (a): DIMENSIONAL NOTATIONS FOR TYPE-I POWER TAKE-OFF SHAFT

1.14.3 Power Take-off Master Shield : Provided, Type - I

Dimensions of PTO master shield for type I & II PTO (mm) [Refer Fig. 2(b)]

Specification	As per IS 4931-1995 (Reaffirmed in 2014)	As observed	Remarks
k	70 (min)	72	Conforms
m	125±5	122	Conforms
n	85±5	90	Conforms
p	285±5	280	Conforms
r	76 (max.)	0	Conforms

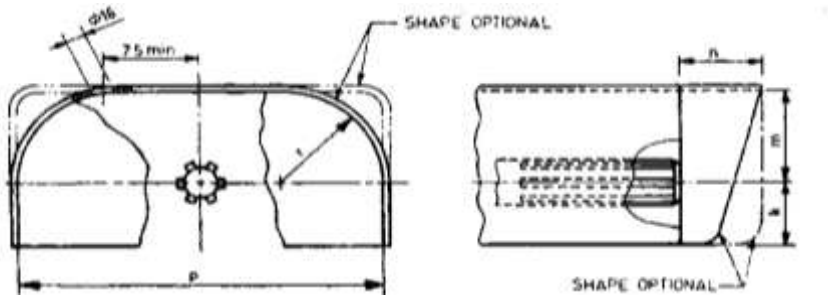


Fig. 2 (b): DIMENSIONAL NOTATIONS OF PTO SHAFT MASTER SHIELD

1.15 Towing hitch:

1.15.1 Front:

Type	:	Clevis
Location	:	At front, centre of front axle bracket
Height above ground level,(mm)	:	630
Type of adjustment	:	Fixed
Width of clevis, (mm)	:	50.0
Dia of pin hole, (mm)	:	27.1

1.15.2 Rear:

Type	:	Clevis
Location	:	At the rear of transmission housing
Height above ground level, (mm):		
- Maximum	:	822
- Minimum	:	562
No. of position	:	06
- Type of adjustment	:	By changing and reversing the position of hitch on its mounting bracket
Distance of hitch point,(mm):		
- From rear axle centre	:	445
- From power take-off shaft end	:	85
Dia of pin hole, (mm)	:	35.0
Width of clevis, (mm)	:	75.0

1.16 Steering:

Make	:	ZF, India
Type	:	Mechanical, Worm & roller with single drop arm
Location of control wheel	:	Above clutch housing
Method of operation	:	Manually by steering control wheel
Diameter of steering control wheel, (mm)	:	430
Steering oil capacity, (l)	:	0.50
Lubricant change period	:	First change after 750 hours of operation subsequently changes after every 1000 hours of operation.

1.17 Brakes:

1.17.1 Service Brake:

Make	:	Vishwas
Type	:	Mechanical, dry discs
Location	:	On bull pinion half axle shaft, outside differential housing
No. of discs	:	Two (on each wheel side)
Area of liners. (cm^2)	:	737.4 (on each wheel side)

	Material of liners	:	Asbestos (apa)
	Method of operation	:	Independent / combined pedal operation by right foot
1.17.2	**Parking Brake:**		
	Type	:	Pawl and ratchet arrangement
	Method of operation	:	Service brake acts as parking brake when locked in depressed position by a hand lever provided on RHS operator's seat
1.18	**Wheel Equipment:**		
1.18.1	**Steered Wheel(s):**		
	Make	:	MRF, Shakti Life
	Number	:	Two
	Type of tyre	:	Pneumatic, ribbed
	Size	:	6.00 -16
	Ply rating	:	8
	Maximum permissible loading capacity of each tyre at inflation pressure (230 kPa) recommended for road work pressure, (kgf)	:	450
	Recommended inflation pressure, kPa	:	
	- for field work	:	230
	- for road work	:	230
	Track width, (mm)	:	1300 (std.) & 1510
	Method of changing track width	:	By reversing wheel disc
	Make & size of rim	:	CWPL & 4.5 E x 16
1.18.2	**Driving wheel:**		
	Make	:	MRF, Shakti Life
	Number	:	Two
	Type of tyre	:	Pneumatic, traction
	Size	:	14.9 - 28
	Ply rating	:	12
	Maximum permissible loading capacity of each tyre at inflation pressure (140 kPa) recommended for road work pressure, (kgf)	:	1610
	Recommended inflation pressure, (kPa)		
	- for field work	:	113
	- for road work	:	140
	Track width, (mm)	:	1420 (std.), 1450, 1530, 1610, 1690, 1770 & 1810
	Method of changing track width	:	By changing and reversing the position of wheel disc on off-set rim lugs
	Make & size of rim	:	CWPL & W13 x 28
1.18.3	**Wheel base, (mm)**	:	1960
	Method of changing wheel base, if any	:	**None**
1.19	**Operator's seat:**		
	Make	:	ACE
	Type	:	Cushioned seat with backrest
	Type of suspension	:	Two Helical coil springs
	Type of damping	:	Hydraulic shock absorber

Range of adjustment,(mm):

- Vertical : Nil
- Lateral : Nil
- Longitudinal : ± 52

1.20 Provision for safety and comfort of operator:

1.20.1 Conformity with IS: 12343-1998 (Reaffirmed in 2014)

All parameters meets the minimum requirements of IS: 12343-1998, (Re-affirmed in 2014)

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).

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):

i) Provision of safety against accidental start of engine has not been provided.

1.20.4 Conformity with IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017):

Meets the requirements of IS: 12239 (Part-1)-1996 (Re-affirmed in October, 2017),

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:**

i) The spark arrester has not been provided in the exhaust system

ii) Working clearance between operator's seat & PTO engaging lever is less than the minimum requirement of 75 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 is provided

1.20.8 Slow moving emblem:

Slow moving vehicle emblem have been provided.

1.21 Labelling of tractor as per IS: 10273-1987 (Reaffirmed in March, 2014):

Locations of labelling plate:- The labelling plate is riveted on LHS of differential housing and provides the following information:

Name of Manufacturer	**:**	**M/s. Action Construction Equipment Ltd.**
Make	**:**	ACE
Model	**:**	DI 550 NG
Year of manufacture	**:**	RAH (i.e. June, 2018)
Engine Serial Number	**:**	TRAH0007170
Chassis Serial Number	**:**	RAH550032129
Maximum PTO Power, kW	**:**	34.0
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	
Front	C.I. weight	100	100	Nil
	Water	Nil	Nil	Nil
Rear	C.I. weight	560	80	Nil
	Water	320	320	Nil
	Additional weight, if any	Nil	Nil	Nil

1.22.1 Standard ballast, if any: None

1.23 Masses:

Particulars		Mass of the tractor without operator but with all the liquid reservoirs full, (kg)		
		Front	Rear	Total
i)	Without ballast	765	1205	1970
ii)	With ballast as used during drawbar performance test	930	2020	2950
iii)	With ballast as used during haulage test (including trailer hitch, canopy & linkage drawbar)	775	1225	2000

1.24 Overall dimensions:

Condition	Length, (mm)	Width, (mm)	Height, (mm)		Ground Clearance, (mm)
			With exhaust pipe	Without exhaust pipe	
With unballast	3785	1825	2290	1700 (at steering control wheel)	425 (below front axle)

1.25 Number of external lubricating points:

- Oiling : Nil
- Grease nipples : 02
- Grease cups : 19

1.26 Colour of tractor:

Chassis & engine : Black

Sheet metal:

Mudguard : Blue

Bonnet : Blue

Rim & disc : Silver

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 oil	20W40	20W40
2.	Gearbox, differential, rear xle, final drive and hydraulic system oil	EP-80	Oil originally filled in the system of tractor was not changed
3.	Steering housing oil	EP-80	--do--
4.	Grease	Servo Grease MP	Servo Grease MP

3. PTO PERFORMANCE TEST

Date(s) of test : 30.01.2019 & 31.01.2019

Tractor run at the Institute prior to start of PTO test (h) : 1.16

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

3.1 The results of power take-off performance 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:						
32.9	643	2099	10.34	8.65	0.263	3.18
31.2	643	2100	9.99	8.35	0.267	3.12*
b) Power at rated engine speed (2100 rpm):						
32.9	643	2099	10.34	8.65	0.263	3.18
31.2	643	2100	9.99	8.35	0.267	3.12*
c) Power at standard power take-off speed (540 ± 10 rpm):						
30.9	540	1764	8.95	7.48	0.242	3.45
29.5	540	1764	8.65	7.23	0.245	3.41*
d) Varying loads at rated engine speed (2100 rpm):						
i) Torque corresponding to maximum power available at rated engine speed:						
32.9	643	2099	10.34	8.65	0.263	3.18
ii) 85% of the torque obtained in (i):						
29.5	678	2215	9.72	8.13	0.276	3.03
iii) 75% of the torque obtained in (ii) :						
22.3	681	2225	7.92	6.62	0.297	2.82
iv) 50% of the torque obtained in (ii) :						
14.9	685	2238	6.18	5.17	0.347	2.41
v) 25% of the torque obtained in (ii) :						
7.5	689	2251	4.69	3.92	0.523	1.60
vi) Unloaded:						
1.5	691	2257	3.49	2.92	1.947	0.43
e) Varying loads at Standard PTO Speed (540 ± 10 rpm):						
i) Torque corresponding to maximum power available at standard PTO speed:						
30.9	540	1764	8.95	7.48	0.242	3.45
ii) 85% of the torque obtained in (i) :						
28.3	583	1905	8.48	7.09	0.251	3.34
iii) 75% of the torque obtained in (ii) :						
21.3	585	1911	6.82	5.70	0.268	3.12
iv) 50% of the torque obtained in (ii):						
14.3	589	1924	5.25	4.39	0.307	2.72
v) 25% of the torque obtained in (ii) :						
7.2	592	1934	3.80	3.18	0.442	1.89
vi) Unloaded:						
1.2	595	1944	2.68	2.24	1.867	0.45

