भारत सरकार
रेल मंत्रालय

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

Data Book of Electric Locomotives

PUBLICATION NO.
RDSO/2016/EL/PUB/0001 Rev '0'

Issued by :
ELECTRICAL LOCO DIRECTORATE
May 2016

RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW - 226011

अ अ मा सं RDSO
रेल अग्रदूत Transforming Railways
www.rdso.gov.in

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सत्यमेव जयते

स्वच्छ भारत
एक कदम स्वच्छता की ओर

सदस्य बिजली, रेलवे बोर्ड
एवं
पदेन सचिव, भारत सरकार
रेल मंत्रालय
रेल भवन, नई दिल्ली – 110001
MEMBER ELECTRICAL, RAILWAY BOARD
&
EX-OFFICIO SECRETARY,
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
RAIL BHAVAN, NEW DELHI - 110001

Foreword

Key parameters and technical data of electric locomotives are very useful in framing specifications of loco equipments, calculation of haulage capacity, chalking out maintenance strategy, carrying out failure investigation and other developmental works in the field of loco operation and maintenance. These information about locomotives are needed frequently by Rolling Stock Engineers in day to day working.

At present, for getting correct and required information about Electric Locomotives, Engineers have to search manuals and other technical literature which is not only time consuming but also tedious.

It gives me immense pleasure that RDSO has compiled and published the Technical Data Book of Electric Locomotives which will be very useful for Railway Electrical Engineers.

(Ashwani Kumar Kapoor)
3/5/16

सत्यमेव जयते

P.K. SRIVASTAVA
पी.के. श्रीवास्तव

DIRECTOR GENERAL
& EX OFFICIO GENERAL MANAGER
महानिदेशक एवं पदेन महाप्रबन्धक
Government of India - Ministry of Railways
भारत सरकार, रेल मंत्रालय
Research Designs & Standards Organisation
अनुसंधान अभिकल्प एवं मानक संगठन
Manak Nagar, Lucknow-226011
मानक नगर, लखनऊ–226011



Message

Electrical Directorate of RDSO is publishing a Data Book for Electric Locomotives. This will serve as a very useful reference book for all Railway Electrical Engineers. It will provide ready information about various class of Electric Locomotive as and when required for the purpose of analysis, development and reliability study of locomotives.

This is a very commendable effort of Electrical Directorate and I wish all success in their endeavour.

(P. K. Srivastava)
Director General
RDSO

Introduction

Design parameters of Electric Locomotives are used in day to day working by Rolling stock Engineers. Depending on the feedback from Zonal Railway as well as production units, performance of the equipments in question are evaluated in given operating conditions. During such evaluation and investigation, various parameters, characteristics and dimensional details are needed. Information of locomotives is available in maintenance manuals and in other technical literatures in segregated form. At present a lot of time is consumed in getting the desired and correct information. Keeping this requirement in view, efforts have been made by Electric Loco directorate to compile all the relevant data of various types of electric locomotives at one place and issue it in the form of data book.

More over, during service of locomotives, some changes or alterations take place in equipment lay out as well as type of equipments to get optimum and reliable utilisation of locomotives. Such changes have also been incorporated while keeping the original equipment design data.

I hope this will serve as a useful reference book.

ओमप्रकाश 05.5.16

(Om Prakash Kesari)
EDSE (Co-ord), R.D.S.O.

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Three Phase Electric Locomotives (B.G.)



WAG 9

CONT. RAIL P.S. 6120
CO-CO TYPE WAG9 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAG-9

CO-CO TYPE WAG-9 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

20 LOCOMOTIVES(6 FULLY ASSEMBLED + 7SKD + 7CKD) PLUS TWO (CKD) LOCOMOTIVES TO SERVE AS BANK OF SPARES OF THIS TYPE WERE ORDERED BY IR ON M/S ABB, SWITZERLAND AS PER RDSO'S SPECIFICATION No.E-17/08. FIRST LOCOMOTIVE WAS RECIEVED IN 1996. THE CONTINUOUS HORSE POWER OF THE LOCOMOTIVE IS 6120.

THE LOCOMOTIVE IS POWERED BY SIX AXLE HUNG NOSE SUSPENDED FORCED VENTILATED 3.PHASE TRACTION MOTORS.SPEED CONTROL IS ACHIEVED THROUGH CONVERTER-INVERTER CONTROL USING G T O THYRISTORS.

MULTIPLE CONNECTION UP TO TWO LOCOMOTIVES IS POSSIBLE.THESE LOCOMOTIVES HAVE MICRO-PROCESSOR BASED CONTROL AND FAULT INDICATION SYSTEM.

AIR AND REGENERATIVE SYSTEM FOR THE LOCOMOTIVE AND AIR BRAKE FOR THE TRAIN ARE PROVIDED.

PROCUREMENT PARTICULARS

Contracts		BUILDER	Year put in line	I. R. Loco Numbers	TENDER Spec. No.	Total No. Ordered.	Remarks
	Date						
92/RSF/459/1-(GP-140)	23.07.93	ABB SWITZERLAND		31000-31021	E-17/08	20+2	

MAIN PARTICULARS OF LOCO

WAG-9

GENERAL

SYSTEM OF CURRENT	:	AC
LINE VOLTAGE	:	25000V
WEIGHT IN W.O.	:	123t+/-1% (+1230kgs)
ADHESIVE WEIGHT	:	123t+/-1%
AXLE LOAD	:	20.5t+/-2%

CONTINUOUS RATING

H.P.	:	6120
T.E.	:	33129 kg
SPEED	:	50 kmph
MAX. T.E.	:	46890 kg
MAX. SPEED	:	100 Kmph
WHEEL DIA (NEW)	:	1092 mm
(HALF WORN)	:	1054 mm
(FULLY WORN)	:	1016 mm

BOGIE

DRIVE ARRANGEMENT	:	GEAR PINION
DESIGN	:	3 AXLE. FABRICATED

BRAKES

LOCO	:	AIR REGENERATIVE
TRAIN	:	AIR

PANTOGRAPH

No.	:	2
MAKE	:	SECHERON
TYPE	:	ESID 103-2500
WEIGHT (W.O. INSULATOR)	:	186 kgs

TRANSFORMER

Make	:	ABB
Type	:	LOT 6500
No.	:	1
WEIGHT COMPLETE	:	9523 KG
COOLING	:	OFAF
INSULATION	:	CLASS A

Rating

PRIMARY	:	25KV, 6531 kvA, 261.25A
SECONDARY	:	4x1269V, 4x1449KVA, 4x1142A
AUXILIARY	:	1000V, 334KVA, 334A
HOTEL LOAD	:	960V, 2x622.5 KVA, 2x648 A
FILTER	:	1154V, 400kvA,347A

POWER CONVERTOR

No.	:	2
Make	:	ABB, BHEL, MEDHA
Type	:	UW-2423-2810
COOLING	:	OFAF
TYPE OF GTO	:	SG 3000 G X H24
TYPE OF IGBT	:	5SNA 1200G450300
TYPE OF DIODE	:	D 921S45 T
CONNECTION	:	BRIDGE
No. OF THYRISTER/CON	:	14 + 1 (MUB)
No. OF DIODES/CON	:	14 + 1 (MUB)

LINE CONVERTOR

CONT RATING	:	2x1269 V
FREQUENCY	:	50 HZ+/-3%
DC LINK VOLTAGE	:	2800 V (NOMINAL)

DRIVE CONVERTOR

MOTOR VOLTAGE (PHASE TO PHASE)	:	2180V
MAX. O/P CURRENT (per PHASE)	:	971 A
MOTOR FREQUENCY	:	0- 132 HZ

TRACTION MOTOR

MAKE	:	ABB
TYPE	:	6 FRA6068
No.	:	6
INSULATION	:	CLASS 200
SUSPENSION	:	AXLE HUNG, NOSE SUSPENDED
VENTILATION	:	FORCED AIR
WEIGHT	:	2150 kg
1 Hr RATING	:	850KW, 2089V 290A, 1135 rpm
CONT. RATING	:	850KW, 2180V 270A, 1283 rpm
GEAR RATIO	:	5.133 (77:15) / (107:21)

AUXILIARY CONVERTER

MAKE	:	ABB
TYPE	:	BUR 10A 100LVPS
RATING 100kvA	:	3PHASE, 415V,

TRACTION MOTOR BLOWER

No.	:	2.
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-605-115
Rating	:	4.05m^3/s.2950Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RFXH2A-01
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

OIL COOLER BLOWER

No.	:	2.
Blower		
Make/Type	:	BEHR
Rating	:	4.05m/s.2950Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RH2A
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	MB 55
Rating	:	0.664 m^3/s,450Pa
Motor		
Make	:	LANDERT
Type	:	100L28-R2C
Rating	:	3 phase,415V,50Hz 2850 rpm,3.0kW
Insulation	:	Class H

TRANSFORMER OIL PUMP

No.	:	2.
Pump		
Make	:	Fumettaz,Switzerland
Type	:	TA08-2174/15
Rating	:	1000lpm.1720Pa
Motor		
Make	:	LANDERT
Type	:	112M-2B
Rating	:	3 phase,415V,50Hz 2930 rpm,4.7kW
Insulation	:	Class F

CONVERTOR OIL PUMP

No.	:	2.
Pump		
Make	:	Plumettaz,Switzerland
Type	:	TC10-2185/29
Rating	:	960LPM.3300Pa
Motor		
Make	:	LANDERT
Type	:	112M-2F
Rating	:	3 phase,415V,50Hz 2860 rpm,11kW
Insulation	:	Class F

MAIN COMPRESSOR:

No.	:	2.
Compressor		
Make	:	D&M
Type	:	2A320D C13-T32
Rating	:	1554 lt/min.10Kg/cm
Motor		
Make	:	LANDERT
Type	:	200l55-RPAH8B
Rating	:	415V.3phase,50Hz, 15kW,730 rpm
Insulation	:	Class H

Machine room blower

No.	:	2
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-415-60
Rating	:	1 m^3/s, 1390Pa
Motor		
Make	:	LANDERT
Type	:	132M-RFXHE2C
Rating	:	1 phase,415V,50Hz 2830 rpm,2.6kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	BB 11
Rating	:	0.1 m^3/s, 550Pa
Motor		
Make	:	LANDERT
Type	:	90L24-RE2C
Rating	:	1 phase,415 V,50 Hz 2910 rpm,0.75kW
Insulation	:	Class F

AUXILIARY COMPRESSOR:

No.	:	1.
Compressor		
Make	:	D&M Bristol
Type	:	FF 3145
Capacity	:	141.6lt/min,7.03kg/cm^2
Motor		
Make	:	D&M
Rating	:	110 VDC.0.75kW,1450rpm

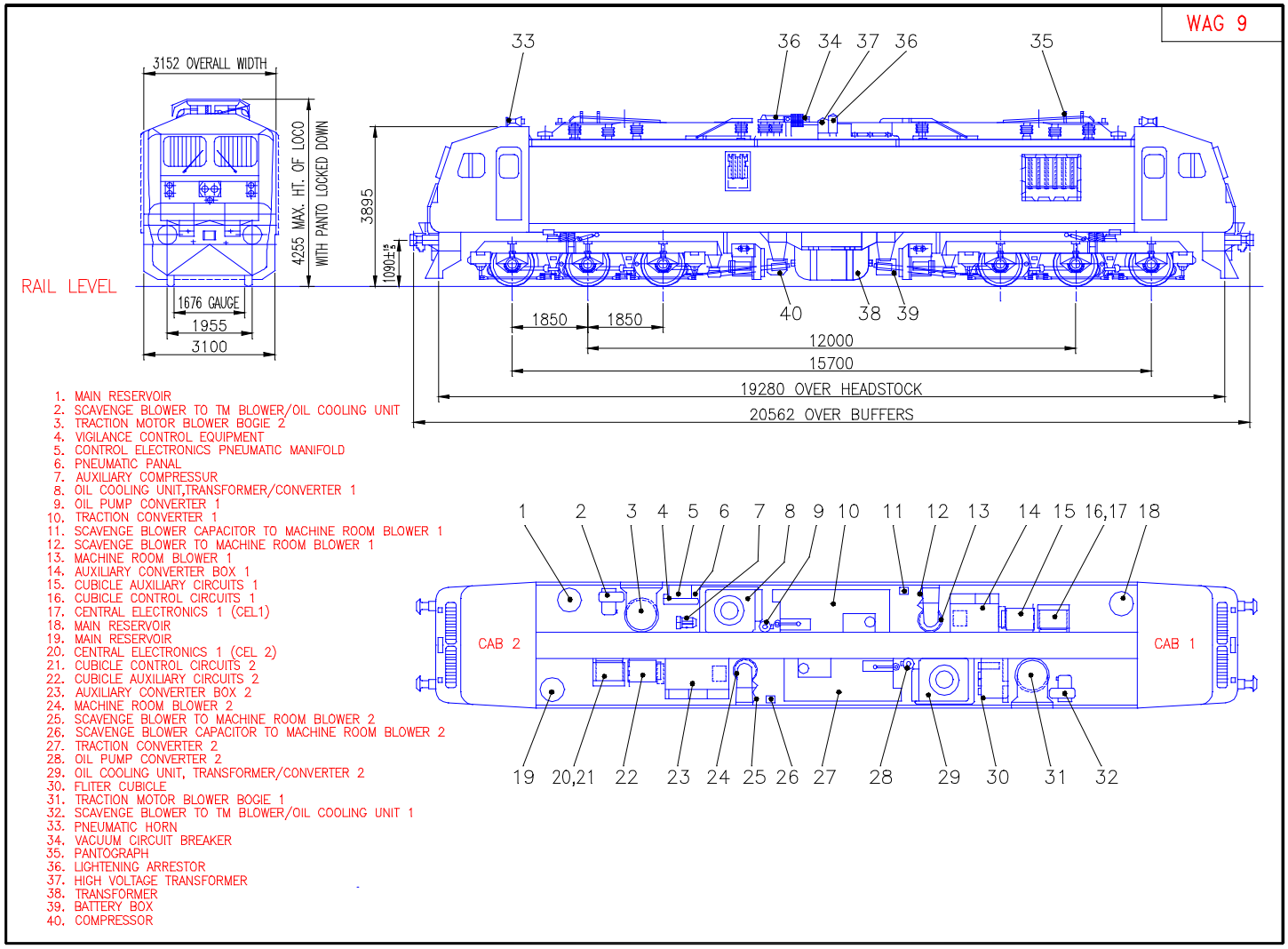
Air dryer(1no/loco) provided for compression

BATTERY

Make	:	SAFT NIFE
Type	:	Ni-Cd(SAF-39 SBL199)
Rating	:	110V,199AH

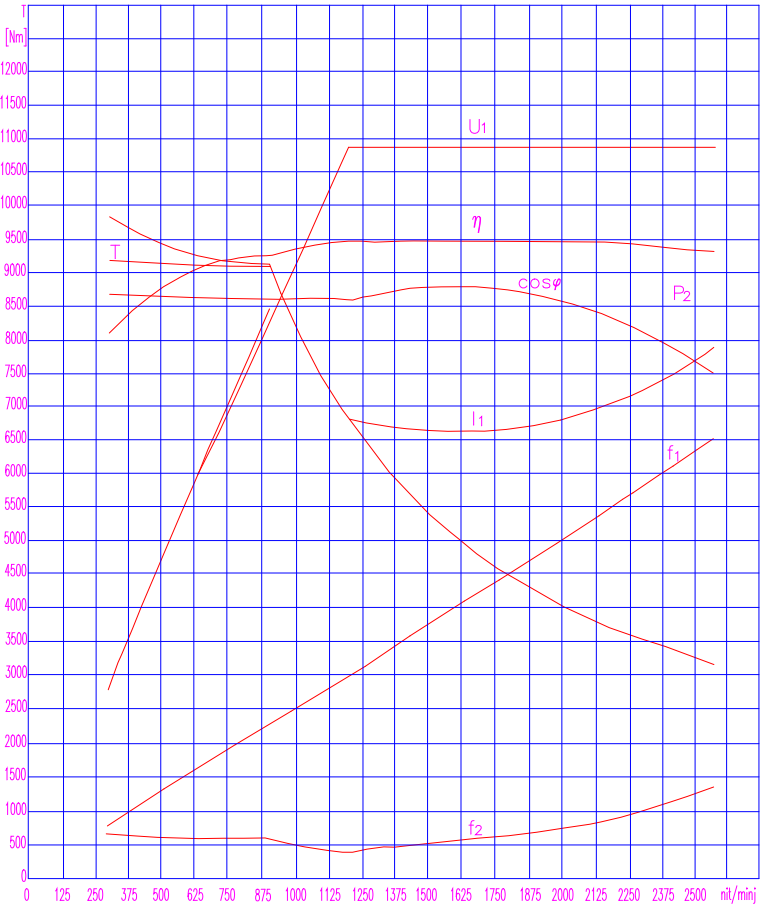
PROTECTIVE DEVICES

Vigilance control	:	Yes
Slip/Slide control	:	Yes
Main Overload relay	:	Yes
No volt relay	:	Yes
Over voltage protection	:	Yes
Earth fault relay Low	:	Yes


