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

संख्या / No. : T-864/1375/2013
माह / Month : March, 2013

SWARAJ 855 XM TRACTOR

सत्यमेव जयते

भारत सरकार

GOVERNMENT OF INDIA

कृषि मंत्रालय (कृषि एवं सहकारिता विभाग, मशीनीकरण एवं प्रोद्योगिकी प्रभाग)

Ministry of Agriculture (Deptt. of Agri. & Co-op, Mechanization & Technology Division

केन्द्रीय कृषि मशीनरी प्रशिक्षण एवं परीक्षण संस्थान

CENTRAL FARM MACHINERY TRAINING & TESTING INSTITUTE

(An ISO : 9001-2008 Certified Institute)

ट्रैक्टर नगर, बुदनी (म.प्र.) ४६६ ४४५ TRACTOR NAGAR, BUDNI (M.P.) 466445

Phone : 07564-234729 Fax : 07564-234743 E-mail : fmti-mp@nic.in Website: http://cfmtti.dacnet.nic.in

The applicant had submitted 'Swaraj 855 XM' tractor vide their application No. Nil dated 10.12.2011 for Initial Commercial Testing. During the course of testing i.e. during PTO performance test, the clutch housing and other parts was damaged /become unserviceable due to misalignment of clutch and flywheel housing and considered as consequential breakdowns. Moreover the nature of breakdowns falls under the critical category and having multiple breakdowns as listed on page No 38 to 39 of this report. Thus as per clause 3.2.4 of IS: 12207-2008, the supplementary test on PTO performance was conducted and thereafter all required necessary test for Initial Commercial Test carried out and resulted in this report.

Manufacturer	:	**Mahindra & Mahindra Ltd., Farm Equipment Sector, Swaraj Division Phase IV, Industrial Area, S.A.S. Nagar (Mohali) Near Chandigarh – 160 055**
Test requested by	:	**Mahindra & Mahindra Ltd., Farm Equipment Sector, Swaraj Division Phase IV, Industrial Area, S.A.S. Nagar (Mohali) Near Chandigarh – 160 055**
Place of running-in	:	At Applicant's works
Duration of said running-in, (h):		
- Engine	:	28
- Transmission	:	32
Method of Selection	:	The tractor was submitted directly by the applicant for test. Hence method of selection is not known.

1. SPECIFICATIONS

1.1	**Tractor:**		
	Make	:	Swaraj
	Model	:	855 XM
	Type	:	Four wheeled, rear-wheel driven, unit construction general purpose, agricultural tractor
	Year of manufacture	:	2011
	Chassis number	:	WWCE 63622142687
	Country of origin	:	India
1.2	**Engine:**		
	Make	:	Swaraj
	Model	:	RB 33 XM+
	Type	:	Water cooled, four stroke, direct injection, diesel engine
	Serial number	:	47.1402/SPD 02217

1.2.1	**Engine speed(Manufacturer's recommended production setting), (rpm):**		
	- Maximum speed at no load	:	1900 to 2000
	- Low idle speed	:	580 to 700
	- Speed at maximum torque	:	1000 to 1400
	Rated speed, (rpm):		
	- For PTO use	:	1800
	- For drawbar use	:	1800
1.3	**Cylinder & Cylinder Head:**		
	Number	:	Three
	Disposition	:	Vertical, Inline
	Bore/stroke, (mm)	:	110/122 (apa)
	Capacity as specified by the applicant, (cc)	:	3480
	Compression ratio	:	19.2 (± 0.5) : 1
	Type of cylinder head	:	Individual
	Type of cylinder liners	:	Wet, replaceable
	Type of combustion chamber	:	Direct injection, open chamber on piston crown
	Arrangement of valves	:	Overhead, inline
	Valve clearance (cold):		
	- Inlet valve, (mm)	:	0.25 to 0.30
	- Exhaust valve, (mm)	:	0.30 to 0.35
1.4	**Fuel System:**		
	Type of fuel feed system	:	Gravity and force feed
1.4.1	**Fuel tank:**		
	Capacity, (l)	:	59.800
	Location	:	Above clutch housing
	Provision for draining of sediments/ water	:	Not provided, however a water separator and sediment bowl is provided
	Material of fuel tank	:	M.S. sheet
1.4.2	**Water Separator:**		
	Make	:	SAL
	Type	:	Inverted funnel gravity separation.
	Location	:	On LHS of the engine, in between fuel tank & fuel feed pump
	Capacity (l)	:	0.5
1.4.3	**Fuel feed pump:**		
	Make	:	Bosch, India
	Type	:	Plunger with hand primer
	Model/Group combination No.	:	FP/KS22AD62, 9440 030 029
	Provision of sediment bowl	:	Provided (Metallic)
	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 105
	Number	:	Two
	Type of elements:		
	- Primary	:	Cloth
	- Secondary	:	Paper
	Capacity of final stage filter, (l)	:	0.45