*** Under high ambient conditions**

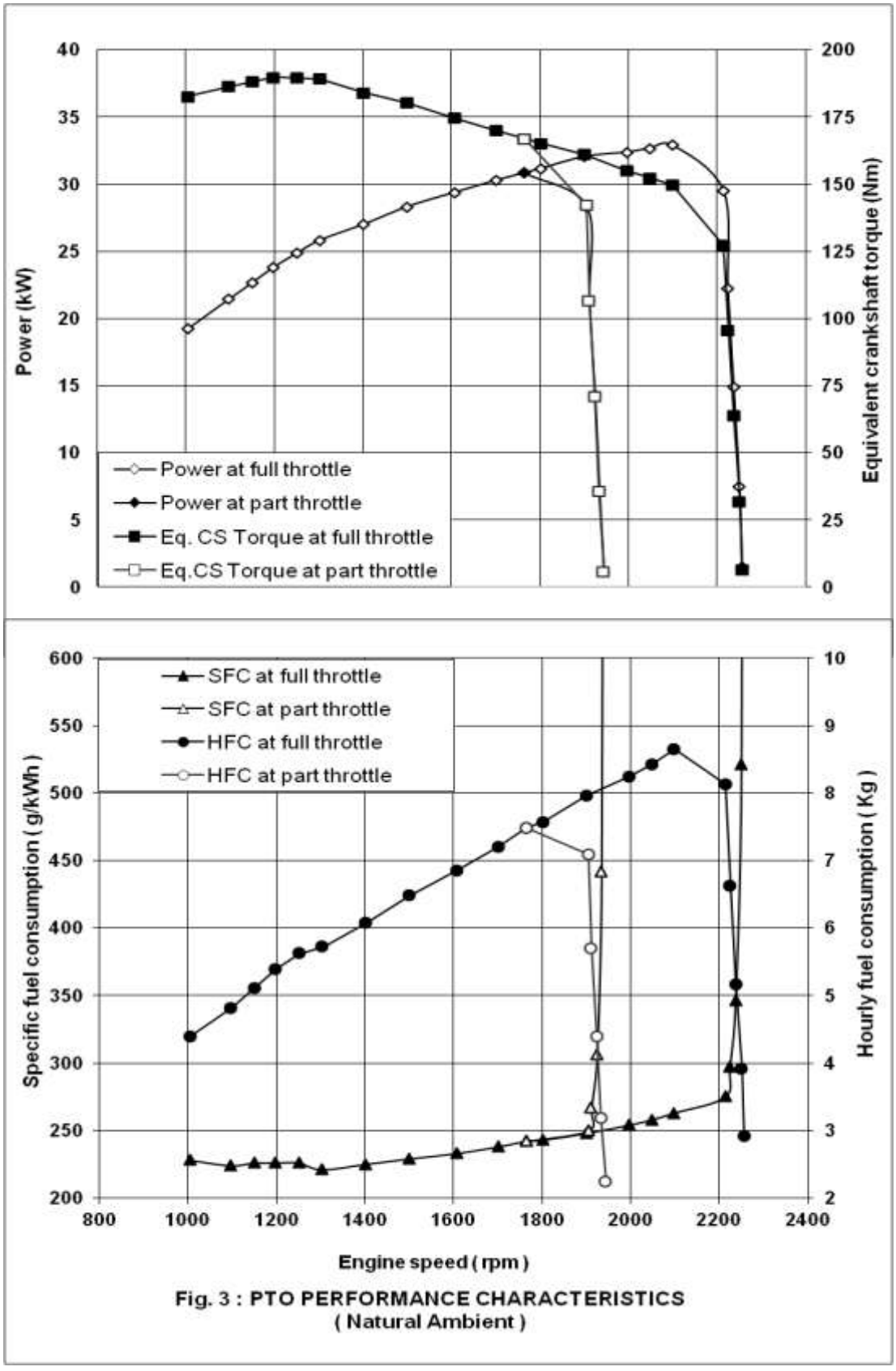


Fig. 3 : PTO PERFORMANCE CHARACTERISTICS
(Natural Ambient)

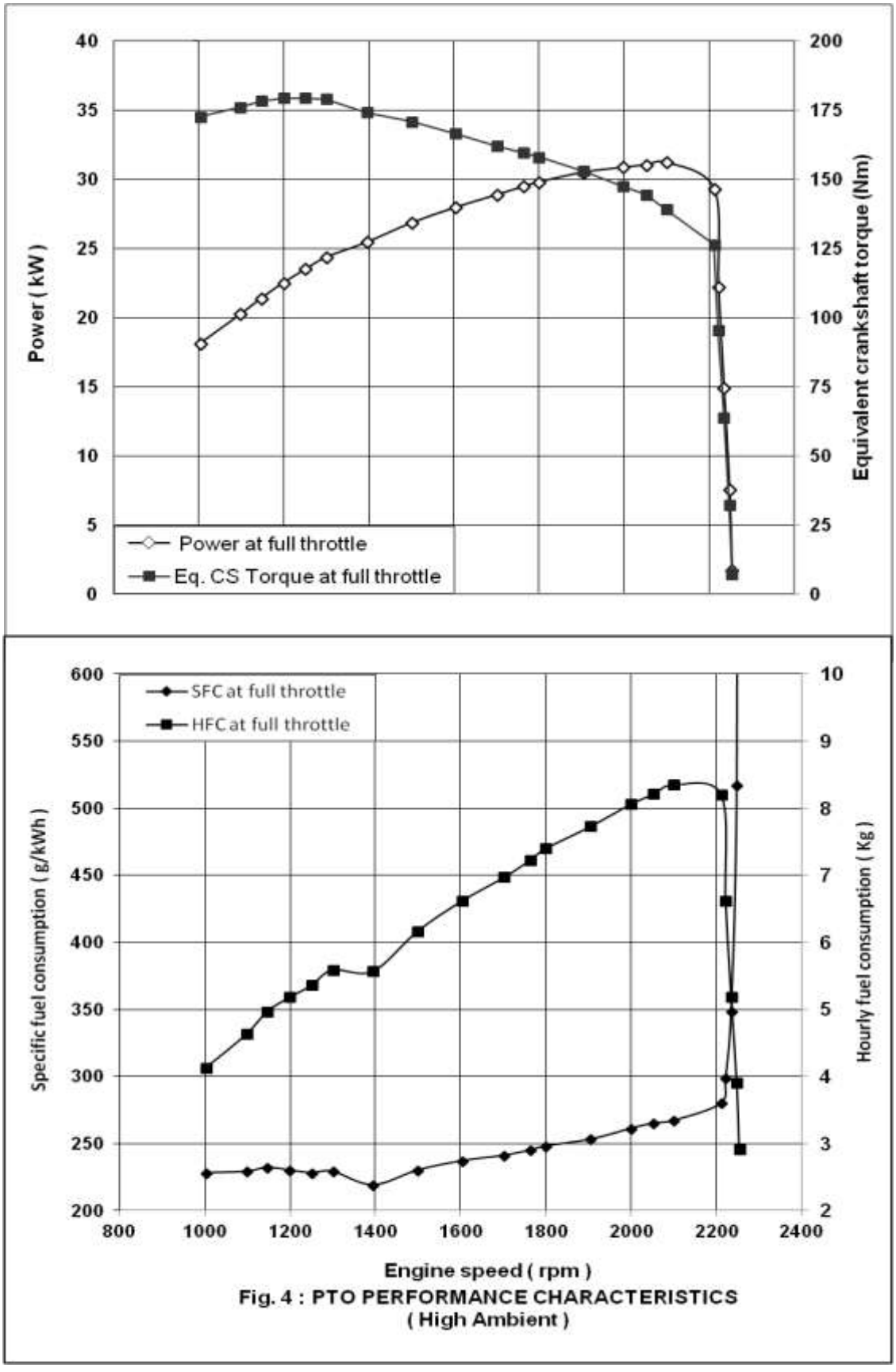


Fig. 4 : PTO PERFORMANCE CHARACTERISTICS
(High Ambient)