WAG 9
3152 OVERALL WIDTH
4255 MAX. HT. OF LOCO WITH PANTO LOCKED DOWN
3895
1090±5
RAIL LEVEL
1676 GAUGE
1955
3100
33
36
34
37
36
35
40
38
39
1850
1850
12000
15700
19280 OVER HEADSTOCK
20562 OVER BUFFERS
1. MAIN RESERVOIR
2. SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT
3. TRACTION MOTOR BLOWER BOGIE 2
4. VIGILANCE CONTROL EQUIPMENT
5. CONTROL ELECTRONICS PNEUMATIC MANIFOLD
6. PNEUMATIC PANAL
7. AUXILIARY COMPRESSUR
8. OIL COOLING UNIT,TRANSFORMER/CONVERTER 1
9. OIL PUMP CONVERTER 1
10. TRACTION CONVERTER 1
11. SCAVENGE BLOWER CAPACITOR TO MACHINE ROOM BLOWER 1
12. SCAVENGE BLOWER TO MACHINE ROOM BLOWER 1
13. MACHINE ROOM BLOWER 1
14. AUXILIARY CONVERTER BOX 1
15. CUBICLE AUXILIARY CIRCUITS 1
16. CUBICLE CONTROL CIRCUITS 1
17. CENTRAL ELECTRONICS 1 (CEL1)
18. MAIN RESERVOIR
19. MAIN RESERVOIR
20. CENTRAL ELECTRONICS 1 (CEL 2)
21. CUBICLE CONTROL CIRCUITS 2
22. CUBICLE AUXILIARY CIRCUITS 2
23. AUXILIARY CONVERTER BOX 2
24. MACHINE ROOM BLOWER 2
25. SCAVENGE BLOWER TO MACHINE ROOM BLOWER 2
26. SCAVENGE BLOWER CAPACITOR TO MACHINE ROOM BLOWER 2
27. TRACTION CONVERTER 2
28. OIL PUMP CONVERTER 2
29. OIL COOLING UNIT, TRANSFORMER/CONVERTER 2
30. FLITER CUBICLE
31. TRACTION MOTOR BLOWER BOGIE 1
32. SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT 1
33. PNEUMATIC HORN
34. VACUUM CIRCUIT BREAKER
35. PANTOGRAPH
36. LIGHTENING ARRESTOR
37. HIGH VOLTAGE TRANSFORMER
38. TRANSFORMER
39. BATTERY BOX
40. COMPRESSOR
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16,17 18
CAB 2
CAB 1
19 20,21 22 23 24 25 26 27 28 29 30 31 32

WAG9

P_2 [KW]	U_1 [V]	f_1 [Hz]	f_2 [Hz]	I_1 [A]	cosφ [1]	T [Nm]
1200	2400	240	24	1200	η	12000
1150	2300	230	23	1150	[1]	11500
1100	2200	220	22	1100		11000
1050	2100	210	21	1050		10500
1000	2000	200	20	1000	1	10000
950	1900	190	19	950		9500
900	1800	180	18	900	.9	9000
850	1700	170	17	850		8500
800	1600	160	16	800	.8	8000
750	1500	150	15	750		7500
700	1400	140	14	700	.7	7000
650	1300	130	13	650		6500
600	1200	120	12	600	.6	6000
550	1100	110	11	550		5500
500	1000	100	10	500	.5	5000
450	900	90	9	450		4500
400	800	80	8	400	.4	4000
350	700	70	7	350		3500
300	600	60	6	300	.3	3000
250	500	50	5	250		2500
200	400	40	4	200	.2	2000
150	300	30	3	150		1500
100	200	20	2	100	.1	1000
50	100	10	1	50		500
0	0	0	0	0	0	0



THREE-PHASE ASYNCHRONOUS
TRACTION MOTOR

TYPE 6 FRA 6068

DATA PER MOTOR		CONTINUOUS RATING	MAXIMUM VALUES
U1	[V]	2180	2180
I1	[A]	270	393
P2	[KW]	850	850
T	[Nm]	6330	9200
n	[1/min]	1283	2584
COSφ	[1]	.88	–
η	[1]	.95	–
f1	[Hz]	65	132
f2	[Hz]	.9	–

MEANING OF THE SYMBOLS :

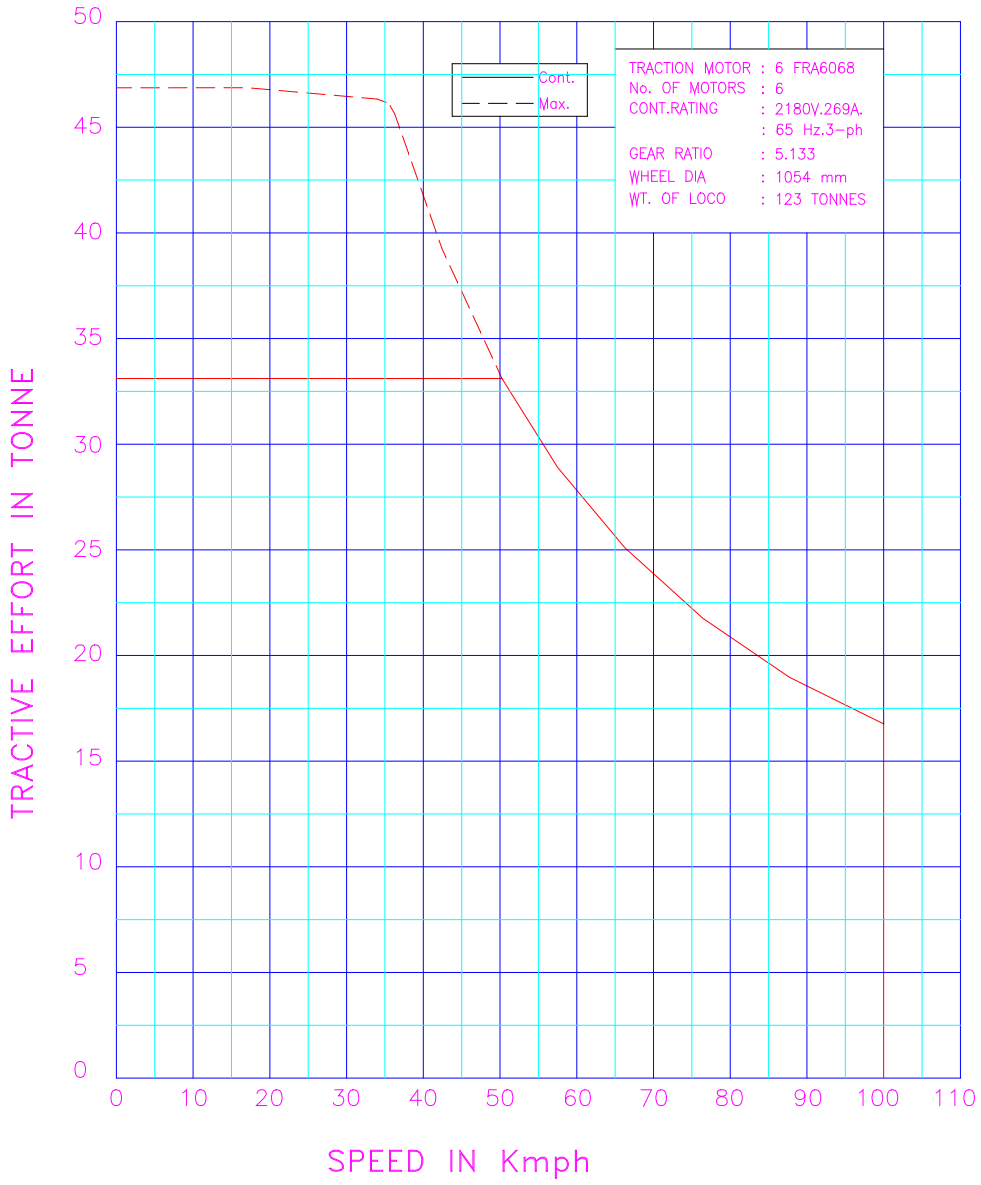
U1 = PHASE-TO-PHASE VOLTAGE
I1 = PHASE CURRENT
P2 = OUTPUT AT THE MOTOR SHAFT
T = TORQUE AT MOTOR SHAFT
n = MOTOR SPEED
COSφ = POWER FACTOR
η = MOTOR EFFICIENCY
f1 = STATOR FREQUENCY
f2 = ROTOR FREQUENCY

I = AT FUNDAMENTAL FREQUENCY

CALCULATED FOR A TEMPERATURE
OF THE WINDINGS OF 150°C

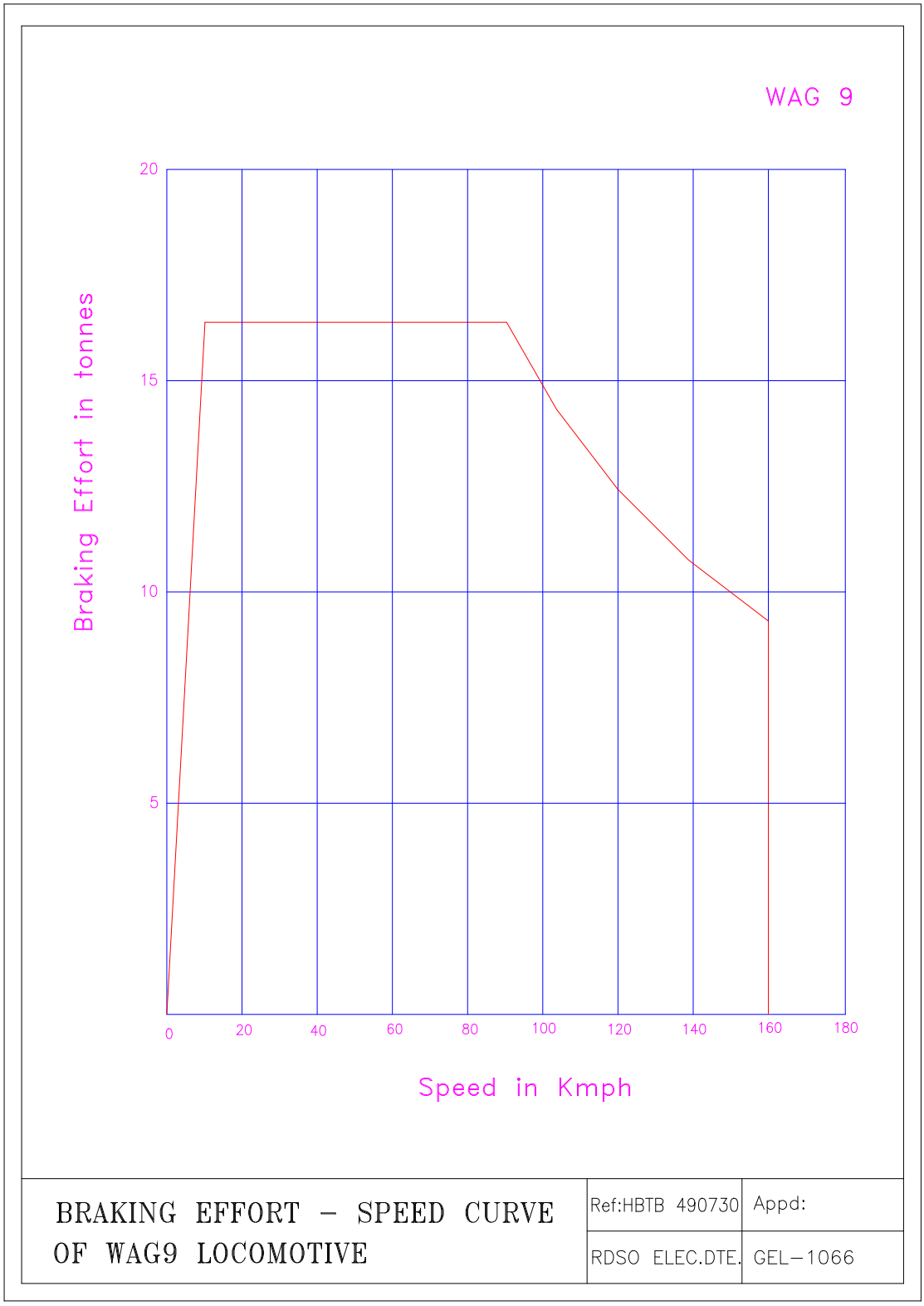
REVISION : a) 1993-09-07
b) 1994-02-04

WAG 9



TRACTIVE EFFORT - SPEED CURVE OF WAG9 LOCOMOTIVE

Ref:HBTB 490727	Appd:
RDSO ELEC.DTE.	GEL-1067



BRAKING EFFORT – SPEED CURVE OF WAG9 LOCOMOTIVE	Ref:HBTB 490730	Appd:
	RDSO ELEC.DTE.	GEL–1066

WAG 9

HAULAGE CAPACITY OF 3 PHASE FREIGHT LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:5.1 T.M. 6FRA-6068

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOXN)	LEVEL	ABOVE 6000											ABOVE 6000
		1/500	ABOVE 6000						4985	4150	3500			ABOVE 6000
		1/200	5060	5060	5060	5060	4045	3325	2780	2365	2040			5060
		1/150	4250	4165	4080	3985	3200	2640	2220	1895	1640			4250
		1/100	2910	2870	2825	2775	2240	1855	1565	1345	1165			3205
		1/50	1455	1445	1435	1420	1440	945	795	680	590			1820
PASSENGER SERVICE	ICF COACH	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG9H

CONT. RAIL P.S. 6120
CO-CO TYPE WAG 9H ELECTRIC LOCOMOTIVE
1676 mm GAUGE

MAIN PARTICULARS OF LOCO

WAG-9H

GENERAL

SYSTEM OF CURRENT	:	AC
LINE VOLTAGE	:	25000V
WEIGHT IN W.O.	:	132t+/-1% (+1320kgs)
ADHESIVE WEIGHT	:	132t+/-1%
AXLE LOAD	:	22.0t+/-2%

CONTINUOUS RATING

H.P.	:	6120
T.E.	:	33129 kg
SPEED	:	55 kmph
MAX. T.E.	:	53000 kg
MAX. SPEED	:	100 Kmph
WHEEL DIA (NEW)	:	1092 mm
(HALF WORN)	:	1054 mm
(FULLY WORN)	:	1016 mm