17. SUMMARY OF OBSERVATIONS, COMMENTS & RECOMMENDATIONS

17.1 Evaluative (mandatory) / Non-evaluation (Non-mandatory) parameter applicable for qualifying Minimum Performance criteria as per Clause-4 (Table-1) of IS: 12207-2008 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: 12207-2008	Values declared by the applicant/ (D) Requirement (R)	As observed	Whether meets the require-ments (Yes/No.)
1	2	3	4	5	6	7
17.1.1	**PTO Performance :**					
a)	Maximum power under 2 h test, (kW) (Natural ambient condition)	Evaluative	Declared value to be achieved with a tolerance of: -5 / +10% for PTO power >35hp. –7.5/+10% for PTO power ≤ 35 hp	33.8 (D)	33.0	Yes
b)	Power at rated engine speed, (kW)	Non Evaluative	-do-	33.8 (D)	33.0	Yes
c)	Specific fuel consumption corresponding to maximum power, (g/kWh)	Non Evaluative	± 5%	258 (D)	255	Yes
d)	Maximum equivalent crankshaft torque, (Nm)	Non Evaluative	± 8%	210 (D)	207	Yes
e)	Back-up torque, percent	Non Evaluative	10 percent, min.	18 % D)/ 10% (R)	18.4	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.	130 (D)	105	Yes
	2) Coolant (water)	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.	115 (D)	98	Yes
g)	3) Engine oil consumption, (g/kWh)	Evaluative	Not exceeding 1% of SFC at max. power under High ambient conditions	2.55 (R)	0.39	Yes
h)	4) Smoke level	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 per metre (R)	0.39	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 65% of static mass with ballast	20.46 (R) 24.0 (D)	25.01	Yes
b)	Max. drawbar pull without ballast corresponding to 15 percent wheel slip, (kN)		Evaluative	Minimum 65% of static mass of tractor without ballast	13.83 (R) 16.0 (D)	17.54	Yes
c)	Maximum drawbar power without ballast, (kW).		Evaluative	Min. 80% of PTO power as referred in 16.1.1 (a) of PTO performance	26.4 (R) 27.5 (D)	28.8	Yes
d)	Maximum transmission oil temperature (°C)		Non Evaluative	The declared value should not exceed the maximum value specified by oil company	110 (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	Non Evaluative	[Tolerance of minus 10%]	14.71 (D)	18.44	Yes
	2)	With the standard frame	Evaluative	The lift capacity should at least be 18 kg/PTO hp. and it should be 16 kg/engine hp where the tractor is not provided with a PTO shaft	7.81 (R) (Minimum) 10.78 (D)	13.43	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	[Tolerance of plus 5 mm]	50 (R)	88	**No**
17.1.4	**Brake performance at 25 kmph:**						
a)	Maximum stopping distance at a force, equal to or less than 600 N on brake pedal with road ballast, (m):						
	1)	Cold brake	Evaluative	10	10 (R)	8.37	Yes
	2)	Hot brake	Evaluative	10	10 (R)	8.55	Yes
b)	Maximum force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2 (N)		Evaluative	600	600 (R)	382 to 392	Yes
c)	Whether parking brake is effective at a force of 600 N at foot pedal(s) or 400 N at hand lever		Evaluative	Yes / No	Yes (R)	Yes	Yes
17.1.5	**Noise measurement :**						
a)	Maximum ambient noise emitted by the tractor, dB(A)		Evaluative	As per CMVR	88 (R)	84	Yes
b)	Maximum noise at operator's ear level, dB(A)		Evaluative	As per CMVR	98 (R)	94	Yes