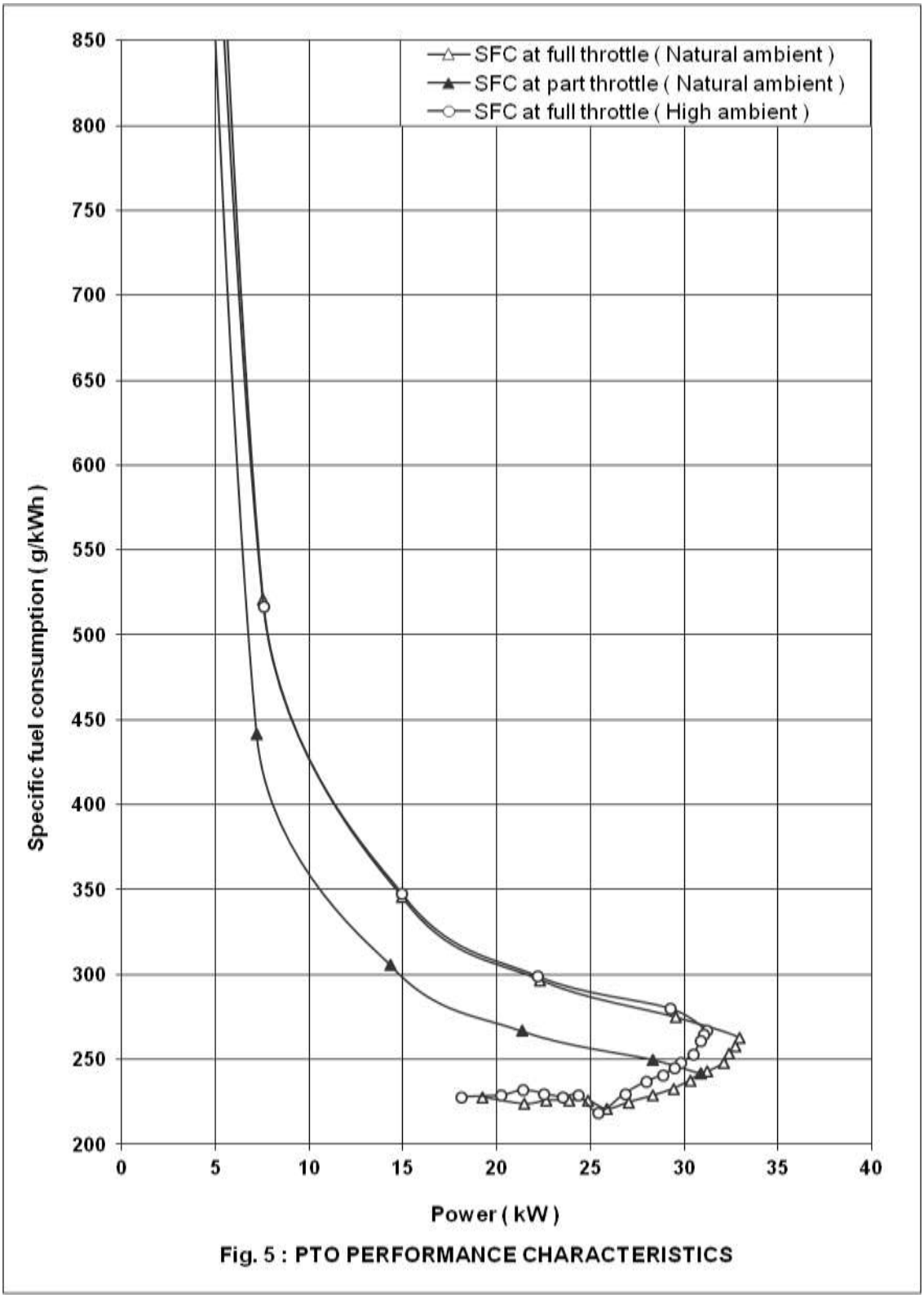


Fig. 5 : PTO PERFORMANCE CHARACTERISTICS

Sl. No.	Parameters	Natural Ambient	High Ambient
i)	No load maximum speed, (rpm)	2257	2254
ii)	Equivalent crankshaft torque at maximum power (Nm)	149.82	141.87
iii)	Maximum equivalent crank shaft torque (Nm)	189.78	179.34
iv)	Engine speed at maximum equivalent crankshaft torque, (rpm)	1199	1251
v)	Backup torque (%)	26.7	26.4
vi)	Smoke level at 80 % of max. power	0.23	--
vii)	**Range of atmospheric condition :**		
	- Temperature, (^{O}C)	25 to 28	41 to 44
	- Pressure, (kPa)	98.8 to 99.3	99.2 to 99.5
	- Relative humidity, (%)	26 to 29	13 to 18
viii)	**Maximum Temperature, (^{O}C):**		
	- Engine oil	95	105
	- Coolant	78	90
	- Fuel	40	56
	- Air intake	30	45
	- Exhaust gas	569	575
ix)	**Pressure at maximum power:**		
	- Intake air, (kPa)	3.2 to 3.3	3.2 to 3.3
	- Exhaust gas, (kPa)	7.7	9.7 to 10.1
x)	**Consumptions:**		
	Lub. Oil (g/kWh)	--	0.81
	-Coolant (% of total coolant capacity)	--	Nil

4. DRAWBAR PERFORMANCE TEST

Date(s) of test	:	07.05.2019, 08.05.2019, 15.05.2019, 16.05.2019 & 18.05.2019
Tractor run at the Institute prior to start of drawbar performance test, (h)	:	23.18
Type of track	:	Concrete
Height of drawbar, (mm):		
- With unballast	:	600
- With ballast	:	575

4.1 The results of drawbar performance test consisting of maximum power and pull without 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

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. sust-ained pull, (kN)
						(kg/kWh)	(l/h)		Temp (°C)	Pre-ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Cool-ant (water)	Eng-ine oil	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
i) Maximum power test (Tractor unballasted):																
L1	2.49	11.6	16.72	2228	15.4	0.447	6.20	1.87	32	98.4	28	65	55	76	104	17.20
L2	3.16	15.1	17.20	2223	14.8	0.401	7.24	2.09	31	98.4	22	67	52	76	103	17.72
L3	5.16	22.3	15.57	2184	14.8	0.378	10.08	2.21	37	98.3	17	69	75	82	112	16.52
L4	8.72	25.2	10.40	2101	5.1	0.331	9.98	2.53	35	98.4	20	59	64	81	111	13.67
H1	10.59	27.5	9.36	2114	3.6	0.302	9.93	2.77	35	98.4	22	55	55	83	107	10.89
ii) Maximum power test (Tractor ballasted):																
L1	2.44	16.2	23.86	2208	15.1	0.394	7.63	2.12	34	98.5	27	56	75	78	108	24.93
L2	3.08	20.9	24.37	2199	15.0	0.369	9.23	2.26	33	98.5	29	57	63	80	110	25.13
L3	5.34	26.2	17.63	2102	7.1	0.317	9.93	2.64	31	98.4	32	54	59	80	103	22.10
L4	8.80	25.8	10.55	2110	3.3	0.323	9.97	2.59	30	98.4	30	48	58	79	105	13.95
H1	10.50	27.7	9.49	2102	2.6	0.309	10.24	2.71	30	98.4	29	52	55	81	104	11.11

Table-2 Contd..

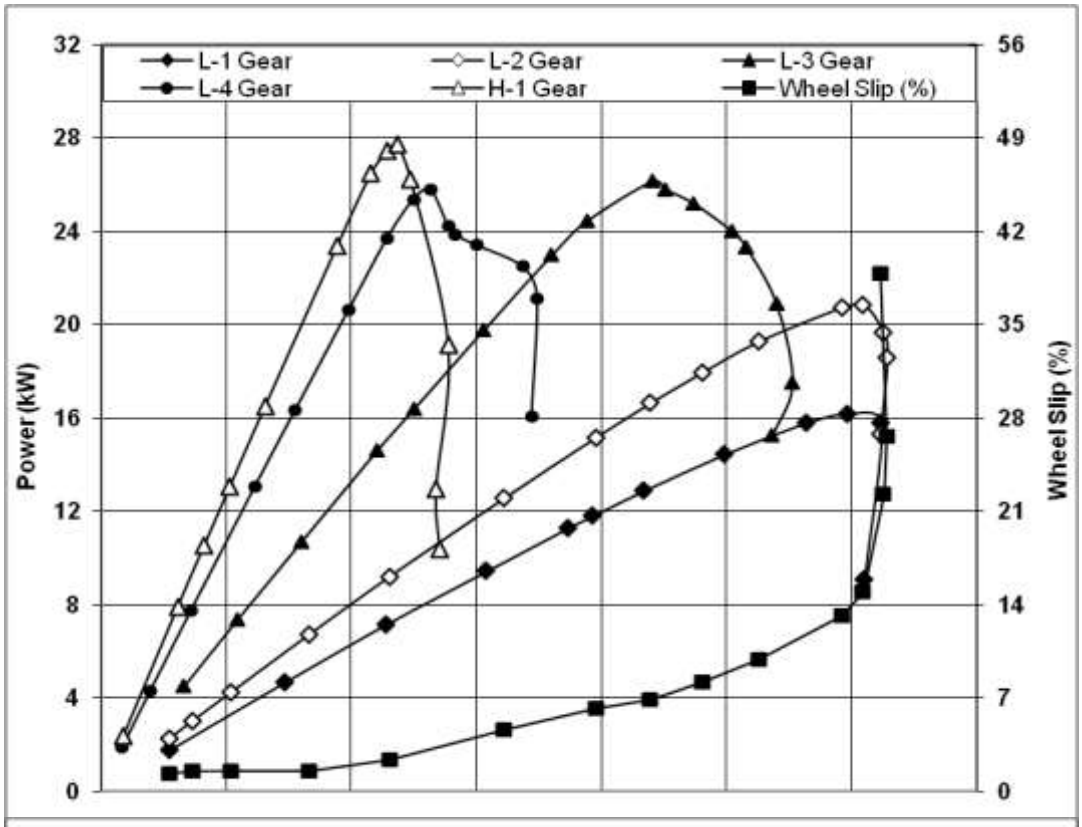
Contd..Table-2

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. sust-ained pull, (kN)
						(kg/ kWh)	(l/h)		Temp (°C)	Pre-ssure (kPa)	R.H. (%)	Fuel	Trans. oil	Coolant (water)	Eng-ine 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	5.81	21.3	13.22	2216	4.6	0.310	8.95	2.39	37 to 34	98.4 to 98.6	30 to 47	64 to 72	53 to 81	76 to 80	106 to 110	--
iv) Five hours test at pull corresponding to 15 percent wheel slip (ballasted wheeled tractor):																
L2	3.16	21.4	24.37	2213	---	0.359	9.56	2.23	26 to 33	98.5 to 98.7	27 to 35	62 to 74	50 to 80	75 to 79	104 to 111	--