BOGIE

DRIVE ARRANGEMENT	:	GEAR PINION
DESIGN	:	3 AXLE. FABRICATED

BRAKES

LOCO	:	AIR REGENERATIVE
TRAIN	:	AIR

PANTOGRAPH

No.	:	2
MAKE	:	SECHERON
TYPE	:	ESID 103-2500
WEIGHT (W.O. INSULATOR)	:	186 kgs

TRANSFORMER

Make	:	ABB
Type	:	LOT 6500
No.	:	1
WEIGHT COMPLETE	:	9523 KG
COOLING	:	OFAF
INSULATION	:	CLASS A

Rating

PRIMARY	:	25KV, 6531 kvA, 261.25A
SECONDARY	:	4x1269V, 4x1449KVA, 4x1142A
AUXILIARY	:	1000V, 334KVA, 334A
HOTEL LOAD	:	960V, 2x622.5 KVA, 2x648 A
FILTER	:	1154V, 400kvA,347A

POWER CONVERTOR

No.	:	2
Make	:	ABB, BHEL, MEDHA
Type	:	UW-2423-2810
COOLING	:	OFAF
TYPE OF GTO	:	SG 3000 G X H24
TYPE OF IGBT	:	5SNA 1200G450300
TYPE OF DIODE	:	D 921S45 T
CONNECTION	:	BRIDGE
No. OF THYRISTER/CON	:	14 + 1 (MUB)
No. OF DIODES/CON	:	14 + 1 (MUB)

LINE CONVERTOR

CONT RATING	:	2x1269 V
FREQUENCY	:	50 HZ+/-3%
DC LINK VOLTAGE	:	2800 V (NOMINAL)

DRIVE CONVERTOR

MOTOR VOLTAGE (PHASE TO PHASE)	:	2180V
MAX. O/P CURRENT (per PHASE)	:	971 A
MOTOR FREQUENCY	:	0- 132 HZ

TRACTION MOTOR

MAKE	:	ABB
TYPE	:	6 FRA6068
No.	:	6
INSULATION	:	CLASS 200
SUSPENSION	:	AXLE HUNG, NOSE SUSPENDED
VENTILATION	:	FORCED AIR
WEIGHT	:	2150 kg
1 Hr RATING	:	850KW, 2089V 290A, 1135 rpm
CONT. RATING	:	850KW, 2180V 270A, 1283 rpm
GEAR RATIO	:	5.133 (77:15) / (107:21)

AUXILIARY CONVERTER

MAKE	:	ABB
TYPE	:	BUR 10A 100LVPS
RATING	:	3PHASE, 415V, 100kvA

TRACTION MOTOR BLOWER

No.	:	2.
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-605-115
Rating	:	4.05m^3/s.2950Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RFXH2A-01
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

OIL COOLER BLOWER

No.	:	2.
Blower		
Make/Type	:	BEHR
Rating	:	4.05m/s.2950Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RH2A
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	MB 55
Rating	:	0.664 m^3/s,450Pa
Motor		
Make	:	LANDERT
Type	:	100L28-R2C
Rating	:	3 phase,415V,50Hz 2850 rpm,3.0kW
Insulation	:	Class H

TRANSFORMER OIL PUMP

No.	:	2.
Pump		
Make	:	Fumettaz,Switzerland
Type	:	TA08-2174/15
Rating	:	1000lpm.1720Pa
Motor		
Make	:	LANDERT
Type	:	112M-2B
Rating	:	3 phase,415V,50Hz 2930 rpm,4.7kW
Insulation	:	Class F

CONVERTOR OIL PUMP

No.	:	2.
Pump		
Make	:	Plumettaz,Switzerland
Type	:	TC10-2185/29
Rating	:	960LPM.3300Pa
Motor		
Make	:	LANDERT
Type	:	112M-2F
Rating	:	3 phase,415V,50Hz 2860 rpm,11kW
Insulation	:	Class F

MAIN COMPRESSOR:

No.	:	2.
Compressor		
Make	:	D&M
Type	:	2A320D C13-T32
Rating	:	1554 lt/min.10Kg/cm
Motor		
Make	:	LANDERT
Type	:	200l55-RPAH8B
Rating	:	415V.3phase,50Hz, 15kW,730 rpm
Insulation	:	Class H

Machine room blower

No.	:	2
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-415-60
Rating	:	1 m^3/s, 1390Pa
Motor		
Make	:	LANDERT
Type	:	132M-RFXHE2C
Rating	:	1 phase,415V,50Hz 2830 rpm,2.6kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	BB 11
Rating	:	0.1 m^3/s, 550Pa
Motor		
Make	:	LANDERT
Type	:	90L24-RE2C
Rating	:	1 phase,415 V,50 Hz 2910 rpm,0.75kW
Insulation	:	Class F

AUXILIARY COMPRESSOR:

No.	:	1.
Compressor		
Make	:	D&M Bristol
Type	:	FF 3145
Capacity	:	141.6lt/min,7.03kg/cm^2
Motor		
Make	:	D&M
Rating	:	110 VDC.0.75kW,1450rpm

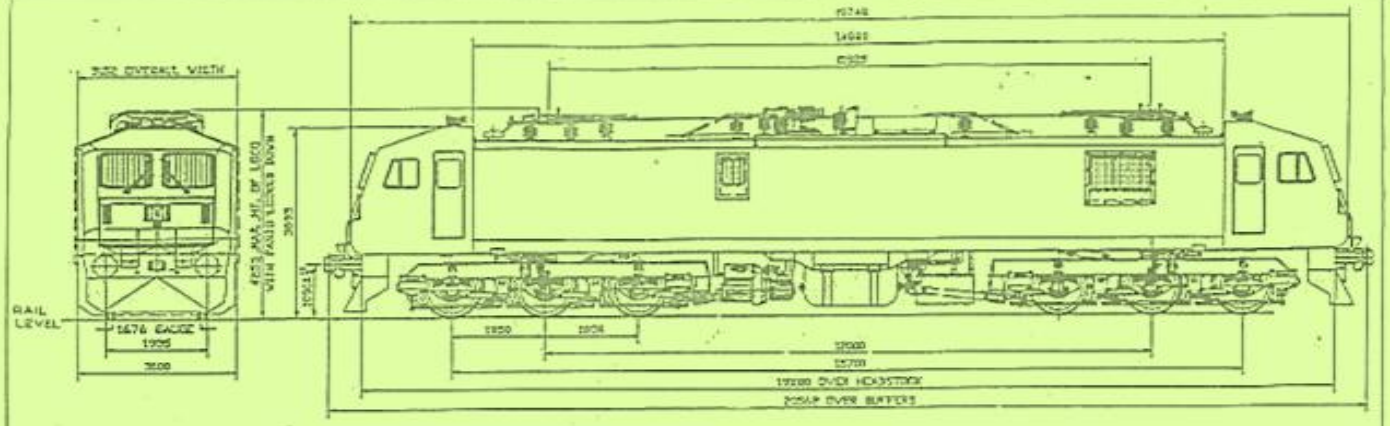
Air dryer(1no/loco) provided for compression

BATTERY

Make	:	SAFT NIFE
Type	:	Ni-Cd(SAF-39 SBL199)
Rating	:	110V,199AH

PROTECTIVE DEVICES

Vigilance control	:	Yes
Slip/Slide control	:	Yes
Main Overload relay	:	Yes
No volt relay	:	Yes
Over voltage protection	:	Yes
Earth fault relay Low	:	Yes

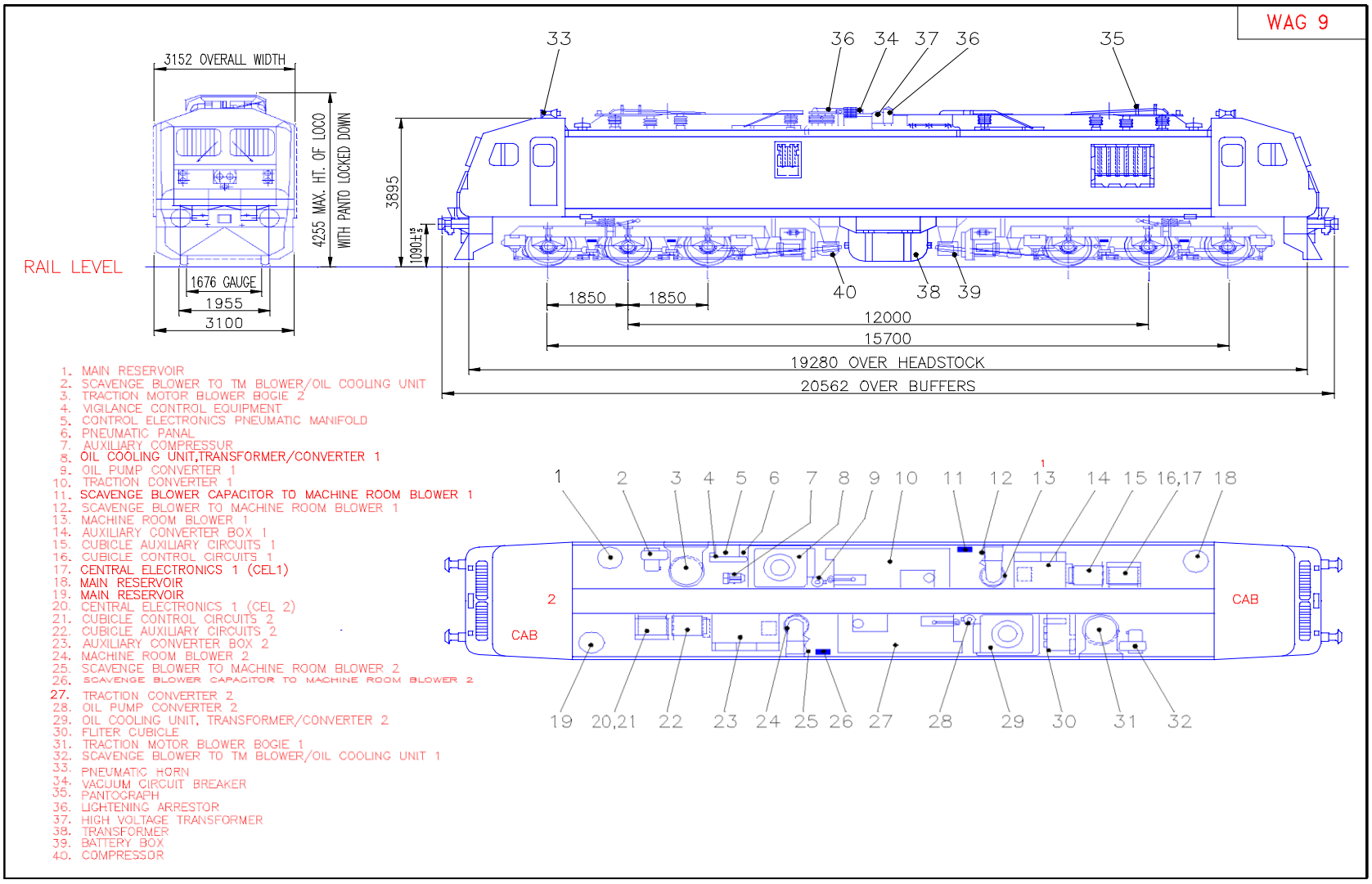


1.	TYPE OF SERVICE	: FREIGHT
2.	SUPPLY SYSTEM	: 25 kV, 50Hz ac
3.	CLASS OF LOCO	: WAG-9H
4.	TRACK GAUGE	: 1676mm BROAD GAUGE
5.	AXLE ARRANGEMENT	: Co-Co
6.	BRAKE SYSTEM	: Air, Regenerative & Parking brake
7.	TOTAL WEIGHT	: 132 ± 1 t
8.	AXLE LOAD	: 22.0 ± 2 t
9.	UNSPRUNG MASS PER AXLE	: 3.984 t
10.	WHEEL DIAMETER	: 1092mm (new), 1016mm (Full worn)
11.	LENGTH OF LOCO OVER BUFFERS	: 20568mm
12.	LENGTH OF LOCO OVER HEADSTOCK	: 19200mm
13.	BOGIE CENTER DISTANCE	: 12000mm
14.	LOCO WHEEL BASE	: 15700mm
15.	BOGIE WHEEL BASE	: 1850mm + 1850mm
16.	OVERALL WIDTH OF BODY	: 3052mm
17.	LENGTH OF CAB	: 2434mm
18.	PANTO LOCKED DOWN HEIGHT	: 4015mm
19.	TRACTION MOTOR TYPE	: 6FRA 6068
20.	TRACTION MOTOR MOUNTING	: Axle hung nose suspended
21.	GEAR RATIO	: 5.133 (77:15)
22.	CONT. RATED POWER	: 4500kW (6122Hp)
23.	STARTING TRACTIVE EFFORT	: 520kN (53.0 t)
24.	CONT. RATED TRACTIVE EFFORT	: 325 KN (33.1 t)
25.	MAX. REGEN BRAKING EFFORT	: 265kN (26.5t)
26.	MAX. SERVICE SPEED	: 120km/h
27.	CONTROL CIRCUIT VOLTAGE	: 110Vdc (NOMINAL)
28.	DRIVE SYSTEM	: 3 Phase Drive With GTO Thyristors and Microprocessor Based Control System
29.	MULTIPLE UNIT OPERATION	: Max. 3 Locos

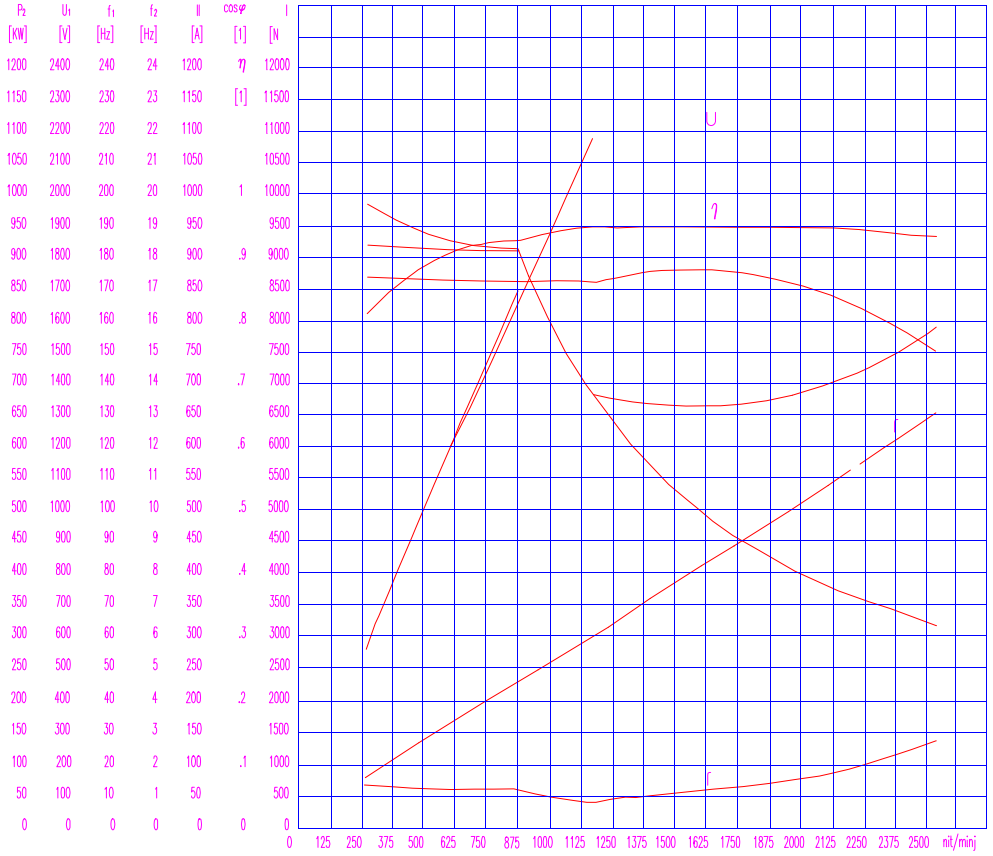
STATUS	ALT	REF No.	DESCRIPTION	APPROVED BY	DATE
—	1	7.8.24	VALUES CORRECTED		

REF :- SKEL-4557 WAG-9	- E -	SCALE :-	APPROVED BY
LOCO OUTLINE DRAWING FOR 25 kv. ac LOCOMOTIVE WAG-9 H			
RDSO ELECT. DTE	SKEL 4547		SUPERSEDED BY