T- 864/1375/2013 | SWARAJ 855 XM TRACTOR – Commercial (Initial)

1	2		3	4	5	6	7
17.1.6	**Amplitude of mechanical vibrations at :**						
	1)	Left foot rest	Non Evaluative	100 microns (max)	100 (R)	60	Yes
	2)	Right foot rest				60	Yes
	3)	Seat (with driver seated)				180	**No**
	4)	Steering Wheel				190	**No**
17.1.7	**Haulage requirements :**						
a)	Gross mass of the trailers, (tones):						
	1)	Two wheel	Non Evaluative	--	5.0 (D)	5.0	Yes
	2)	Four wheel		--	7.0 (D)	7.0	Yes
b)	Distance travelled / litre of fuel consumption, (km/l):						
	1)	Two wheel	Non Evaluative	--	5.0 to 6.0 (D)	4.73	**No**
	2)	Four wheel			4.0 to 5.0 (D)	3.59 to 3.66	**No**
c)	Fuel consumption (ml/km/tonne):						
	1)	Two wheel	Non Evaluative	--	30 to 40 (D)	42.31	**No**
	2)	Four wheel		--	25 to 35 (D)	39.07 to 39.72	**No**
17.1.8	**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	No ingress of mud and / or water was observed	Yes
	1)	Clutch assembly	-do-				
	2)	Brake housings	-do-				
	3)	Front axle hubs	-do-				
17.1.9	**Safety features :**						
a)	Guards against moving and hot parts		Evaluative	As per CMVR	At present no requirements	Provided	Yes
b)	Lighting arrangement		Evaluative	As per CMVR	--	Provided	Yes
17.1.10	**Labelling of tractors (Provision of labelling plate):**						
	1)	Make	Evaluative	Should conform to the requirements of CMVR alongwith declared value of PTO HP	--	Swaraj	Yes
	2)	Model	Evaluative		--	855 XM	Yes
	3)	Year of manufacture	Evaluative		--	WW	Yes
	4)	Engine number	Evaluative		--	47.1402/SPD02217	Yes
	5)	Chassis number	Evaluative		--	WWCE 63622142687	Yes
	6)	Declaration of PTO power, (kW)	Evaluative		--	33.8 (46.0)	Yes
17.1.11	**Discard limit for:**						
(a)	Cylinder bore diameter, (mm)		Evaluative	To be specified by the manufacturer	110.225 (D)	100.00 to 100.02	Yes
(b)	Clearance between piston & cylinder liner at skirt, (mm)		Non Evaluative		0.60 (D)	0.151 to 0.165	Yes

1	2	3	4	5	6	7
(c)	**Ring end gap (mm):**					
	- Top comp. ring.	Evaluative	-do-	1.75	0.40 to 0.50	Yes
	- 2nd comp. ring.		-do-	1.75	0.40 to 0.60	Yes
	- Oil ring.		-do-	1.75	0.40 to 0.60	Yes
(d)	**Ring groove clearance (mm):**					
	- Top comp. ring.	Evaluative	-do-	--	Tapered	--
	- 2nd comp. ring.		-do-	0.25	0.074	Yes
	- Oil ring.		-do-	0.25	0.058 to 0.064	Yes
(e)	**Clearance of main bearings (mm):**					
	- Diametrical clearance	Evaluative	To be specified by the manufacturer	0.30	0.056 to 0.101	Yes
	- Crankshaft end float	Evaluative		0.50	0.25	Yes
(f)	**Clearance of big end bearings, (mm):**					
	- Diametrical	Evaluative	-do-	0.30	0.081 to 0.101	Yes
	- Axial	Evaluative	-do-	0.60	0.20	Yes
(g)	Clearance between king pin and bush, (mm)	Non Evaluative	-do-	0.60	0.02 to 0.04	Yes
(h)	Clearance between centre pin and bush, (mm)	Non Evaluative	-do-	0.80	0.04 to 0.08	Yes