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

ii) Tyre Creeping, (mm):
- LHS : 25
- RHS : 30

iii) Maximum temperatures during entire drawbar test, (°C):
Engine oil : 113
Coolant (water) : 89
Transmission oil : 81
Fuel : 74



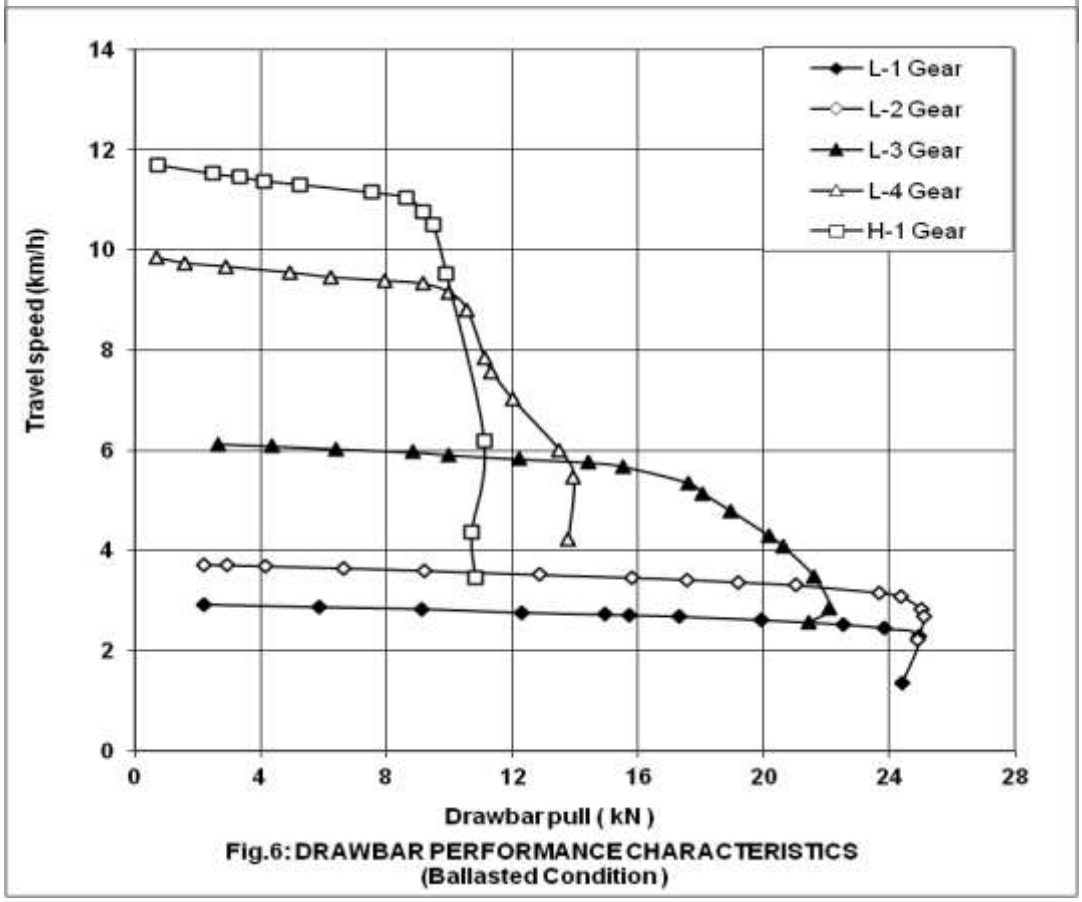


Fig.6: DRAWBAR PERFORMANCE CHARACTERISTICS
(Ballasted Condition)

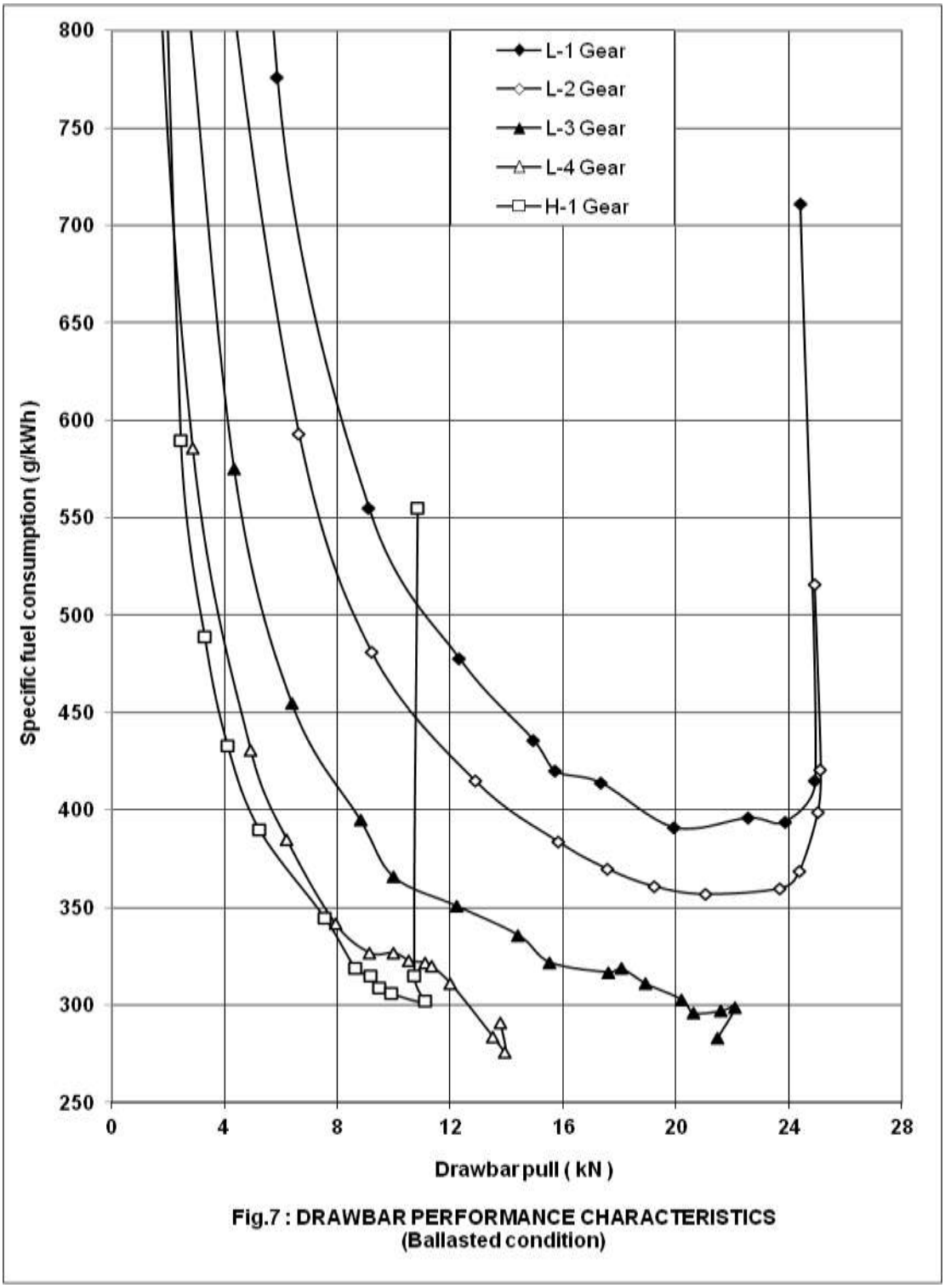


Fig.7 : DRAWBAR PERFORMANCE CHARACTERISTICS (Ballasted condition)

5. POWER LIFT & HYDRULIC PUMP PERFORMANCE TEST

Date(s) of test : 07.02.2019, 08.02.2019 & 11.02.2019
Tractor run at the Institute prior to start of hydraulic test, (h) : 11.65
Pump speed at rated engine speed (rpm) : 2100

5.1 Hydraulic power test:

Pump delivery rate at minimum pressure and rated engine speed, (l/min) : 38.5
Maximum hydraulic power,(kW) : 9.4
Pump delivery rate at maximum hydraulic power, (l/min) : 37.5
Pressure at maximum hydraulic power, (MPa) : 15.0
Sustained pressure of the open relief valve, (MPa) : 18.0

Tapping point:

a) Relief valve test : External circuit
b) Pump performance test : Pump outlet
Temperature of hydraulic fluid, (°C) : 60 to 68