Dt	8.2.2017	
D		
C		
Fac No.	EV3130/2	


WAG 9
3152 OVERALL WIDTH
4255 MAX. HT. OF LOCO WITH PANTO LOCKED DOWN
3895
1090±15
RAIL LEVEL
1676 GAUGE
1955
3100
33
36
34
37
36
35
40
38
39
1850
1850
12000
15700
19280 OVER HEADSTOCK
20562 OVER BUFFERS
1 MAIN RESERVOIR
2 SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT
3 TRACTION MOTOR BLOWER BOGIE 2
4 VIGILANCE CONTROL EQUIPMENT
5 CONTROL ELECTRONICS PNEUMATIC MANIFOLD
6 PNEUMATIC PANAL
7 AUXILIARY COMPRESSUR
8 OIL COOLING UNIT,TRANSFORMER/CONVERTER 1
9 OIL PUMP CONVERTER 1
10 TRACTION CONVERTER 1
11 SCAVENGE BLOWER CAPACITOR TO MACHINE ROOM BLOWER 1
12 SCAVENGE BLOWER TO MACHINE ROOM BLOWER 1
13 MACHINE ROOM BLOWER 1
14 AUXILIARY CONVERTER BOX 1
15 CUBICLE AUXILIARY CIRCUITS 1
16 CUBICLE CONTROL CIRCUITS 1
17 CENTRAL ELECTRONICS 1 (CEL1)
18 MAIN RESERVOIR
19 MAIN RESERVOIR
20 CENTRAL ELECTRONICS 1 (CEL 2)
21 CUBICLE CONTROL CIRCUITS 2
22 CUBICLE AUXILIARY CIRCUITS 2
23 AUXILIARY CONVERTER BOX 2
24 MACHINE ROOM BLOWER 2
25 SCAVENGE BLOWER TO MACHINE ROOM BLOWER 2
26 SCAVENGE BLOWER CAPACITOR TO MACHINE ROOM BLOWER 2
27 TRACTION CONVERTER 2
28 OIL PUMP CONVERTER 2
29 OIL COOLING UNIT, TRANSFORMER/CONVERTER 2
30 FLITER CUBICLE
31 TRACTION MOTOR BLOWER BOGIE 1
32 SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT 1
33 PNEUMATIC HORN
34 VACUUM CIRCUIT BREAKER
35 PANTOGRAPH
36 LIGHTENING ARRESTOR
37 HIGH VOLTAGE TRANSFORMER
38 TRANSFORMER
39 BATTERY BOX
40 COMPRESSOR
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16,17 18
19 20,21 22 23 24 25 26 27 28 29 30 31 32
CAB
CAB
2

WAG9



THREE-PHASE ASYNCHRONOUS
TRACTION MOTOR

TYPE 6 FRA 6068

DATA PER MOTOR		CONTINUOUS RATING	MAXIMUM VALUES
U1	[V]	2180	2180
I1	[A]	270	393
P2	[KW]	850	850
T	[Nm]	6330	9200
n	[1/min]	1283	2584
COSφ	[1]	.88	–
η	[1]	.95	–
f1	[Hz]	85	132
f2	[Hz]	9	–

MEANING OF THE SYMBOLS :

U1 = PHASE-TO-PHASE VOLTAGE
I1 = PHASE CURRENT
P2 = OUTPUT AT THE MOTOR SHAFT
T = TORQUE AT MOTOR SHAFT
n = MOTOR SPEED
COSφ = POWER FACTOR
η = MOTOR EFFICIENCY
f1 = STATOR FREQUENCY
f2 = ROTOR FREQUENCY

I = AT FUNDAMENTAL FREQUENCY

CALCULATED FOR A TEMPERATURE
OF THE WINDINGS OF 150°C

REVISION : a) 1993-09-07
b) 1994-02-04

TRACTIVE EFFORT – SPEED CHARACTERISTICS FOR WAG-9H LOCOMOTIVE

CONTINUOUS RATING

SPEED (Kmph)	0	55	60	70	80	90	100
T.E. (Tonne)	30.025	30.025	27.525	23.59	20.64	18.35	16.51

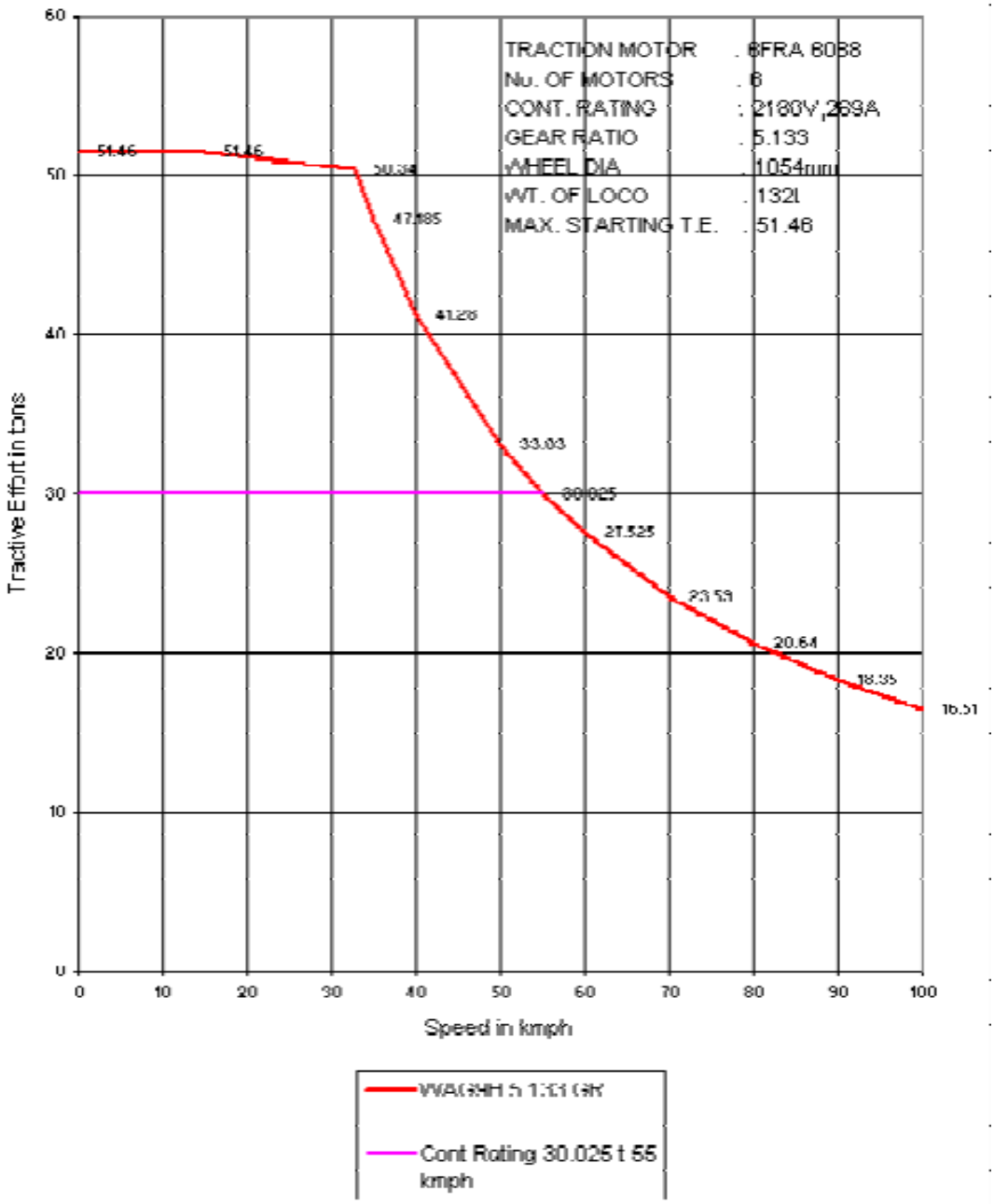
SHORT TIME RATING

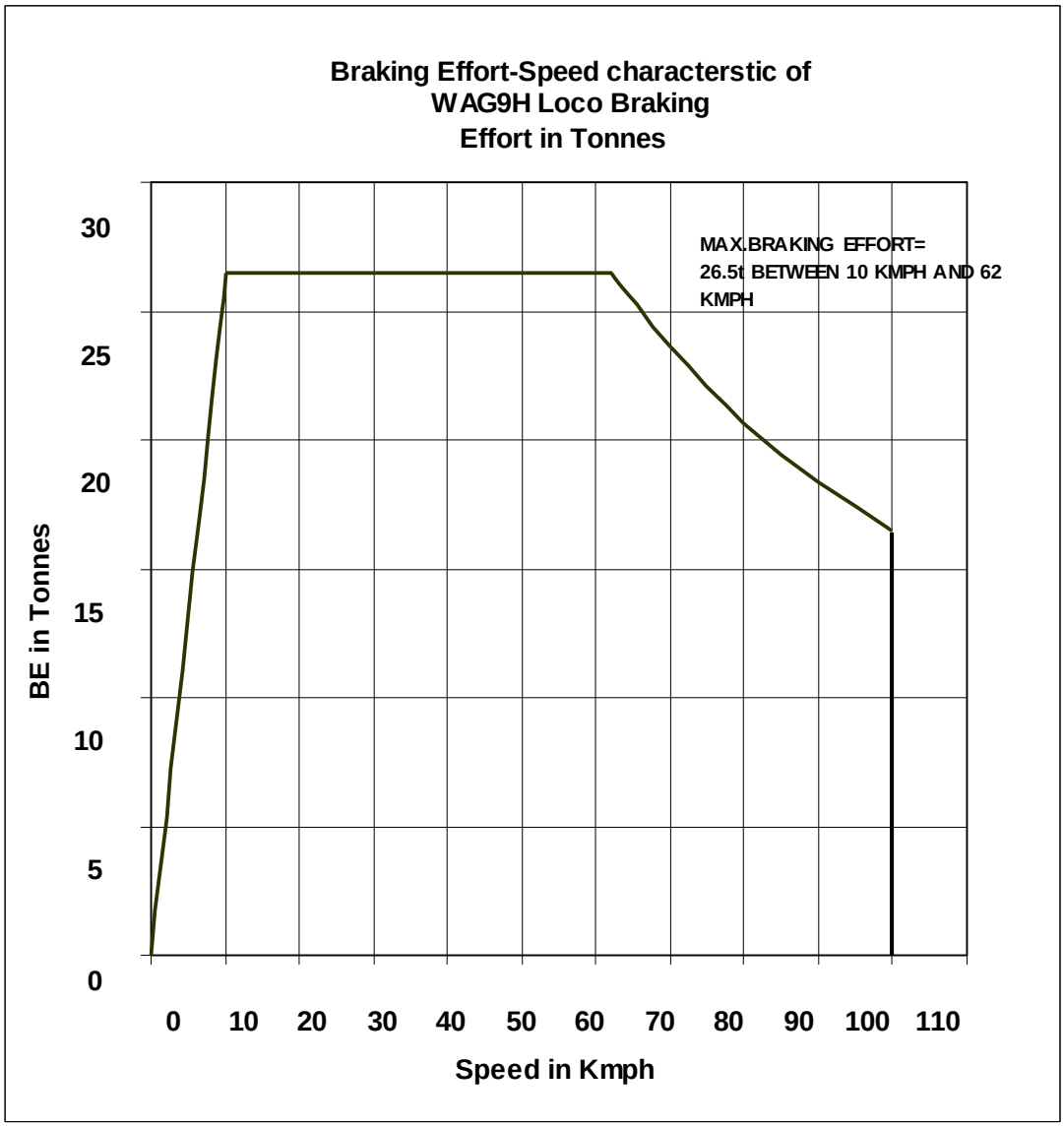
SPEED (Kmph)	0	15	32.8	35	40	50
T.E. (Tonne)	51.46	51.46	50.3413	47.185	41.28	33.03

BRAKING EFFORT – SPEED CHARACTERISTICS FOR WAG-9H LOCOMOTIVE

SPEED (Kmph)	0	10	62	70	80	90	100
B.E. (Tonne)	0	26.5	26.5	23.59	20.64	18.35	16.51

Tractive Effort-Speed Characteristic of WAG9H Locomotives




Braking Effort-Speed characterstic of
WAG9H Loco Braking
Effort in Tonnes
MAX.BRAKING EFFORT=
26.5t BETWEEN 10 KMPH AND 62
KMPH
BE in Tonnes
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
110
Speed in Kmph

Haulage Capacity of three phase WAG9H locomotive (without acceleration reserve)

GR-1:1.51, TM-6FRA 6068(Three phase)

Service		Grade	Tomes at KMPH (Tangent Track)									Start
			20	30	40	50	60	70	80	90	100	
Goods	BOXN	Level	Above 7500								6465	Above 7500
		1/500	Above7500				7570	6095	4995	4015	3475	-do-
		1/200	5800	5800	5800	5050	4035	3320	2780	2280	2015	5800
		1/150	4745	4650	4550	3950	3185	2635	2215	1825	1620	4870
		1/100	3250	3205	3155	2765	2225	1845	1560	1290	1150	3680
		1/50	1630	1615	1600	1405	1130	935	785	645	575	2090

Code: 251099 haulage WAP7

WAP7

CONT. RAIL P.S. 6120
CO-CO TYPE WAP 7 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

MAIN PARTICULARS OF LOCO

WAP-7

GENERAL

SYSTEM OF CURRENT	:	AC
LINE VOLTAGE	:	25000V
WEIGHT IN W.O.	:	123t+/-1% (+1230kgs)
ADHESIVE WEIGHT	:	123t+/-1%
AXLE LOAD	:	20.5t+/-2%

CONTINUOUS RATING

H.P.	:	6120
T.E.	:	23200 kg
SPEED	:	71 kmph
MAX. T.E.	:	32900 kg
MAX. SPEED	:	140Kmph
WHEEL DIA (NEW)	:	1092 mm
(HALF WORN)	:	1054 mm
(FULLY WORN)	:	1016 mm

BOGIE

DRIVE ARRANGEMENT	:	GEAR PINION
DESIGN	:	3 AXLE. FABRICATED

BRAKES

LOCO	:	AIR REGENERATIVE
TRAIN	:	AIR

PANTOGRAPH

No.	:	2
MAKE	:	SECHERON
TYPE	:	ESID 103-2500
WEIGHT (W.O. INSULATOR)	:	186 kgs

TRANSFORMER

Make	:	ABB, HI-VOLT, BHEL
Type	:	LOT 7500/7775
No.	:	1
WEIGHT COMPLETE	:	9523 KG
COOLING	:	OFAF
INSULATION	:	CLASS A

Rating

PRIMARY	:	25KV, 7475/7775 kvA, 299/311A
SECONDARY	:	4x1269V, 4x1449KVA, 4x1142A
AUXILIARY	:	1000V, 334KVA, 334A
HOTEL LOAD	:	960V, 2x622.5 KVA, 2x648 A
FILTER	:	1154V, 400kvA, 347A

POWER CONVERTOR

No.	:	2
Make	:	ABB, BHEL, MEDHA
Type	:	UW-2423-2810
COOLING	:	OFAF
TYPE OF GTO	:	SG 3000 G X H24
TYPE OF IGBT	:	5SNA 1200G450300
TYPE OF DIODE	:	D 921S45 T
CONNECTION	:	BRIDGE
No. OF THYRISTER/CON	:	14 + 1 (MUB)
No. OF DIODES/CON	:	14 + 1 (MUB)

LINE CONVERTOR

CONT RATING	:	2x1269 V
FREQUENCY	:	50 HZ+/-3%
DC LINK VOLTAGE	:	2800 V (NOMINAL)