17.1.12 CATEGORY OF BREAKDOWNS / DEFECTS :

S. No.	Category of breakdowns	Category (Evaluative / Non Evaluative)	Requirements as per IS: 12207-2008	As observed	Whether meets the requirements (Yes/No.)
1.	Critical	Evaluative	No critical breakdown	**One**	**Yes***
2.	Major	Evaluative	Not more than two and neither of them should be repetitive in nature	**Eleven (11)**	**Yes***
3.	Minor	Evaluative	Not more than five and frequency of each should not be more than two.	**Three**	**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.	**Fifteen (15)**	**Yes***

* **These breakdowns occurred during initial and repeat PTO performance test. More over the nature of breakdowns falls under the critical category and having multiple consequential breakdowns. Thus as per clause 3.2.4 of IS: 12207-2008 and by accorded the approval of competent authority, the supplementary PTO performance test was conducted and resulted in this report.**
After the replacement of listed defected parts and proper alignment, supplementary test of the tractor was conduced satisfactory. No breakdown/ defect were observed during the supplementary test.

17.2 Optional requirements as per Clause-4 (Table-2) of IS:12207-2008:

S. No.	Characteristic	Requirements as per IS: 12207-2008	As observed	Whether meets the requirements (Yes/No.)
1	2	3	4	5
1	Maximum oil pull over, (%)	0.25% (max.)	0.11	Yes
2.	Seating requirements	Should meet the requirements of IS: 12343-1998	Meets the requirements	Yes
3.	Fitment of ROPS	With a provision for fitment of ROPS.	Not provided	No
		If ROPS fitted it should meet the requirement of IS: 11821-1992	ROPS not fitted	Not applicable.
4.	Technical requirements for PTO shaft	Should meet the requirements of IS: 4931 -1995	Meets the requirements	Yes
5.	Dimensions of three point linkage	Should meet the requirements of IS: 4468 (Part-I)-1997	Does not meets the requirements	**No**
6.	Specifications of linkage drawbar	Should meet the requirements of IS: 12953-1990.	Meets the requirements	Yes
	Specification of swinging drawbar	Should meet the requirements of IS: 12362 Part 3-1994.	Not provided	--
7.	Accessories	Trailer hitch, front tow hook, linkage drawbar may be provided.	Provided	Yes

17.3 Conformity with following IS:

i)	Guidelines for declaration of power and specific fuel consumption and labeling of agricultural tractors (First revision) [IS 10273:1987 (Reaffirmed in March, 2009)]	:	Conforms
ii)	Agricultural tractors – Rear mounted power take-off - Types 1, 2 and 3 (third revision) [IS: 4931-1995 (Reaffirmed in March, 2009)]	:	Conforms
iii)	Agricultural wheeled tractors - Rear mounted three-point linkage: Part 1 Categories 1, 2, 3 & 4 (fourth revision) [IS 4468 (Part-I):1997 (Reaffirmed in March, 2007)/ISO 730-1:1994]	:	**Does not conform**
iv)	Drawbar for agricultural tractors – Link type [IS 12953:1990 (Reaffirmed in March, 2007)]	:	Conforms
v)	Agricultural tractors - Operator's seat technical requirement [IS 12343 –1998 (First revision) (Reaffirmed in March, 2009)]	:	Conforms
vi)	Guide for safety & comfort of operator of agricultural tractors: Part 1 General requirements (first revision) : [IS 12239 (PT-1)-1996 (Reaffirmed in March, 2009)/ISO 4254-1:1989]	:	**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 in March, 2009)]	:	**Does not conform**
viii)	Tractors and machinery for agriculture and forestry, powered lawn and garden equipment – Symbols for operator controls and other displays [IS: 6283 (Part-1 & Part-2) –2006 & 2007(Reaffirmed in March, 2009)/ ISO 3767-2:1991)]	:	Conforms
ix)	Guide lines for location and operation of operator controls on agricultural tractors and machinery (first revision) (IS: 8133 – 1983) (Reaffirmed in March, 2009)]	:	Conforms
x)	Agricultural Tractor & Machinery Lighting device for travel on public roads (IS: 14683-1999) (Reaffirmed in March, 2009)]	:	Conforms