5.2 Lifting capacity test :

Test	Height of lower hitch point above ground in down position, (mm)	Vertical move-ment with lifting forces, (mm)	Maximum corrected force exerted through full range, (kN)	Corres-ponding pressure, (MPa)	Moment about rear axle, (kN-m)	Maximum tilt angle of mast from vertical (degrees)
At hitch point	200	650	15.66	16.2	13.86	--
On the standard frame	200	640	11.19	16.2	16.73	20.0°

5.3 Maintenance of lift load:

Force applied at the frame, (kN) : 10.07
Temperature of hydraulic fluid at the start of test, (°C) : 60

Test data:

Elapsed time (minute)	5	10	15	20	25	30
Cumulative drop in height of lift, (mm)	37	50	60	65	73	80

6. BRAKE TEST

6.1 Service brake:

6.1.1 Cold brake test:

Date of test(s) : 22.02.2019
Type of Track : Concrete
Maximum attainable speed (kmph):
-Without Ballast : 35.0

		At maximum attainable speed			
Unballasted tractor	Braking device control, force (N)	499	466	433	400
	Mean deceleration, (m/sec^2)	3.33	3.11	2.82	2.50
	Stopping distance, (m)	14.20	15.20	16.76	18.90
		At 25 kmph travel speed			
Unballasted tractor	Braking device control, force(N)	535	497	458	420
	Mean deceleration, (m/ sec^2)	3.04	2.80	2.65	2.50
	Stopping distance, (m)	8.11	8.60	9.09	9.65

6.1.2 Brake fade test:

	At maximum attainable speed			
Braking device control force (N)	598	563	527	492
Mean deceleration, (m/ sec^2)	3.27	2.98	2.73	2.50
Stopping distance, (m)	14.60	15.84	17.30	18.90

	At 25 kmph travel speed			
Braking device control force,(N)	584	555	526	498
Mean deceleration, (m/ sec^2)	2.80	2.69	2.64	2.50
Stopping distance, (m)	8.79	8.96	9.13	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	18 percent slope		12 percent slope with trailer of 1.97 tones.	
	Up	Down	Up	Down
Braking device control force, (N)	415	360	300	342
Efficacy of parking brake	----------Effective----------			

7. NOISE MEASUREMENT

7.1 Noise at bystander's position:

Date of test : 14.02.2019
Type of track : Concrete
Background noise level, dB (A) : 52

Atmospheric conditions:

Temperature, (°C) : 28
Pressure, (kPa) : 97.7
Relative humidity, (%) : 38
Wind velocity, (m/s) : 1.5

TEST DATA:-

S. No.	G e a r	Travelling speed before acceleration, (kmph)	Noise level, dB (A)
(i)	L1	2.19	85
(ii)	L2	2.80	85
(iii)	L3	4.57	85
(iv)	L4	7.20	85
(v)	H1	8.63	84
(vi)	H2	10.90	84
(vii)	H3	17.98	83
(viii)	H4	28.42	83

7.2 Noise at operator's ear level:

Date of test : 08.06.2019
Type of track : Concrete
Background noise level, dB(A) : 54

Atmospheric conditions:

Temperature, (°C) : 31
Pressure, (kPa) : 98.5
Relative humidity, (%) : 27
Wind velocity, (m/s) : 1.9

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	2.09 to 16.76	2.95 to 2.53	95
(ii)	L2	2.73 to 17.35	3.73 to 3.12	95
(iii)	L3*	1.99 to 15.58	6.19 to 5.16	95
(iv)	L4	2.48 to 10.18	9.78 to 8.87	96
(v)	H1	7.37 to 8.87	11.19 to 11.01	96

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

8. MECHANICAL VIBRATION MEASUREMENT

Date of test : 01.02.2019

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	90	120*	100	180*
		Right	100	60	190*	120*
ii)	Steering control wheel		90	60	100	130*
iii)	Seat	Bottom	40	10	70	40
		Back	20	30	30	30
iv)	Mudguard	Left	100	60	100	60
		Right	60	130*	80	120*
v)	Head light	Left	70	60	80	120*
		Right	90	60	100	120*
vi)	Battery base, centre		40	60	100	100
vii)	Tail light	Left	60	80	150*	120*
		Right	80	60	140*	100
viii)	Plough light		120*	110*	320*	130*
ix)	Gear shifting lever		30	20	100	100
x)	Accelerator lever	Hand	110*	150*	190*	220*
		Foot	50	190*	90	150*
xi)	Brake pedal	Left	60	80	70	120*
		Right	60	80	80	170*
xii)	Clutch pedal		40	100	90	90
xiii)	Main hydraulic control lever		60	40	70	70
xiv)	PTO engaging lever		30	70	90	90

*The amplitude of mechanical vibration is on higher side.

9. HAULAGE TEST

		Two wheel (Single axle)	Four wheel (Double axle)
Type of trailer	:		
Gross mass of trailer (tonne)	:	5.0	6.0
Height of trailer hitch above ground level, (mm)	:	555	570
Gear used during the test for negotiating slopes up to 8%	:	H-4	H-4
Average travel speed,(kmph)	:	28.14 to 32.57	31.82
Average fuel consumption:			
- (l/h)	:	4.15 to 4.96	5.54
- (ml/km/tonne)	:	29.5 to 30.5	29.0
Average distance traveled per liter of fuel consumption, (km)	:	6.78 to 6.57	5.74
General observations:			
Effectiveness of brakes	:	Effective	Effective
Maneuverability of tractor-trailer combination	:	Satisfactory	Satisfactory

10. FIELD TEST

The major breakdowns were not observed in the field test during initial commercial testing of the base model of tractor having test report No. **T- 922/1439/2014** released in **June 2014**. So, as per the provision as laid down in clause 7.2 of IS: 12207- 2014, the field test during the batch testing of this tractor model was not conducted.

11. COMPONENTS/ASSEMBLY INSPECTION

The engine and other assemblies were dismantled after **40.14** hours of tractor operation at this Institute.

11.1 Engine:

11.1.1 Cylinder bore:

Cyli-nder No.	Cylinder bore dia, (mm)						Max. 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.	105.038	105.038	105.038	105.042	105.040	105.042	105.3
2.	105.040	105.042	105.042	105.042	105.042	105.042	
3.	105.038	105.038	105.042	105.042	105.042	105.042	

11.1.2 Piston:

Piston No.	Piston dia, (mm)				Piston to cylinder liner clearance at skirt (mm)	
	Top (above top compression ring)		At skirt			
	Thrust Side	Non-thrust Side	Thrust side	Non-thrust side	As observed	Max. permissible limit,
1.	104.457	104.471	104.935	**	0.107	0.45
2.	104.455	104.472	104.935	**	0.107	
3.	104.455	104.472	104.934	**	0.108	

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

11.1.3 Ring end gap:

Rings	Ring end gap, (mm)									Maximum Permissib-le limit, (mm)
	Cylinder No.1			Cylinder No.2			Cylinder No. 3			
	Top	Middle	Bottom	Top	Middle	Bottom	Top	Middle	Bottom	
1st comp. ring	0.45	0.48	0.35	0.50	0.50	0.50	0.50	0.50	0.50	2.0
2nd comp. ring	0.85	0.90	0.90	0.85	0.85	0.90	0.75	0.75	0.75	2.0
Oil ring	0.70	0.70	0.70	0.60	0.60	0.60	0.60	0.60	0.60	2.0

11.1.4 Ring side clearance:

R i n g s	Ring side clearance, (mm)			Maximum Permissible Limit, (mm)
	Piston-I	Piston-II	Piston-III	
1st Compression ring	-------Tapered-------			--
2nd Compression ring	0.088	0.082	0.084	0.25
Oil ring	0.042	0.042	0.041	0.25

1.1.5 Main bearings:

Bearing No.	Diametrical Clearance, (mm)	Crankshaft end float, (mm)	Maximum permissible limit, (mm)	
			Diametrical clearance	Crankshaft end float
1.	0.098 to 0.100	0.15	0.55	0.60
2.	0.097 to 0.099			
3	0.098 to 0.099			
4.	0.098 to 0.099			

11.1.6 Big end bearings:

Bearing No.	Clearance, (mm)		Maximum permissible limit,(mm)	
	Diametrical	Axial	Diametrical	Axial
1.	0.097 to 0.099	0.25	0.60	1.00
2.	0.098 to 0.099	0.25		
3.	0.097 to 0.098	0.25		

11.1.7 Valve, guides and timing gears: **Observation**

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

Spring rate, (N/mm):

- Intake valve spring :	Inner spring	:	2.18 to 2.34	Against discard limit of 1.50 N/mm & 5.17 N/mm for inner & outer spring respectively.
	Outer spring		7.01 to 7.35	
- Exhaust valve spring:	Inner spring		2.22 to 2.34	
	Outer spring	:	7.03 to 7.36	

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

- Intake valve	:	0.083 to 0.086	Against discard limit of 0.25 mm
- Exhaust valve	:	0.085 to 0.087	

11.2 Clutch:

Any marked wear on clutch friction plates : None

Condition of clutch release bearing : Normal

Condition of springs and release levers : 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	:	10.82 to 10.83	Discard limit is wear upto rivet head.
-PTO	:	7.67 to 7.75	

Height of lining over rivet head, (mm):

-Transmission	:	3.03 to 3.35	Discard limit is wear upto rivet head.
-PTO	:	0.96 to 1.01	

11.3 Transmission gears:

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

Backlash between crown wheel and pinion, (mm) : 0.45 — Discard limit is not specified. However backlash may be adjusted through check nut and shims

11.4 Brakes:

Description	Initial specified overall thickness of brake plate, (mm)	Measured overall thickness of brake plate after test, (mm)	Height of brake lining over rivet head, (mm)	Minimum permissible height of brake lining above rivet head, (mm)
Left	14.00	13.17 to 13.50	2.03 to 2.67	Wear upto rivet head
Right	14.00	13.10 to 13.29	2.15 to 2.44	

11.5 Front axle:

Any marked wear of king pins	:	None	
Any marked wear of king pin bushes	:	None	
Clearance between king pin and bushes, (mm)	:	0.09	Against the discard limit of 1.0 mm.
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)	:	0.12 to 0.13	Against the discard limit of 1.0 mm.