DRIVE CONVERTOR

MOTOR VOLTAGE (PHASE TO PHASE)	:	2180V
MAX. O/P CURRENT (per PHASE)	:	971 A
MOTOR FREQUENCY	:	0- 132 HZ

TRACTION MOTOR

MAKE	:	ABB
TYPE	:	6 FRA6068
No.	:	6
INSULATION	:	CLASS 200
SUSPENSION	:	AXLE HUNG, NOSE SUSPENDED
VENTILATION	:	FORCED AIR
WEIGHT	:	2150 kg
1 Hr RATING	:	850KW, 2089V 290A, 1135 rpm
CONT. RATING	:	850KW, 2180V 270A, 1283 rpm
GEAR RATIO	:	3.6 (72:20)

AUXILIARY CONVERTER

MAKE	:	ABB
TYPE	:	BUR 10A 100LVPS
RATING	:	3PHASE, 415V, 100kvA

HOTEL LOAD CONVERTER

MAKE	:	SIEMENS/MEDHA
RATING	:	2x500 KVA
VOLTAGE	:	750V +/-5%, 3-PH

TRACTION MOTOR BLOWER

No.	:	2.
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-605-115
Rating	:	4.05m^3/s.2950Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RFXH2A-01
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

OIL COOLER BLOWER

No.	:	2.
Blower		
Make/Type	:	BEHR
Rating	:	4.05m/s.2950Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RH2A
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	MB 55
Rating	:	0.664 m^3/s,450Pa
Motor		
Make	:	LANDERT
Type	:	100L28-R2C
Rating	:	3 phase,415V,50Hz 2850 rpm,3.0kW
Insulation	:	Class H

TRANSFORMER OIL PUMP

No.	:	2.
Pump		
Make	:	Fumettaz,Switzerland
Type	:	TA08-2174/15
Rating	:	1000lpm.1720Pa
Motor		
Make	:	LANDERT
Type	:	112M-2B
Rating	:	3 phase,415V,50Hz 2930 rpm,4.7kW
Insulation	:	Class F

CONVERTOR OIL PUMP

No.	:	2.
Pump		
Make	:	Plumettaz,Switzerland
Type	:	TC10-2185/29
Rating	:	960LPM.3300Pa
Motor		
Make	:	LANDERT
Type	:	112M-2F
Rating	:	3 phase,415V,50Hz 2860 rpm,11kW
Insulation	:	Class F

MAIN COMPRESSOR:

No.	:	2.
Compressor		
Make	:	D&M
Type	:	2A320D C13-T32
Rating	:	1554 lt/min.10Kg/cm
Motor		
Make	:	LANDERT
Type	:	200l55-RPAH8B
Rating	:	415V.3phase,50Hz, 15kW,730 rpm
Insulation	:	Class H

Machine room blower

No.	:	2
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-415-60
Rating	:	1 m^3/s, 1390Pa
Motor		
Make	:	LANDERT
Type	:	132M-RFXHE2C
Rating	:	1 phase,415V,50Hz 2830 rpm,2.6kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	BB 11
Rating	:	0.1 m^3/s, 550Pa
Motor		
Make	:	LANDERT
Type	:	90L24-RE2C
Rating	:	1 phase,415 V,50 Hz 2910 rpm,0.75kW
Insulation	:	Class F

AUXILIARY COMPRESSOR:

No.	:	1.
Compressor		
Make	:	D&M Bristol
Type	:	FF 3145
Capacity	:	141.6lt/min,7.03kg/cm^2
Motor		
Make	:	D&M
Rating	:	110 VDC.0.75kW,1450rpm

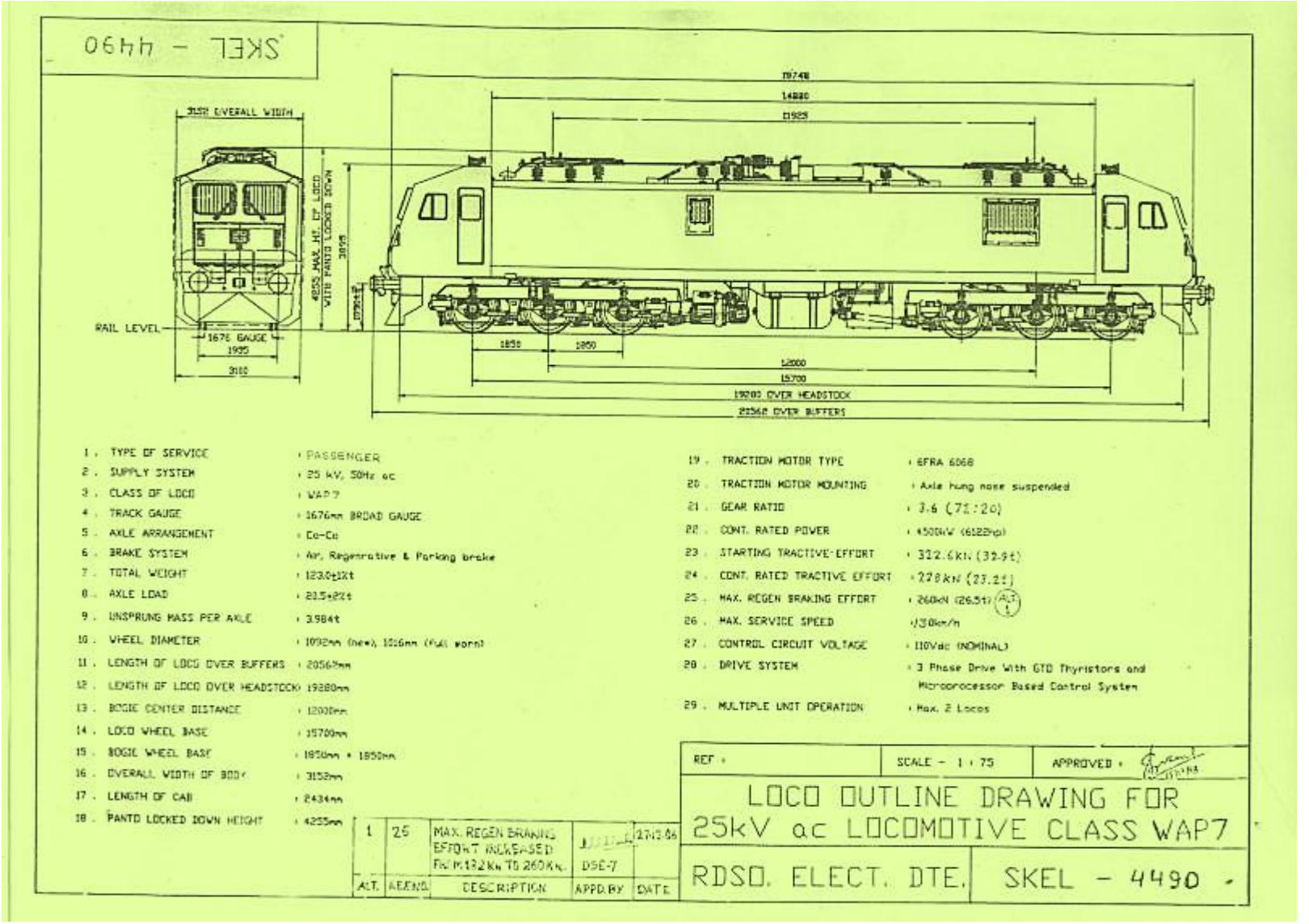
Air dryer(1no/loco) provided for compression

BATTERY

Make	:	SAFT NIFE
Type	:	Ni-Cd(SAF-39 SBL199)
Rating	:	110V,199AH

PROTECTIVE DEVICES

Vigilance control	:	Yes
Slip/Slide control	:	Yes
Main Overload relay	:	Yes
No volt relay	:	Yes
Over voltage protection	:	Yes
Earth fault relay Low	:	Yes



1.	TYPE OF SERVICE	:	PASSENGER
2.	SUPPLY SYSTEM	:	25 kV, 50Hz ac
3.	CLASS OF LOCO	:	WAP7
4.	TRACK GAUGE	:	1676mm BROAD GAUGE
5.	AXLE ARRANGEMENT	:	Co-Co
6.	BRAKE SYSTEM	:	Air, Regenerative & Parking brake
7.	TOTAL WEIGHT	:	123.0±1t
8.	AXLE LOAD	:	21.5±2t
9.	UNSPRUNG MASS PER AXLE	:	3.984t
10.	WHEEL DIAMETER	:	1092mm (new) 1016mm (Full worn)
11.	LENGTH OF LOCO OVER BUFFERS	:	20568mm
12.	LENGTH OF LOCO OVER HEADSTOCK	:	19280mm
13.	BOGIE CENTER DISTANCE	:	12000mm
14.	LOCO WHEEL BASE	:	15700mm
15.	BOGIE WHEEL BASE	:	1850mm + 1850mm
16.	OVERALL WIDTH OF BODY	:	3152mm
17.	LENGTH OF CAB	:	2434mm
18.	PANTO LOCKED DOWN HEIGHT	:	4255mm
19.	TRACTION MOTOR TYPE	:	6FRA 6068
20.	TRACTION MOTOR MOUNTING	:	Axle hung nose suspended
21.	GEAR RATIO	:	3.6 (71:20)
22.	CONT. RATED POWER	:	4500kW (6122hp)
23.	STARTING TRACTIVE EFFORT	:	312.6kN (32.9t)
24.	CONT. RATED TRACTIVE EFFORT	:	228kN (23.2t)
25.	MAX. REGEN BRAKING EFFORT	:	260kN (26.5t) (ALT 1)
26.	MAX. SERVICE SPEED	:	130km/h
27.	CONTROL CIRCUIT VOLTAGE	:	110Vdc (NOMINAL)
28.	DRIVE SYSTEM	:	3 Phase Drive With GTO Thyristors and Microprocessor Based Control System
29.	MULTIPLE UNIT OPERATION	:	Max. 2 Locos

ALT.	AMEND.	DESCRIPTION	APPD BY	DATE
1	25	MAX. REGEN BRAKING EFFORT INCREASED FROM 132kN TO 260kN.	DSE-T	27.12.06

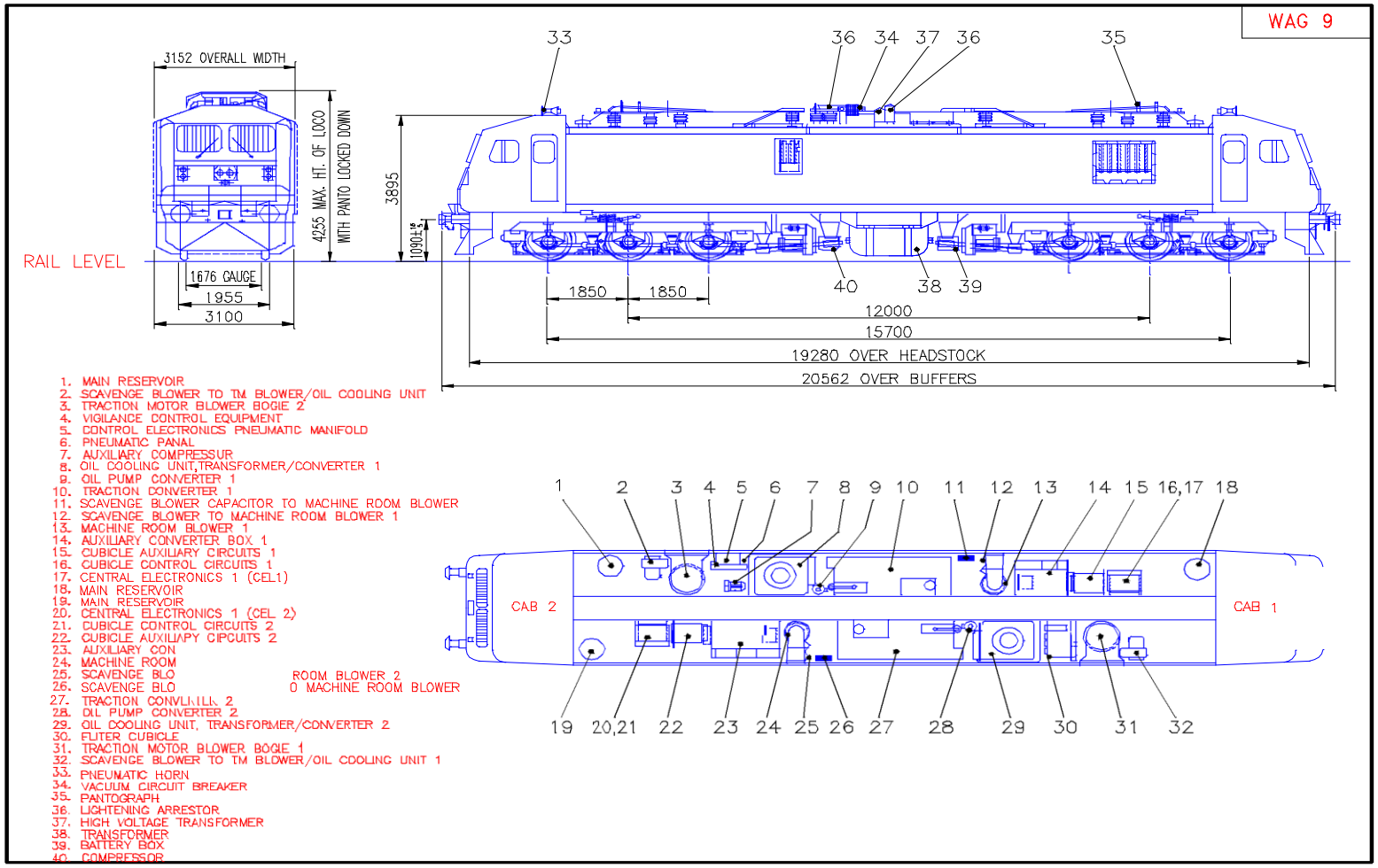
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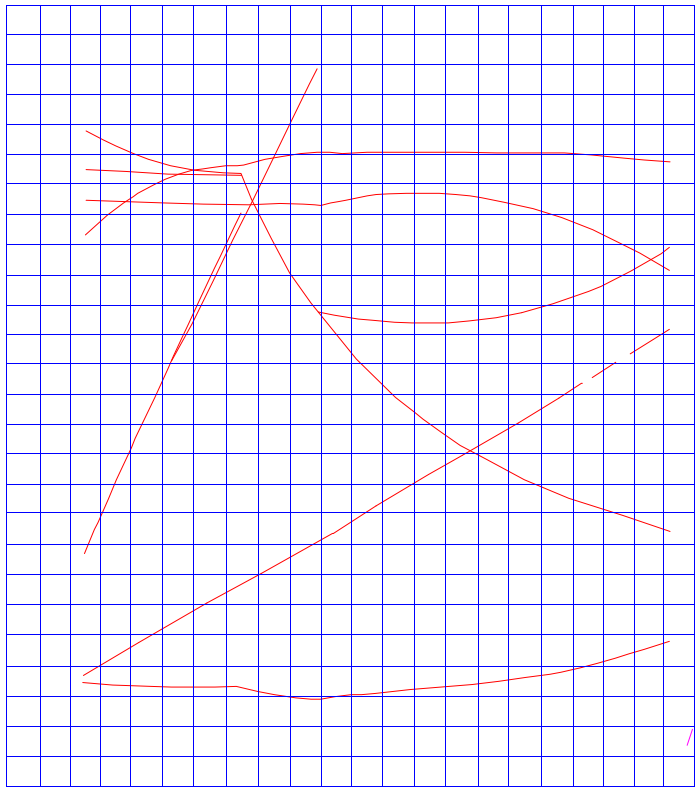
LOCO OUTLINE DRAWING FOR 25kV ac LOCOMOTIVE CLASS WAP7