17.4 Salient Observations:

17.4.1 Laboratory tests:

17.4.1.1 PTO Performance:

i) The backup torque is. **18.4%**.

ii) The specific fuel consumption corresponding to maximum power was measured as **255** g/kWh against the declaration of **258 g/kWh**, which is within the tolerance limit of IS: 12207-2008.

iii) The power drop under high ambient condition in comparison to the natural ambient condition was recorded as **6.24 %.**This should be looked into.

iv) During PTO performance test the abnormal sound was observed from clutch housing. The ball bearing which supports the drive shaft of PTO drive from clutch housing was found broken. It was replaced with new one.

v) After rectifying the problem, during repeat PTO performance test; it was observed that PTO power continuously dropped and transmission temperature was also increase up to 100°C.During inspection, it is observed that the main defective part was clutch housing and other parts were damaged/became unserviceable due to misalignment of clutch and flywheel housing and considered as consequential breakdowns. The breakdowns categorized as one critical breakdown also. Hence as per request of applicant and as per clause 3.2.4 of IS: 12207-2008 the supplementary test was carried out.
Hence to avoid such breakdowns necessary discreetness may be taken at manufacturing level.

17.4.1.2 Hydraulic performance :
During maintenance of lift load test, the cumulative drop in vertical height of the point of application of the force after each 5 min interval over a period of 30 min was observed as 88 mm against the requirement of 50 mm as per relevant Indian standard.

17.4.1.3 Mechanical Vibration:
The amplitude of mechanical vibration especially driver's seat and steering wheel and the various assemblies marked as (*) in Chapter-9 of this test report is on higher side. This calls for dampening down of vibrations to improve the operational comfort and service life of components.

17.4.1.4 Three point linkage:
Lateral distance from lower hitch point to center line of tractor does not meet the requirements of **IS-4468-(Part I)-1997**. This should be looked into

17.4.1.5 Drawbar linkages
Some of the parameters of the drawbar linkage conform to Cat.-I and some of them conform to Cat.-II. Keeping in view of the spirit of standardization, the necessary improvements may be incorporated.

17.4.2 Field performance test:

17.4.2.1 Wet land cultivation (Puddling operation):
No ingress of mud/or water was observed during wetland cultivation. Hence the tractor meets the requirements for wet land cultivation (Pudlling operation) as per IS: 11082-1984 and found suitable for wetland cultivation.

17.5 Haulage test
The average distance travelled per liter of fuel consumption and Specific fuel consumption does not meet the declared value given by manufacturer .This should be looked into.

17.6 Maintenance / Service Problems:
No noticeable maintenance/ service problem was observed during the test.

17.7 Recommendation with regard to safety on tractor:
The following requirements, inter alia, may be considered for incorporation on the tractor:

i) Provision for spark arresting device in exhaust system.
ii) The working clearance around draft control lever and position control lever should as per IS: 12239 (Part-2) – 1999.
iii) Provision of differential lock.
iv) The minimum cautionary notice should be as per clause 11.2 of IS: 12239 (Part-2)-1999.
v) The guard for alternator and silencer should be as per IS: 12239 (Part-2)-1999

17.8 Adequacy of Literature supplied with machine:
The following literature has been supplied with the tractor

i) Operator's manual
ii) Tractor's part's catalogue

The provided Operator's manual during testing is found adequate. Service Manual should be provided essentially with inclusion of all specific data and information required for users.