11.6 Steering system:

Visual condition of the components of complete steering assembly	:	Normal

11.7 Starter motor & Alternator:

Presence of soil/oil in housing	:	None
Condition of bearings and other components	:	Normal

12. ADJUSTMENTS, DEFECTS, BREAKDOWNS AND REPAIRS

Sl. No.	Adjustments/Defects/Breakdowns and Repairs	Tractor run hours
--None--		

13. COMPARISON OF SPECIFICATION AND PERFORMANCE CHARACTERISTICS OF PREVIOUS SAMPLE (TEST REPORT No. T- 922/1439/2014, June, 2014) AND PRESENT SAMPLE

			Previous sample	Present sample
13.1	**Specification:**			
13.1.1	**Tractor**:			
	Make	:	ACE	ACE
	Model	:	DI 550 NG	DI 550 NG
13.1.2	**Engine:**			
	Make	:	ACE	ACE
	Model	:	A50	A50
	Bore/Stroke, (mm)	:	105/118	105/118
	Specified cubic capacity, (cc) (apa)	:	3066	3066
	Rated engine speed, (rpm)	:	2100	2100

			Previous sample	Present sample
13.1.2.1	**Fuel system:**			
	Make & model of fuel feed pump	:	Bosch & FP/KS22A62, 9 440 030 029 (apa)	Bosch, India & FP/KSG22AD105, F002A50040
	Make & model of fuel filters	:	Bosch & 9 450 030 118	Bosch, India & 9 450 030 118
	Make and model of fuel injection pump	:	Bosch & E 040 266 700	Bosch, India & F 002 AOZ 948, PES3A90D320RS3500
	Make & model of fuel injectors	:	Bosch & F 002 C70 552	Bosch, India & F 002 C70 552
	Type of injector	:	Multi hole (five holes)	Multi hole (five holes)
	Manufacturer's production pressure setting, (MPa)	:	25.0 to 25.8	25.0 + 0.8
	Injection timing	:	10 ± 2 degree before TDC	10 ± 2 degree before TDC
	Make & model of governor	:	Bosch & E 042 207 300	Bosch, India & RSV350…1050A1C17 32R
13.1.2.2	**Lubricating system:**			
	Total lubricating oil capacity,(l)	:	8.00	7.95
13.1.3	**Transmission:**			
13.1.3.1	**Clutch:**			
	Type of clutch plate	:	Dual, dry friction plate	Dual, dry friction plate & pad type
	Size, OD/ID,(mm):			
	- Transmission	:	280 /165 Φ	279.9 / 165.7 Φ
	- PTO	:	280/165 Φ	279.0 / 165.0 Φ with four Pads, area of one pad is 27.8 cm^2
13.1.3.2	**Gear Box:**			
	No. of speeds:			
	- Forward	:	08	08
	- Reverse	:	02	02
	Range of speed, (kmph):			
	- Forward	:	2.69 to 35.20	2.69 to 35.23
	- Reverse	:	3.76 to 14.82	3.76 to 14.84
13.1.4	**Service Brake:**			
	Make	:	Vishwas	Vishwas
	Type	:	Mechanical, dry disc brakes	
	No. of friction disc	:	Two (on each wheel side)	Two (on each wheel side)
	Area of liners, (cm^2)	:	732.5 (on each wheel side)	737.4 (on each wheel side)
13.1.5	**Wheel equipment:**			
	Make & Size of tyres	:		
	- Front	:	Good Year	MRF, Shakti Life
	- Rear	:	Good Year	MRF, Shakti Life
	Standard Track width, (mm):			
	- Front	:	1260	1300
	- Rear	:	1435	1420

			Previous sample	Present sample
13.1.5.1	**Wheel base, (mm)**	**:**	1960	1960
13.1.6	**Overall dimensions, (mm):**			
	- Length	**:**	3740	3785
	- Width	**:**	1840	1825
	- Height (at exhaust pipe)	**:**	2295	2290
	- Ground clearance, (mm)	**:**	425 (Below rear towing hitch bracket)	425 (Below front axle)
13.1.7	**Operational mass of unballasted tractor(kg):**			
	- Front	**:**	810	765
	- Rear	**:**	1190	1205
	- Total	**:**	2000	1970

13.1.8	**Conformity with following IS:**		**Previous sample**	**Present sample**
i)	Guide lines for declaration of power and specific fuel consumption and labelling of agricultural tractors (First revision) [IS10273: 1987 (Reaffirmed 2014)]	**:**	Conformed	Conforms
ii)	Agricultural tractors - Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS:4931-1995 (Reaffirmed 2014)]	**:**	Conformed	**Does not conform**
iii)	Agricultural wheeled tractors - Three-point linkage: Part 2 Category 1N (Narrow Hitch) (Third Revision) [IS 4468 (Part-2):1993/ ISO 730-2:1979 (Reaffirmed 2014)]	**:**	**Did not conform**	**Does not conform**
iv)	Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed October, 2017)]	**:**	Conformed	Conforms
v)	Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed 2014)]	**:**	**Did not conform**	Conforms
vi)	Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision): [IS 12239 (PT-1) 1996/ISO 4254-1:1989 (Reaffirmed October, 2017)]	**:**	**Did not conform**	**Does not conform**
vii)	Tractors and machinery for agriculture and forestry – Technical means for ensuring safety Part 2: Tractors (first revision) (IS 12239 (PT-2) 1999) (Reaffirmed 2014)]	**:**	**Did not conform**	**Does not conform**
viii)	Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) IS: 8133-1983 (Reaffirmed 2014)]		**Did not conform**	**Does not conform**
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)]	**:**	Conformed	Conforms
x)	Agricultural Tractors and Machinery - Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed 2014)]	**:**	Conformed	Conforms

13.2 Performance Characteristics:

			Previous sample	Present sample
13.2.1	**PTO Performance:**			
	Maximum Power, (kW)	:	34.5	32.9
	Power at Rated engine speed,(kW)	:	34.2	32.9
	Specific fuel consumption corresponding to maximum power, (g/kWh)	:	251	263
	Maximum equivalent crankshaft torque,(Nm)	:	186.6	189.78
	Back up torque, (%)	:	23.7	26.7
	Maximum temperatures (degree):			
	Engine oil	:	117	105
	Coolant	:	98	90
	Lub oil consumption, (g/kWh)	:	0.44	0.81
13.2.2	**Drawbar performance :**			
	Maximum power with unballasted tractor, (kW)	:	29.4	27.5
	Maximum pull with unballasted Tractor, (kN)	:	18.61	17.20
	Maximum transmission oil temperature (deg. C)	:	78	81
13.2.3	**Hydraulic performance:**			
	Hydraulic pump discharge at minimum pressure and rated engine speed (l/min.)	:	32.03	38.5
	Maximum hydraulic power, (kW)	:	7.2	9.4
	Sustained pressure of the open relief valve, (MPa)	:	20.0	18.0
	Maximum lifting capacity, (kN):			
	- At the hitch point	:	16.84	15.66
	- At the standard frame	:	14.54	11.19
	Total drop in height of lift during load maintenance test, (mm)	:	26	80

13.2.4 Brake performance test at 25 kmph speed (max.)

Parameter	Cold	Hot	Cold	Hot
Maximum Stopping distance, (m)	7.42	8.69	8.11	8.79

Maximum force exerted on the brake Pedal effort required to achieve deceleration of 2.5 m/sq sec, (N)	:	253 to 269	420 to 498
Weather parking brake is effective at a force of 600N at foot pedal (s) or 400 N at hand lever	:	Effective	Effective

13.2.5	**Noise measurement:**			
	- Maximum noise at bystanders position, dB(A)	:	83	85
	- Maximum noise at operator's ear level dB(A)	:	95	96
13.2.6	**Mechanical vibration:**			
	Maximum amplitude of vibration at (microns):			
	- Foot rest – LHS & RHS	:	120 & 140	180 & 190
	- Steering wheel	:	70	130
	-Driver's seat, (driver in seat):	:	130	70

13.2.7 Haulage Test

		Previous sample		Present sample	
		Two wheel trailer	Four wheel trailer	Two wheel trailer	Four wheel trailer
-Gross mass of trailer, (tonnes)	:	5.0	6.0	5.0	6.0
- Average speed, (kmph)	:	25.75	26.47 to 26.69	28.14 to 32.57	31.82
-Distance traveled per litre of fuel consumed, (km)	:	5.91 to 5.96	4.94 to 5.09	6.57 to 6.78	5.74
- Average fuel consumption (cc/km/tonne)	:	33.5 to 33.9	32.7 to 33.8	29.5 to 30.5	29.01

13.3 Qualifying performance (comparable limit) for batch model in comparison to ICT model (please refer Clause 7.6 of IS: 12207-2014):