RDSO. ELECT. DTE. SKEL - 4490


WAG 9
3152 OVERALL WIDTH
4255 MAX. HT. OF LOCO WITH PANTO LOCKED DOWN
3895
1090±5
RAIL LEVEL
1676 GAUGE
1955
3100
33
36 34 37 36
35
40
38 39
1850
1850
12000
15700
19280 OVER HEADSTOCK
20562 OVER BUFFERS
1. MAIN RESERVOIR
2. SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT
3. TRACTION MOTOR BLOWER BOGIE 2
4. VIGILANCE CONTROL EQUIPMENT
5. CONTROL ELECTRONICS PNEUMATIC MANIFOLD
6. PNEUMATIC PANAL
7. AUXILIARY COMPRESSUR
8. OIL COOLING UNIT,TRANSFORMER/CONVERTER 1
9. OIL PUMP CONVERTER 1
10. TRACTION CONVERTER 1
11. SCAVENGE BLOWER CAPACITOR TO MACHINE ROOM BLOWER
12. SCAVENGE BLOWER TO MACHINE ROOM BLOWER 1
13. MACHINE ROOM BLOWER 1
14. AUXILIARY CONVERTER BOX 1
15. CUBICLE AUXILIARY CIRCUITS 1
16. CUBICLE CONTROL CIRCUITS 1
17. CENTRAL ELECTRONICS 1 (CEL1)
18. MAIN RESERVOIR
19. MAIN RESERVOIR
20. CENTRAL ELECTRONICS 1 (CEL 2)
21. CUBICLE CONTROL CIRCUITS 2
22. CUBICLE AUXILIAPY CIPCUITS 2
23. AUXILIARY CON
24. MACHINE ROOM
25. SCAVENGE BLO ROOM BLOWER 2
26. SCAVENGE BLO 0 MACHINE ROOM BLOWER
27. TRACTION CONVLNILL 2
28. OIL PUMP CONVERTER 2
29. OIL COOLING UNIT, TRANSFORMER/CONVERTER 2
30. FLITER CUBICLE
31. TRACTION MOTOR BLOWER BOGIE 1
32. SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT 1
33. PNEUMATIC HORN
34. VACUUM CIRCUIT BREAKER
35. PANTOGRAPH
36. LIGHTENING ARRESTOR
37. HIGH VOLTAGE TRANSFORMER
38. TRANSFORMER
39. BATTERY BOX
40. COMPRESSOR
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16,17 18
CAB 2
CAB 1
19 20,21 22 23 24 25 26 27 28 29 30 31 32

WAG9

P_2 [kW]	U_1 [V]	f_1 [Hz]	f_2 [Hz]	I_L [A]	$\cos\varphi$ [1]	η [%]
1200	2400	240	24	1200	η	120
1150	2300	230	23	1150	$\cos\varphi$	115
1100	2200	220	22	1100		110
1050	2100	210	21	1050		105
1000	2000	200	20	1000	1	100
950	1900	190	19	950		95
900	1800	180	18	900	.9	90
850	1700	170	17	850		85
800	1600	160	16	800	.8	80
750	1500	150	15	750		75
700	1400	140	14	700	.7	70
650	1300	130	13	650		65
600	1200	120	12	600	.6	60
550	1100	110	11	550		55
500	1000	100	10	500	.5	50
450	900	90	9	450		45
400	800	80	8	400	.4	40
350	700	70	7	350		35
300	600	60	6	300	.3	30
250	500	50	5	250		25
200	400	40	4	200	.2	20
150	300	30	3	150		15
100	200	20	2	100	.1	10
50	100	10	1	50		5
0	0	0	0	0	0	



THREE-PHASE ASYNCHRONOUS
TRACTION MOTOR

TYPE 6 FRA 6068

DATA PER MOTOR		CONTINUOUS RATING	MAXIMUM VALUES
U1	[V]	2180	2180
I1	[A]	270	393
P2	[KW]	850	850
T	[Nm]	6330	9200
n	[1/min]	1283	2584
$\cos\varphi$	[1]	.88	–
η	[1]	.95	–
f1	[Hz]	65	132
f2	[Hz]	.9	–

MEANING OF THE SYMBOLS :

U1	=	PHASE-TO-PHASE VOLTAGE
I1	=	PHASE CURRENT
P2	=	OUTPUT AT THE MOTOR SHAFT
T	=	TORQUE AT MOTOR SHAFT
n	=	MOTOR SPEED
$\cos\varphi$	=	POWER FACTOR
η	=	MOTOR EFFICIENCY
f1	=	STATOR FREQUENCY
f2	=	ROTOR FREQUENCY

$\hat{1}$ = AT FUNDAMENTAL FREQUENCY

CALCULATED FOR A TEMPERATURE
OF THE WINDINGS OF 150°C

REVISION : a) 1993-09-07
b) 1994-02-04

TRACTIVE EFFORT – SPEED CHARACTERISTICS FOR WAP-7 LOCOMOTIVE WITH GEAR RATIO 3.6

SHORT TIME RATING

SPEED (kmph)	0	21.39	51.33	55	60	70	71
T.E. (Tonne)	32.88	32.88	32.17	30.02	27.52	23.59	23.23

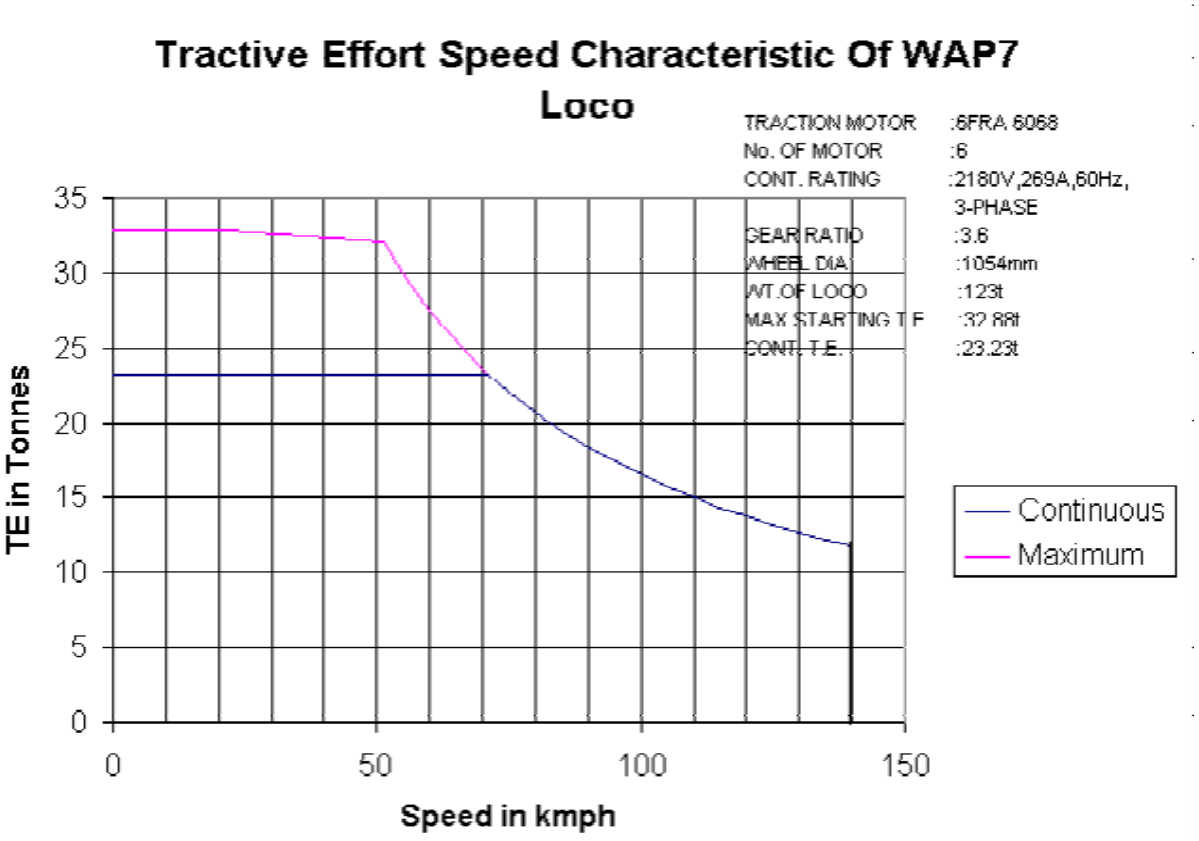
CONTINUOUS RATING

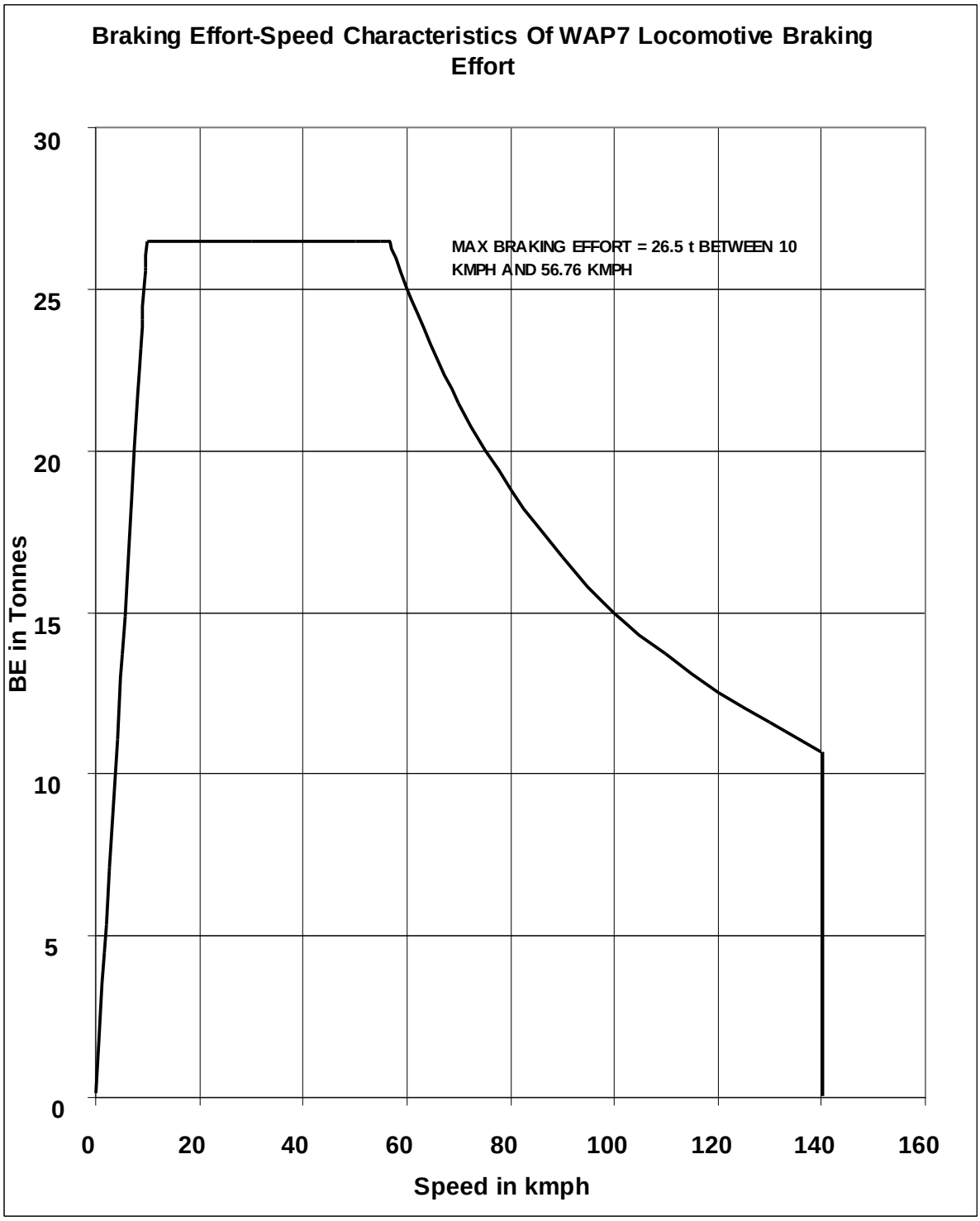
SPEED (kmph)	0	71	75	80	85	90	95	100	105	110	115	120	125	130	135	140
T.E. (Tonne)	23.23	23.23	22.02	20.64	19.43	18.35	17.38	16.51	15.73	15.01	14.36	13.76	13.21	12.7	12.23	11.79

BRAKING EFFORT – SPEED CHARACTERISTICS FOR WAP-7 LOCOMOTIVE WITH GEAR RATIO 3.6

BRAKING EFFORT

SPEED (kmph)	0	10	56.76	60	70	80	90	100	110	120	130	140
T.E. (Tonne)	0	26.50	26.50	25.07	21.50	18.81	16.72	15.04	13.68	12.54	11.57	10.75


Tractive Effort Speed Characteristic Of WAP7 Loco
TRACTION MOTOR :6FRA 6068
No. OF MOTOR :6
CONT. RATING :2180V,269A,60Hz, 3-PHASE
GEAR RATIO :3.6
WHEEL DIA :1054mm
WT.OF LOCO :123t
MAX STARTING T.E :32.88t
CONT. T.E. :23.23t
TE in Tonnes
35
30
25
20
15
10
5
0
0
50
100
150
Speed in kmph
Continuous
Maximum


Braking Effort-Speed Characteristics Of WAP7 Locomotive Braking Effort
MAX BRAKING EFFORT = 26.5 t BETWEEN 10 KMPH AND 56.76 KMPH
BE in Tonnes
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
Speed in kmph

Haulage Capacity of three phase WAP7 locomotive (without acceleration reserve)

GR-20:72, TM-6FRA 6068(Three phase)

Service		Grade	Tonnes at KMPH (Tangent Track)													Start
Passenger	ICF		20	30	40	50	60	70	80	90	100	110	120	130	140	
Coach	Coa-ch	Level	Above 1500													Above 1500
		1/500	Above 1500												1395	-do-
		1/200	Above 1500									1485	1275	1100	950	-do-
		1/150	Above 1500								1440	1235	1065	920	880	-do-
		1/100	Above 1500						1465	1235	1055	910	790	685	595	-do-
		1/50	970	955	940	925	910	895	765	650	555	480	415	360	310	1235

WAP 5

CONT. RAIL P.S. 5440
BO-BO TYPE WAP 5 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAP 5

Bo–Bo TYPE WAP–5 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAGUE

10 LOCOMOTIVES PLUS ONE LOCOMOTIVE TO SERVE AS BANK OF SPARES OF THIS TYPE WERE ORDERED BY IR ON M/s ABB SWITZERLAND AS PER RDSO'S SPECIFICATION No.E–17/08. FIRST LOCOMOTIVE WAS PUT IN SERVICE IN 1996.THE CONTINUOUS HORSE POWER OF THE LOCOMOTIVE IS 5440.

THE LOCOMOTIVE IS POWERED BY FOUR BOGIE MOUNTED FORCED VENTILATED 3–PHASE TRACTION MOTORS SPEED CONTROL IS ACHIEVED THROUGH CONVERTOR–INVERTOR CONTROL USING G T O THYRISTORS.

MULTIPLE CONNECTION UP TO TWO LOCOMOTIVES IS POSSIBLE.THESE LOCOMOTIVES HAVE MICRO–PROCESSOR BASED CONTROL AND FAULT INDICATION SYSTEM.

AIR AND REGENERATIVE SYSTEM FOR THE LOCOMOTIVE AND AIR BRAKE FOR THE TRAIN ARE PROVIDED.