17.8.1 The literatures should also be brought out in national as well as other regional languages for the guidance of users and service personnel.

18. Citizen charter

Duration of Test	Test duration under citizen charter	Whether the report released within time frame given citizen charter	Remark, if any
February, 2012 to January, 2013 - 12 Months	10 Months (ICT) + 4 Months (Supplementary test)	Yes	Delay during ICT due to breakdowns in clutch housing during PTO performance test. After rectifying the defect the tractor was submitted for supplementary test.

TESTING AUTHORITY:

PRADIPKUMAR C. MESHRAM
AGRICULTURAL ENGINEER

H. L. YADAV
SENIOR AGRICULTURAL ENGINEER

C. R. LOHI
DIRECTOR

19. APPLICANT'S COMMENTS

Para No.	Our Reference	Applicant's comments
19.1	16(1,2), 17.4.1.1 (iii, iv, v)	Corrective action has been taken at supplier end to ensure conformity of design by supplier.
19.2	17.1.3 (b), 17.4.1.2	Improved design has been developed and prototype is presently under test.
19.3	17.3 (iii), 17.4.1.4, 17.4.1.5	Stringent checks are being introduced for ensuring supplier quality.
19.4	17.3 (vi, vii), 17.7	The requirements are being revisited for necessary corrective action at our end.
19.5	17.4.1.3, 17.5	Study & trials are under progress for necessary corrective action.

ANNEXURE – I

TRACTOR RUN HOURS DURING TEST

A.	LABORATORY AND TRACK TESTS:	HOURS
1.	Running-in	--
2.	PTO performance test	12.65
3.	Power lift and hydraulic pump performance test	1.83
4.	Drawbar performance test	13.70
5.	Turning ability	0.20
6.	Location of centre of gravity	--
7.	Operator's field of vision	--
8.	Brake test	1.75
9.	Noise measurement	1.55
10.	Air Cleaner oil pullover test	7.50
11.	Mechanical vibration test	1.0
12.	Nominal speed test	0.40
B.	**FIELD TEST:**	
1.	Disc ploughing	10.25
2.	Rotavation	10.58
3.	Wet land (puddling) operation (including water proof test)	15.08
C.	**HAULAGE TEST:**	8.91
D.	Miscellaneous test and other run hours including idle run, transportation, trials and preparation for test	31.29
	TOTAL:	**117.69**

T- 864/1375/2013 | SWARAJ 855 XM TRACTOR – Commercial (Initial)

ANNEXURE- II

BRIEF SPECIFICATION OF IMPLEMENTS USED DURING FIELD TEST

S. No	I t e m	Disc Plough	Rotavator	Paddy puddler
1	**2**	**3**	**4**	**5**
1.	Make	Anil Industries	Howard	NA
2.	Type	Mounted	Mounted	Mounted
3.	No. of Disc/blades	3	42 in 7 flange	10 (5x5)
4.	Type of Disc/blades	Plain concave	Hatchet	Notched concave
5.	Size of bottoms/blades, (mm)	620	225 x 50 x 10	450
6.	Spacing of bottoms/flanges, (mm)	455	250	170
7.	Lower hitch point span, (mm)	690	720	700
8.	Mast height, (mm)	455	481	395
9.	**Overall dimensions, (mm):**			
	- Length	1610	1850	1300
	- Width	850	1000	2492
	- Height	1080	980	1230
10.	Gross mass, (kg)	370	375	245

ANNEXURE-III

BRIEF SPECIFICATION OF HALF CAGE WHEEL

Sr. No.	Items	Specification
1	Type	Half cage wheel
2	Outer dia. (mm)	1800
3	Width (mm)	355
4	No. & Type of Lugs	12, straight lugs made of MS angle section welded to angle iron frame
5	Size of angle section, (mm)	50 x 45 x5
6	Length of lug, (mm)	350
7	Spacing of lug, (mm)	205
8	Weight of each cage wheel (kg)	65