S. No.	Characteristic	Requirements as per IS: 12207-2014		As observed		Whether meets the require-ment (Yes/No)
		Column 4 of Table-1	Clause 7.6	Previous sample	Present sample	
1	2	3	4	5	6	7
13.3.1	**Drawbar performance:**					
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Minimum 65% of static mass with ballast	The performance shall be within 7.5% of ICT or limit specified under Column 3 whichever is higher	25.50	24.37	Yes
b)	Maximum drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)	Minimum 65% of static mass of tractor without ballast		18.61	17.20	Yes
c)	Maximum drawbar power without ballast, (kW).	Minimum 80 % of PTO power as referred in Sl No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in Sl No. i) a) of PTO performance.		29.4	27.5	Yes
d)	Maximum transmission oil temperature (^{o}C)	The declared value should not exceed the maximum value specified by oil company		78	81	Yes

1	2		3	4	5	6	7
13.3.2	**Hydraulic performance:**						
a)	Maximum lifting capacity throughout the range of lift, (kN):						
	1)	At hitch points	[Tolerance of minus 10%]	The performance shall be within 7.5% of ICT or limit specified under Column 3 whichever is higher	16.84	15.66	Yes
	2)	With the standard frame	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		14.54	11.19	**No**
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)		The observed value should not exceed 50 mm		26	80	**No**

13.4 Salient Observations:

13.4.1 Laboratory test:

	Previous Sample		**Present Sample**
13.4.1.1	**PTO Performance Test:**		
i)	The backup torque is 23.7 **%.**	**i)**	The maximum PTO power was recorded as **32.9 kW** against the declaration of **34.0 kW,** which meets the requirement of IS: 12207-2014 with regard to tolerance limit.
ii)	The specific fuel consumption corresponding to maximum power was measured as 251g/kWh against the declaration of 265 g/kWh, which does not meet the requirement of IS:12207-2008 with regard to tolerance. This should be looked into.	**ii)**	The specific fuel consumption corresponding to maximum power was recorded as **263 g/kWh** against the declaration of **265 g/kWh**, which is within the tolerance limit of IS: 12207-2014.
		iii)	The maximum equivalent crankshaft torque was recorded as **189.78 N-m** against the declaration of **202.0 N-m**, which is within the permissible limit as specified in IS: 12207-2014.
		iv)	The backup torque is **26.7** %.
		v)	The max PTO power drop of **5.2 %** between natural and high ambient condition which is considered on higher side. This should be looked into for necessary corrective action.

	Previous Sample	Present Sample
13.4.1.2	**Drawbar Performance Test:**	
	During 10 hour drawbar test, the creeping of LHS & RHS rear tyre over the rims was observed as 50mm & 95 mm respectively, which was considered on higher side. This may be looked into for necessary corrective action.	**i)** During ten hours drawbar performance test, creeping of LHS & RHS rear tyre over the rims was observed as **25 & 30 mm** respectively. This should be looked into for necessary corrective action.
13.4.1.3	**Hydraulic Performance Test:**	
i)	During Hydraulic performance maintenance of lift of load test the weight suddenly drop & touches the ground after inspected the internal leakage was observed .so the copper washer part no.90168142000 (size 14 x20x15) was found in damaged condition & were replaced with new one.	**i)** The moment about rear axle at standard frame was calculated as **16.73 kN-m**, whereas, the moment about front axle was calculated as **14.71 kN-m** under unballasted condition. The moment about rear axle at standard frame is on higher side as compared to the moment about front axle. It is therefore recommended that the lifting capacity of the hydraulic system may be reduced suitably or ballast mass recommendation may be reviewed to avoid the front lifting of the tractor.
ii)	The lifting capacity at standard frame was recorded as 14.54 kN and the moment about rear axle was computed as 21.52 kN-m, which is on higher side in compare to the moment about front axle i.e. 15.57 kN-m. Therefore, it is recommended that the lifting capacity should be reduced suitably or standard mass at front axle may be provided to avoid front lifting of tractor.	**ii)** Maximum drop in the height of lower links during maintenance of lift load test was recorded as **80 mm** against the maximum permissible limit of **50 mm** & which does not meet the requirement of IS: 12207-2014. This should be looked into necessary corrective action.
iii)	The maximum tilt angle of mast from vertical over the full range of lift was observed as 9.0 degrees against the minimum requirement of 10 degree as per IS: 12224-1987. This should be looked into for necessary corrective action.	
13.5	**Adequacy of literature:**	
	Following literature was supplied with the test sample for reference during the test.	
i)	Operator's manual (for ACE DI 550 *, DI 854 NG ,DI 350 NG, DI 450 NG,DI 550 NG, tractors)	**a)** Operator's manual of ACE DI 854 NG, DI 350 NG, DI 450 NG, DI 550 NG, DI 450 NG 4WD & DI 550 NG 4WD tractor model.
ii)	Spare parts catalogue (for DI 854 NG ,DI 350 NG, DI 450 NG,DI 550 NG, tractors)	**b)** Parts catalogue of ACE DI-305 NG, DI-854 NGDI, DI-350 NG, DI-450 NG, DI-550 NG & DI-6565 tractor model. **c)** Service Manual of ACE DI 854 NG, DI 350 NG, DI 450 NG, DI 550 NG, DI 350 NG 4WD & DI 6565 4WD tractor model.

14. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

14.1 Evaluative (mandatory) / Non-evaluative (Non-mandatory) parameters applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2014 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: 12207-2014	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the require-ments (Yes/No)
1	2	3	4	5	6	7
14.1.1	**PTO Performance :**					
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >26 kW. –7.5/+10% for PTO power ≤ 26 kW or-5 / +10% for Engine power >26 kW. –7.5/+10% for Engine power ≤ 26 kW	34.0 (D)	32.9	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	--do--	34.0 (D)	32.9	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	+ 5%	265 (D)	263	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	202 (D)	189.78	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	17% (D)	26.7	Yes
f)	Maximum operating temperature, (^{O}C)					
	1) Engine oil	Non 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.	135	105	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	90	Yes
g)	Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.67 (Maximum) (R)	0.81	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)	0.23	Yes

1	2	3	4	5	6	7
14.1.2	**Drawbar performance :**					
a)	Maximum drawbar pull with ballast corresponding to 15 percent wheel slip, (kN)	Non Evaluative	Minimum 65% of static mass with ballast	19.0 (D) 18.80 (R) Minimum	24.37	Yes
b)	Max. drawbar pull with unballasted corresponding to 15 percent wheel slip, (kN)	Evaluative	Minimum 65% of static mass of tractor without ballast or with standard ballast, as the case may be	13.0 (D) 12.56 (R) Minimum	17.20	Yes
c)	Maximum drawbar power with unballast, (kW).	Evaluative	Minimum 80 % of PTO power as referred in Sl No. i) a) of PTO performance in case of tractors having total static mass > 1500 kg Minimum 75 % of PTO power as referred in Sl 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 Sl No. i) a) of engine performance in case of tractors which do not have a PTO shaft.	27.2 (D) 26.3 (R) Minimum	27.5	Yes
d)	Maximum transmission oil temperature (^{o}C)	Non Evaluative	The declared value should not exceed the maximum value specified by oil company	135 (D)	81	Yes
14.1.3	**Power lift and hydraulic pump performance :**					
a)	Maximum lifting capacity throughout the range of lift, (kN):					
	1) At hitch points	Non Evaluative	[Tolerance of minus 10%]	14.71 (D)	15.66	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	8.21 (D) 7.75 (R) Minimum	11.19	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	80	**No**
14.1.4	**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)	8.11	Yes
	2) Hot brake	Evaluative	10	10 (R)	8.79	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	420 to 498	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	415	Yes