PROCUREMENT PARTICULARS

CONTRACT	DATE	BUILDER	YEAR PUT IN LINE	I. R. LOCO	TENDER SPEC.No.	TOTAL Nos. ORDERED	REMARKS
92/RSF/459/1 (GP–140)	23.07.93	ABB SWITZERLAND	1996	30000–30010	E–17/08	10+1	

MAIN PARTICULARS OF LOCO

WAP-5

GENERAL

SYSTEM OF CURRENT	:	AC
LINE VOLTAGE	:	25000V
WEIGHT IN W.O.	:	78t+/-1% (+800kgs)
ADHESIVE WEIGHT	:	78t+/-1%
AXLE LOAD	:	19.5t+/-2%

CONTINUOUS RATING

H.P.	:	5440
T.E.	:	22426 kg
SPEED	:	50 kmph
MAX. T.E.	:	26299 kg
MAX. SPEED	:	160Kmph
WHEEL DIA (NEW)	:	1092 mm
(HALF WORN)	:	1054 mm
(FULLY WORN)	:	1016 mm

BOGIE

DRIVE ARRANGEMENT	:	GEAR COUPLING AND 3 STAGE GEAR
DESIGN	:	2 AXLE. FABRICATED

BRAKES

LOCO	:	AIR REGENERATIVE
TRAIN	:	AIR

PANTOGRAPH

No.	:	2
MAKE	:	FAIVELEY
TYPE	:	FAI AM92BUGV
WEIGHT (W.O. INSULATOR)	:	231 kgs

TRANSFORMER

Make	:	ABB, HI-VOLT, BHEL
Type	:	LOT 7500/7775
No.	:	1
WEIGHT COMPLETE	:	10000 +/-3%
COOLING	:	OFAF
INSULATION	:	CLASS A

Rating

PRIMARY	:	25KV, 7475/7775 kvA, 299/311A
SECONDARY	:	4x1269V, 4x1449KVA, 4x1142A
AUXILIARY	:	1000V, 334KVA, 334A
HOTEL LOAD	:	960V, 2x622.5 KVA, 2x648 A
FILTER	:	1154V, 400KVA,347A

POWER CONVERTOR

No.	:	2
Make	:	ABB, BHEL, MEDHA
Type	:	UW-2423-2810
COOLING	:	OFAF
TYPE OF GTO	:	SG 3000 G X H24
TYPE OF IGBT	:	5SNA 1200G450300
TYPE OF DIODE	:	D 921S45 T
CONNECTION	:	BRIDGE
No. OF THYRISTER/CON	:	14 + 1 (MUB)
No. OF DIODES/CON	:	14 + 1 (MUB)

LINE CONVERTOR

CONT RATING	:	2x1269 V
FREQUENCY	:	50 HZ+/-3%
DC LINK VOLTAGE	:	2800 V (NOMINAL)

DRIVE CONVERTOR

MOTOR VOLTAGE (PHASE TO PHASE)	:	2180V
MAX. O/P CURRENT (per PHASE)	:	953 A
MOTOR FREQUENCY	:	0-160.3 HZ

TRACTION MOTOR

MAKE	:	ABB
TYPE	:	6 FXA 7059
No.	:	4
INSULATION	:	CLASS 200
SUSPENSION	:	FULLY SUSPENDED
VENTILATION	:	FORCED AIR
WEIGHT	:	1990 kg
1 Hr RATING	:	1150 KW, 2044V 396A, 1485 rpm
CONT. RATING	:	1150 KW, 2180V 370A, 1585 rpm
GEAR RATIO	:	3.91 (69:35:17)

AUXILIARY CONVERTER

MAKE	:	ABB
TYPE	:	BUR 10A 100LVPS
RATING	:	3PHASE, 415V, 100kvA

HOTEL LOAD CONVERTER

MAKE	:	SIEMENS/MEDHA
RATING	:	2x500 KVA
VOLTAGE	:	750V +/-5%, 3-PH

TRACTION MOTOR BLOWER

No.	:	2.
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-605-115
Rating	:	3.6m^3/s.3425Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RFXH2A-01
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

OIL COOLER BLOWER

No.	:	2.
Blower		
Make/Type	:	BEHR
Rating	:	8.8m^3/s.1781Pa.
Motor		
Make	:	LANDERT
Type	:	200L55-RH2A
Rating	:	3 phase,415V,50Hz 2930 rpm,25kW
Insulation	:	Class F

SCAVANGE BLOWER FOR TM & OIL COOLER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	MB 55
Rating	:	0.664 m^3/s,450Pa
Motor		
Make	:	LANDERT
Type	:	100L28-R2C
Rating	:	3 phase,415V,50Hz 2850 rpm,3.0kW
Insulation	:	Class H

TRANSFORMER OIL PUMP

No.	:	2.
Pump		
Make	:	Plumettaz,Switzerland
Type	:	TA08-2174/15
Rating	:	1000lpm,1720Pa
Motor		
Make	:	LANDERT
Type	:	112M-2B
Rating	:	3 phase,415V,50Hz 2850 rpm,4.7kW
Insulation	:	Class F

CONVERTOR OIL PUMP

No.	:	2.
Pump		
Make	:	Plumettaz,Switzerland
Type	:	TC10-2185/29
Rating	:	960LPM.3300Pa
Motor		
Make	:	LANDERT
Type	:	112M-2F
Rating	:	3 phase,415V,50Hz 2860 rpm,11kW
Insulation	:	Class F

MAIN COMPRESSOR:

No.	:	2.
Compressor		
Make	:	D&M
Type	:	2A320D C13-T32
Rating	:	1554 lL/min.10Kg/cm^2
Motor		
Make	:	LANDERT
Type	:	200l55-RPAH8B
Rating	:	415V.3phase,50Hz, 15kW,730 rpm
Insulation	:	Class H

Machine room blower

No.	:	2
Blower		
Make	:	FLAKT ABB
Type	:	HCBO-415-60
Rating	:	1 m^3/s, 1390Pa
Motor		
Make	:	LANDERT
Type	:	132M-RFXHE2C
Rating	:	1 phase,415V,50Hz 2830 rpm,2.6kW
Insulation	:	Class F

SCAVANGE BLOWER FOR MR BLOWER

No.	:	2.
Blower		
Make	:	HOWDEN SAFANCO
Type	:	BB 11
Rating	:	0.1 m^3/s, 550Pa
Motor		
Make	:	LANDERT
Type	:	90L24-RE2C
Rating	:	1phase, 415V, 50Hz 2910 rpm,0.75kW
Insulation	:	Class F

AUXILIARY COMPRESSOR:

No.	:	1.
Compressor		
Make	:	D&M Bristol
Type	:	FF 3145
Capacity	:	141.6lt/min,7.03kg/cm^2
Motor		
Make	:	D&M
Rating	:	110VDC,.75kW,1450rpm

Air dryer(1no/loco) provided for compressors

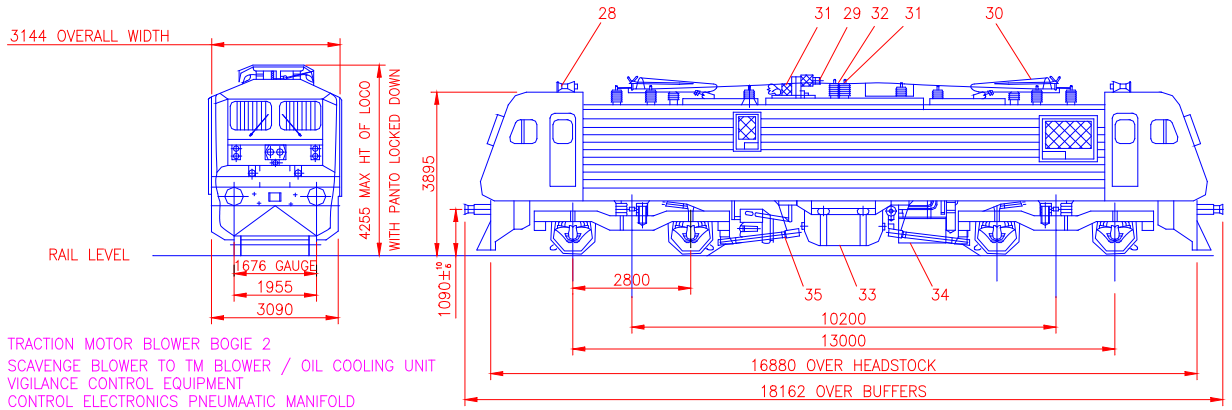
BATTERY

Make	:	SAFT NIFE
Type	:	NiCd(SAF-39 SBL199)
Rating	:	110V,199AH

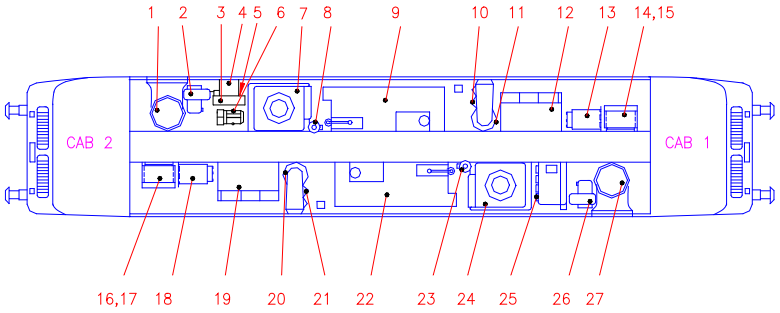
PROTECTIVE DEVICES

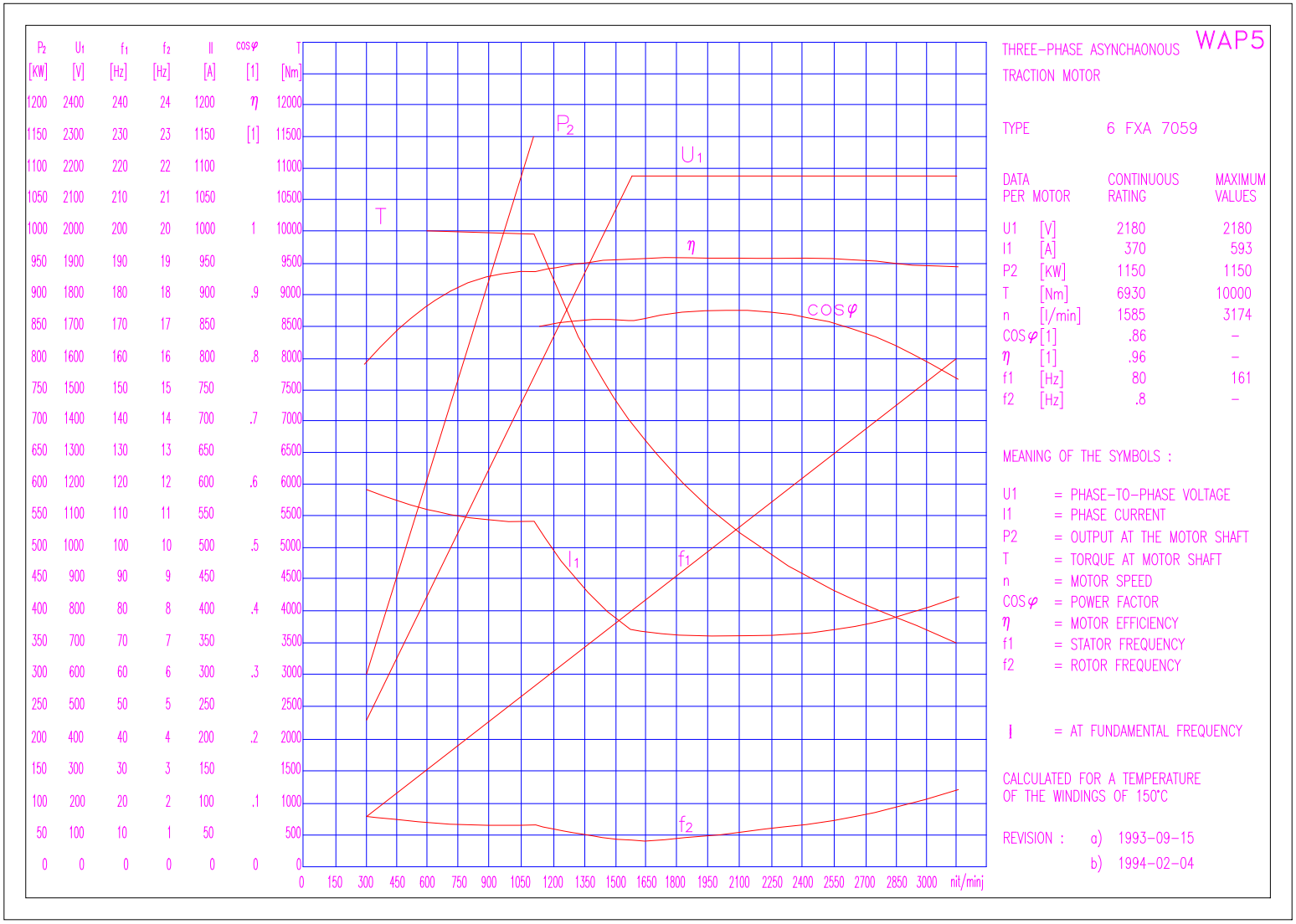
Vigilance control	:	Yes
Slip/Slide control	:	Yes
Main Overload relay	:	Yes
No volt relay	:	Yes
Over voltage protection	:	Yes
Earth fault relay Low	:	Yes

WAP 5



1. TRACTION MOTOR BLOWER BOGIE 2
2. SCAVENGE BLOWER TO TM BLOWER / OIL COOLING UNIT
3. VIGILANCE CONTROL EQUIPMENT
4. CONTROL ELECTRONICS PNEUMAATIC MANIFOLD
5. PNEUMATIC PANEL
6. AUXILIARY COMPRESSOR
7. OIL COOLING UNIT, TRANSFORMER/CONVERTER 1
8. OIL PUMP CONVERTER I
9. TRACTION CONVERTER 1
10. SCAVENGE BLOWER TO MACHINE ROOM BLOWER 1
11. MACHINE ROOM BLOWER 1
12. AUXILIARY CONVERTER BOX 1
13. CUBICLE AUXILIARY CIRCUITS 1
14. CUBICLE CONTROL CIRCUITS 1
15. CENTRAL ELECTRONICS 1 (CEL1)
16. CENTRAL ELECTRONICS 1 (CEL 2)
17. CUBICLE CONTROL CIRCUITS 2
18. CUBICLE AUXILIARY CIRCUITS 2
19. AUXILIARY CONVERTER BOX 2
20. MACHINE ROOM BLOWER 2
21. SCAVENGE BLOWER TO MACHINE ROOM BLOWER 2
22. TRACTION CONVERTER 2
23. OIL PUMP CONVERTER 2
24. OIL COOLING UNIT, TRANSFORMER/CONVERTER 2
25. FLITER CUBICLE
26. SCAVENGE BLOWER TO TM BLOWER/OIL COOLING UNIT 1
27. TRACTION MOTOR BLOWER BOGIE 1
28. PNEUMATIC HORN
29. VACUUM CIRCUIT BREAKER
30. PANTOGRAPH
31. LIGHTENING ARRESTOR
32. HIGH VOLTAGE TRANSFORMER
33. TRANSFORMER
34. BATTERY BOX
35. COMPRESSOR