1	2	3	4	5	6	7
14.1.5	**Noise measurement :**					
a)	Maximum ambient noise emitted by the tractor dB(A)	Evaluative	As per CMVR	88 (R)	85	Yes
b)	Maximum noise at operator's ear level dB(A)	Evaluative	As per CMVR	96 (R)	96	Yes
14.1.6	**Amplitude of mechanical vibrations at:**					
	1) Left foot rest	Non Evaluative	100 microns (max)	100(R)	180	**No**
	2) Right foot rest				190	**No**
	3) Seat (with driver seated)				70	Yes
	4) Steering wheel				130	**No**
14.1.7	**Air cleaner:**					
	Air cleaner oil pull over, (%)	Non Evaluative	0.25 % (maximum)	Not applicable	--	--
14.1.8	**Haulage requirements :**					
a)	Gross mass of the trailers, (tones):					
	1) Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
	2) Four wheel		--	6.0 (D)	6.0	Yes
b)	Distance travelled / liter of fuel consumption, (km/l):					
	1) Two wheel	Non Evaluative	--	4.0 to 6.0 (D)	6.57 to 6.78	Yes
	2) Four wheel		--	3.5 to 5.5 (D)	5.74	Yes
c)	Fuel consumption (ml/km/tonne):					
	1) Two wheel	Non Evaluative	--	35 to 55 (D)	29.5 to 30.5	Yes
	2) Four wheel		--	30 to 50 (D)	29.0	Yes
14.1.9	**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)	The major breakdowns were not observed in the field test during initial commercial testing of the tractor model having test report No. T- 922/1439/2014. So, as per the provisions as laid down in clause 7.2 of 12207-2014 the field test during the batch testing of this tractor model was not conducted.	----
	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
14.1.10	**Safety features :**						
a)	Guards against moving and hot parts		Evaluative	Belt drives, pulley, silencer, hydraulic pipes (As per IS 12239 (part 2)	--	Meets the requirement	Yes
b)	Lighting arrangement (Tractor having more than 1150 mm rear track width)		Evaluative	As per CMVR	--	Meets the requirement	Yes
c)	Seating requirement (Tractors having more than 1150 mm rear track width)		Non-Evaluative	Should meet the requirements of IS 12343 (as amended from time to time)	--	Meets the requirement	Yes
d)	Technical requirements for PTO shaft		Non-Evaluative	Should meet the requirements of IS 4931 (as amended from time to time)	--	**Does not meet the requirement**	**No**
e)	Dimension of three point linkage		Non-Evaluative	Should meet the requirements of IS 4468 (part 1) (as amended from time to time)	--	**Does not meet the requirement**	**No**
f)	Specification of linkage		Non-Evaluative	Should meet the requirements of IS 12953 and IS 12362 (part 3) (as amended from time to time)	--	Meets the requirement	Yes
	Swinging drawbar				--	Not Provided	--
14.1.11	**Labelling of tractors (Provision of labelling plate):**						
	1)	Make	Evaluative	Should conform to the requirements of CMVR	--	ACE	Yes
	2)	Model	Evaluative		--	DI 550 NG	Yes
	3)	Engine number	Evaluative		--	TRAH0007170	Yes
	4)	Chassis number	Evaluative		--	RAH550032129	Yes
	5)	Declaration of PTO power, (kW)	Evaluative		--	34.0	Yes

1	2	3	4	5	6	7
14.1.12	**Discard limit for:**					
(a)	Cylinder bore diameter, (mm)	Evaluative	To be specified by the manufacturer and supported by the printed literature	105.3 (D)	105.038 to 105.042	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)	Non Evaluative		0.45 (D)	0.107 to 0.108	Yes
(c)	**Ring end gap (mm):**					
	- Top comp. ring.	Evaluative	-do-	2.0 (D)	0.35 to 0.50	Yes
	- 2nd comp. ring.		-do-	2.0 (D)	0.75 to 0.90	Yes
	- Oil ring.		-do-	2.0 (D)	0.60 to 0.70	Yes
(d)	**Ring groove clearance (mm):**					
	- Top comp. ring.	Evaluative	-do-	--Tapered--		--
	- 2nd comp. ring.		-do-	0.25 (D)	0.082 to 0.088	Yes
	- Oil ring.		-do-	0.25 (D)	0.041 to 0.042	Yes
(e)	**Clearance of main bearings (mm):**					
	- Diametrical clearance	Evaluative	-do-	0.55 (D)	0.097 to 0.100	Yes
	- Crankshaft end float	Evaluative		0.60 (D)	0.15	Yes
(f)	**Clearance of big end bearings, (mm):**					
	- Diametrical	Evaluative	-do-	0.60 (D)	0.097 to 0.099	Yes
	- Axial	Evaluative	-do-	1.00 (D)	0.25	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	1.00 (D)	0.09	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	1.00 (D)	0.12 to 0.13	Yes
14.1.13	**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

14.1.14	**CATEGORY OF BREAKDOWNS / DEFECTS :**				
Sl. No.	**Category of breakdowns**	**Category (Evaluative / Non Evaluative)**	**Requirements as per IS: 12207-2014**	**As observ-ed**	**Whether meets the Requirem-ents (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 5 minor breakdowns.	None	Yes

14.2	Optional requirements as per Clause-4 (Table-2) of IS:12207-2014:			
S.No.	**Characteris-tic**	**Requirements as per IS: 12207-2014**	**As observed**	**Remarks**
1.	Fitment of ROPS	With a provision for fitment of ROPS.	Provided	Yes
		If ROPS fitted it should meet the requirement of IS: 11821 (As amended from time to time) or equivalent International Standards	ROPS not provided	Not applicable
2.	Accessories	Trailer hitch, front tow hook may be provided.	Provided	Yes

14.3 Salient Observations:

14.3.1 Laboratory tests:

14.3.1.1 PTO Performance Test:

i) The maximum PTO power was recorded as **32.9 kW** against the declaration of **34.0 kW,** which meets the requirement of IS: 12207-2014 with regard to tolerance limit.

ii) The specific fuel consumption corresponding to maximum power was recorded as **263 g/kWh** against the declaration of **265 g/kWh**, which is within the tolerance limit of IS: 12207-2014.

iii) The maximum equivalent crankshaft torque was recorded as **189.78 N-m** against the declaration of **202.0 N-m**, which is within the permissible limit as specified in IS: 12207-2014.

iv) The backup torque is **26.7** %.

v) The max PTO power drop of **5.2 %** between natural and high ambient condition was recorded which is considered on higher side. This should be looked into for necessary corrective action.

14.3.1.2 Drawbar performance test:

During ten hours drawbar performance test, creeping of LHS & RHS rear tyre over the rims was observed as **25 & 30 mm** respectively. This should be looked into for necessary corrective action.

14.3.1.3 Hydraulic performance test:

i) The moment about rear axle at standard frame was calculated as **16.73 kN-m**, whereas, the moment about front axle was calculated as **14.71 kN-m** under unballasted condition. The moment about rear axle at standard frame is on higher side as compared to the moment about front axle. It is therefore recommended that the lifting capacity of the hydraulic system may be reduced suitably or ballast mass recommendation may be reviewed to avoid the front lifting of the tractor.

ii) Maximum drop in the height of lower links during maintenance of lift load test was recorded as **80 mm** against the maximum permissible limit of **50 mm**. Which does not meet the requirement of IS: 12207-2014. This should be looked into necessary corrective action against internal leakage of hydraulic fluid.

14.3.1.4 Mechanical Vibration:

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

14.3.1.5 Specifications of power take-off shaft:

i) The dimensions "DΦ" & "dΦ" of PTO shaft does not meet the requirement of IS:4931-1995 (Reaffirmed 2014). This should be looked into for necessary corrective action.

14.3.1.6 Specifications of three point linkage:

i) The parameter Lateral distance from lower hitch point to centre line of tractor does not meet the requirement of IS: 4468 (Part-1) -1979 (Reaffirmed 2014). This should be looked into for necessary corrective action.

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.

14.4 Maintenance / Service Problems:

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

14.5 Recommendation with regard to safety on tractor:

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

i) There should be provision for spark arresting device in exhaust system.
ii) There should be provision of differential lock.
iii) Working clearance between operator's seat & PTO engaging lever should be as per relevant standard.
iv) There should be provision of safety against accidental start of engine.

14.6 Adequacy of Literature supplied with machine:

14.6.1 Literature was supplied with the tractor for reference during the test.

a) Operator's manual of ACE DI 854 NG, DI 350 NG, DI 450 NG, DI 550 NG, DI 450 NG 4WD & DI 550 NG 4WD tractor model.
b) Parts catalogue of ACE DI-305 NG, DI-854 NGDI, DI-350 NG, DI-450 NG, DI-550 NG & DI-6565 tractor model.
c) Service Manual of ACE DI 854 NG, DI 350 NG, DI 450 NG, DI 550 NG, DI 350 NG 4WD & DI 6565 4WD tractor model.

14.6.2 The supplied literature was found adequate; **except the following**

a) Different oil grades for engine, transmission & hydraulic system provided in the operator's manual does not match with specifications submitted by applicant.
b) Different oil grades for engine, transmission & hydraulic system is not provided in the service manual.
c) Service schedule maintenance chart of different assembly / subassembly / system of tractor is not provided in operator's and service manual.
d) Tractor is fitted with Pad type clutch plate for PTO shaft but circular plate type is mentioned in the Part catalogue submitted by the applicant.

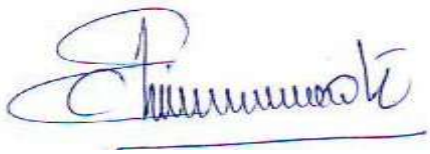
14.6.3 However, these literatures should be brought out in other vernacular languages of India for guidance of users

15. Citizen charter

Duration of Test	Time frame for testing & evaluation as per citizen charter	Whether the report released within time frame given in the citizen charter	Remark
07 Months (December, 2018 to June, 2019)	10 Months	Yes	--None--

TESTING AUTHORITY:

RAJNEESH PATEL
AGRICULTURAL ENGINEER



C.V. CHIMOTE
TEST ENGINEER

J.J.R. NARWARE
DIRECTOR

16. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
16.1	14.3.1.2, 14.3.1.3, 14.3.1.4, 14.3.1.5, 14.3.1.6 & 14.5	Your valuable comments & suggestions for improvement are well taken and these aspects are further being looked into & will try to eliminate these deviations soon wherever necessary.
16.2	14.6.2	We will update the operator manual & part catalogue as per suggestion

ANNEXURE - I

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS	HOURS
1.	Running-in	--
2.	PTO Performance Test	9.83
3.	Power lift and hydraulic pump performance test	3.18
4.	Drawbar performance test	15.39
5.	Brake test	1.08
6.	Noise measurement	1.50
7.	Mechanical vibration test	0.66
8.	Nominal speed test	1.31
B.	**HAULAGE TEST**	5.35
C.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	1.84
TOTAL:		**40.14**