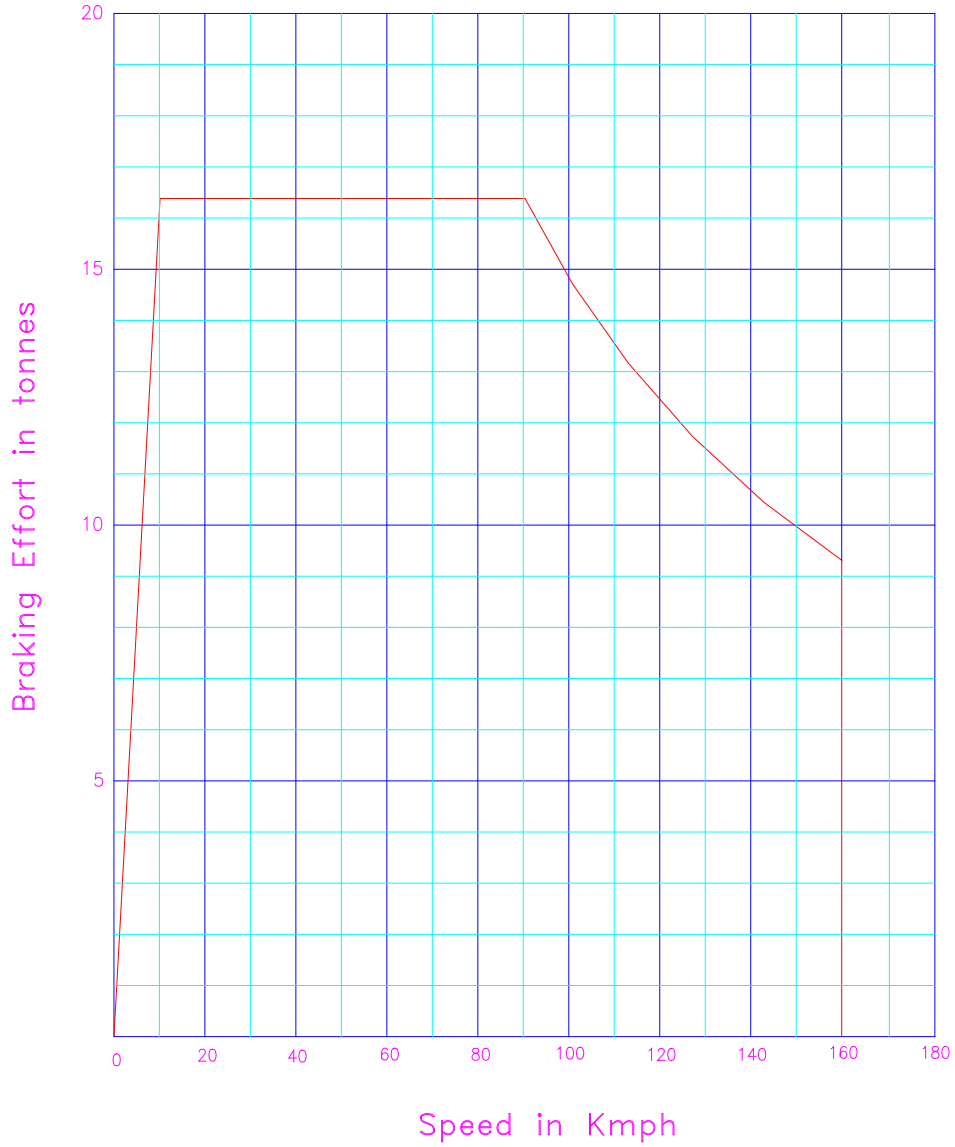

P2 [KW] | U1 [V] | f1 [Hz] | f2 [Hz] | I1 [A] | cosφ [1] | T [Nm]
1200 2400 240 24 1200 η 12000
1150 2300 230 23 1150 [1] 11500
1100 2200 220 22 1100 11000
1050 2100 210 21 1050 10500
1000 2000 200 20 1000 1 10000
950 1900 190 19 950 9500
900 1800 180 18 900 .9 9000
850 1700 170 17 850 8500
800 1600 160 16 800 .8 8000
750 1500 150 15 750 7500
700 1400 140 14 700 .7 7000
650 1300 130 13 650 6500
600 1200 120 12 600 .6 6000
550 1100 110 11 550 5500
500 1000 100 10 500 .5 5000
450 900 90 9 450 4500
400 800 80 8 400 .4 4000
350 700 70 7 350 3500
300 600 60 6 300 .3 3000
250 500 50 5 250 2500
200 400 40 4 200 .2 2000
150 300 30 3 150 1500
100 200 20 2 100 .1 1000
50 100 10 1 50 500
0 0 0 0 0 0 0
P2
U1
T
η
COSφ
I1
f1
f2
0 150 300 450 600 750 900 1050 1200 1350 1500 1650 1800 1950 2100 2250 2400 2550 2700 2850 3000 nit/minj
WAP5
THREE-PHASE ASYNCHAONOUS
TRACTION MOTOR
TYPE 6 FXA 7059
DATA PER MOTOR | CONTINUOUS RATING | MAXIMUM VALUES
U1 [V] 2180 2180
I1 [A] 370 593
P2 [KW] 1150 1150
T [Nm] 6930 10000
n [l/min] 1585 3174
COSφ [1] .86 –
η [1] .96 –
f1 [Hz] 80 161
f2 [Hz] .8 –
MEANING OF THE SYMBOLS :
U1 = PHASE-TO-PHASE VOLTAGE
I1 = PHASE CURRENT
P2 = OUTPUT AT THE MOTOR SHAFT
T = TORQUE AT MOTOR SHAFT
n = MOTOR SPEED
COSφ = POWER FACTOR
η = MOTOR EFFICIENCY
f1 = STATOR FREQUENCY
f2 = ROTOR FREQUENCY
I = AT FUNDAMENTAL FREQUENCY
CALCULATED FOR A TEMPERATURE
OF THE WINDINGS OF 150°C
REVISION : a) 1993-09-15
b) 1994-02-04

WAP 5



TRACTIVE EFFORT – SPEED CURVE OF WAG5 LOCOMOTIVE	Ref:HBTB 490726	Appd:
	RDSO ELEC.DTE.	GEL–1065

WAP 5



BRAKING EFFORT – SPEED CURVE OF WAP5 LOCOMOTIVE	Ref:HBTB 490730	Appd:
	RDSO ELEC.DTE.	GEL–1066

WAP 5

HAULAGE CAPACITY OF 3 PHASE PASSENGER LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.92 T.M. 6FXA-7059

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)															START
			20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL																
		1/500																
		1/200																
		1/150																
		1/100																
		1/50																
	BOGIE WAGONS (BOX)	LEVEL																
		1/500																
		1/200																
		1/150																
		1/100																
		1/50																
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →													1470	1230	ABOVE 1500
		1/500	← ABOVE 1500 →											1470	1250	1065	910	ABOVE 1500
		1/200	← ABOVE 1500 →									1350	1160	995	860	745	645	ABOVE 1500
		1/150	← ABOVE 1500 →								1310	1125	970	840	730	635	550	ABOVE 1500
		1/100	← ABOVE 1500 →					1460	1325	1125	970	840	730	635	555	480	420	ABOVE 1500
		1/50	980	965	955	940	865	780	710	610	525	455	400	345	305	265	230	1010

Dt	
D	
T	
C	

25 KV AC ELECTRIC LOCOMOTIVES (B.G.)



WAG 1

CONT. RAIL P.S. 2900
B-B TYPE WAG 1 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

B–B TYPE WAG1 CLASS ELECTRIC LOCOMOTIVES
(10 LOCOS)
1676 mm Gauge

Forty–two locomotives of this type were ordered on European Group. Five of these were completely assembled in Europe and the remaining were built at C.L.W. with the same traction equipment. The rail horse power of the locomotives is 2895 P.S. at 33 km/hr.

The typical feature of these locomotives is a monomotor bogie. This construction results in substantial. saving in weight in traction equipment and gives better adhesion.

The traction motors are force ventilated and are fully suspended type. These motors are permanently grouped in paralled.

This can be used for a multiple unit operation to a maximum of four locomotives.

Compressed air brake for the loco and vacum brake for the train are provided. In addition, these locomotives have been provided with Regenerative Braking.

A repeat order was placed on Messrs. Group for 20 locomotives in 1963. Eight of these locomotives were completely built in Europe and bogies for the remaining 12 were built at C.L.W./KPA.

PROCUREMENT PARTICULARS

CONTACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
R/229	7.04.61	GROUP	1963	20700–20709	R.D.S.O. EL–104A–59	WAG1 / 1	10	
R/2736/206/63	14.11.63	GROUP	1965	20849–20868	,,	WAG1	20	
R/2294/416/60	07.04.61	C.L.W.	1963	20710–20741	,,	WAG1	32	
R2736/206/63	14.11.63	C.L.W.	1965	20742–20789	,,	WAG1	48	
R/2965/16/64	30.12.64	C.L.W.		20790–20791	,,	WAG1–S	2	

EL ADO/00405 MICRO FILMED 5/87.

MAIN PARTICULARS OF LOCO

WAG 1

GENERAL

SYSTEM OF CURRENT –	A.C.
LINE VOLTAGE –	25000
WEIGHT IN W.O. –	85.2t
ADHESIVE WEIGHT –	85.2t
MAX. AXLE LOAD	21.3t
MIN. AXLE LOAD –	21.3t
1 HR. RATING:–	
R.S. –	2930 PS
T.E.–	24700kg
SPEED –	32kmph
CONTINUOUS RATING–(29th notch)	
P.S. –	2900*
T.E. –	23700kg
SPEED –	33kmph
MAX. T.E. –	30000kg(35% Ad)
MAX. SPEED –	80kmph
WHEEL DIA – NEW	1140 mm
HALF WORN	1102 mm
FULL WORN	1064 mm

BOGIE

DRIVE ARGT –	GEAR & PINION
DESIGN –	Two axle monometer

BRAKES

LOCO –	Air Hand Regen.
TRAIN –	VACCUM

SANDING

NO. OF BOXES –	
CAPACITY EACH –	

CONTROLS – Multiple Unit.

PANTOGRAPH –

NOS –	2
MAKE –	FAIVELEY
TYPE –	AM12

TRANSFORMER

MAKE –		MFO
TYPE –		BOT 3150
NUMBER –		ONE
WT.COMPLETE		10.83t
COOLING		Oil
KVA		3000/4242
TAPS ON H.T.–		32
VOLTS:	H.T.	L.T.
	22.5KV	2x1637
AMPS	H.T.	L.T.
	1.56.7	1295
INSULATION–		

RECTIFIER

MAKE –	SECHERON
TYPE –	A268 (EXCITRON)
NUMBERS–	4
RATING:	
CONTINUOUS 1HR	510A 1250V
INTERMITTENT 1MIN–	

TRACTION MOTORS

MAKE –	ACEC,ALSTHOM,AEG SIEMENS
TYPE –	M.G.1420
NUMBER –	2
INSULATION	CLASS H
SUSPENSION–	FULLY SUSPENDED
VENTILATION –	FORCED AIR
WT. COMPLETE –	5600 kg

1 HR RATING F.F.–
1120KW, 1250V, 960A

CONTINUOUS RATING F.F.–
1080KW, 1250V, 920A, 630RPM

TEMP.RISE(°C) –	ARM	FIELD
(By Resistance)	120	140

COIL RESISTANCE:–

ARMATURE –	0.023
MAIN POLE –	0.024
INTERPOLE –	0.0125

AIR GAP:–

MAIN POLE	6.5 mm
INTERPOLE	5 mm

BUSHES :–

NO. OF HOLDERS –	6
BRUSH PER HOLDER –	3
SIZE (LxWxH) –	44x18x55
MIN. HEIGHT–	24 mm
MOTOR GROUPING:–	
P –	1,2
GEAR RATIO –	1:3.95

AUXILIARIES

HEAD LIGHT –	32 V,250 W
BATTERY –	NI–CD, 72 CELLS. 60AH, (8HR. RATE)
ARNO CONVERTER	
TYPE	AV 5044
RATING	

120 KVA,0.9 PF,380 V,1500 RPM

WEIGHT	800 kg

AUX.GEN. 2.86KW,110V,2700RPM

WEIGHT	110 kg

COMPRESSOR (1 SET):–

MAKE –	OERLIKON
TYPE –	2A–115
CAPACITY –	10001/min, (7KG/CM)
MOTOR –	AC,11HP,380V, 15.5A, 2860RPM

EXHAUSTER (2 SETS) :–

MAKE –	OERLIKON
TYPE –	1A480P+153C4/2
CAPACITY –	3180/6340 1/m
MOTOR –	AC,6/12HP,380V 1460/2860 RPM

T.M.BLOWER (2 SETS):–
CAPACITY– 204m/m,280mmWG
MOTOR – AC,30HP,380V, 2870RPM

AUX.COMP.
CAPACITY– 70 1/m,7kg/cm
MOTOR– 0.8CV,100V,1500RPM

TRANS.OIL PUMP (1SET)
CAPACITY–630 1/m,11mm WG
MOTOR– AC,3.8HP,380V,2865RPM
(10+20 LOCOS GROUP)

TRANS.OIL COOLER BLOWER(1SET)
CAPACITY– 370 m/m
MOTOR– AC,26KW,380V,36A, 1460RPM

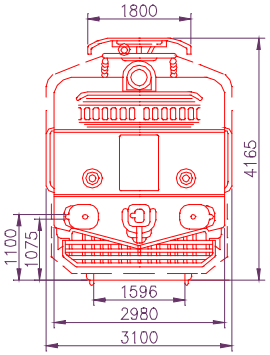
EXCITRON BLOWER (4SETS)
CAPACITY– 56m/m,29mm WG
MOTOR– AC,380V,3.4A,1440RPM

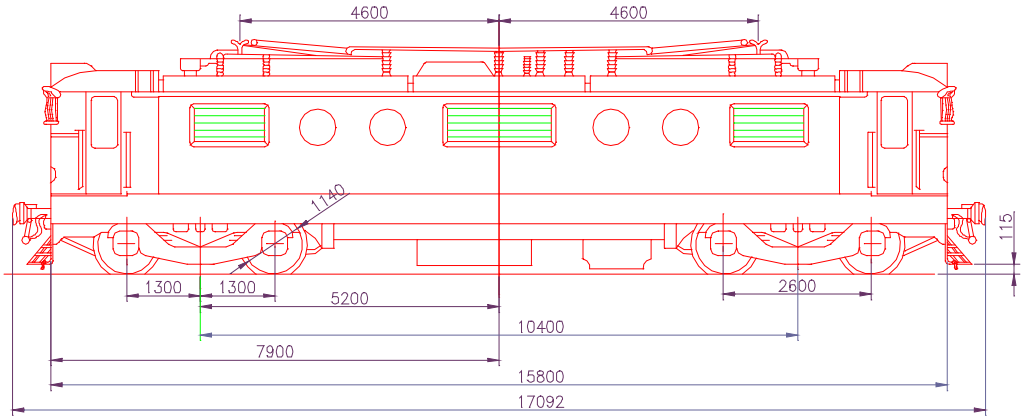
SMOOTHING REACTOR BLOWER
CAPACITY– 75m/m,68mm WG
MOTOR–AC,1.6HP,380V,2850RPM

PROTECTIVE DEVICES

DEADMAN CONTROL–	NO
SLIP CONTROL–	YES
MAIN O/L RELAY–	YES
MOTOR O/L RELAY–	YES
O/V RELAY –	
NO CURRENT RELAY–	NO
EARTH FAULT RELAY –	YES
OVER SPEED TRIP	NO
LOW PR.GOV.–	
VAC.CON.GOV.–	NO
BRAKE CYL C/O VALVE –	
E.A.V. –	

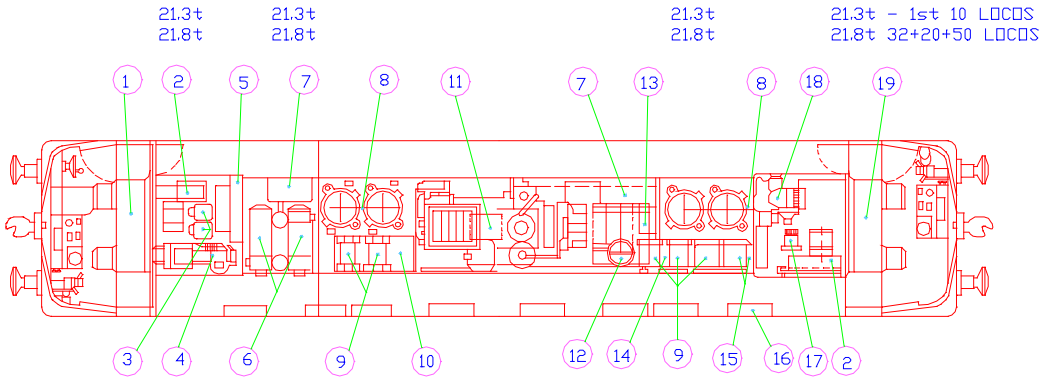
WAG1



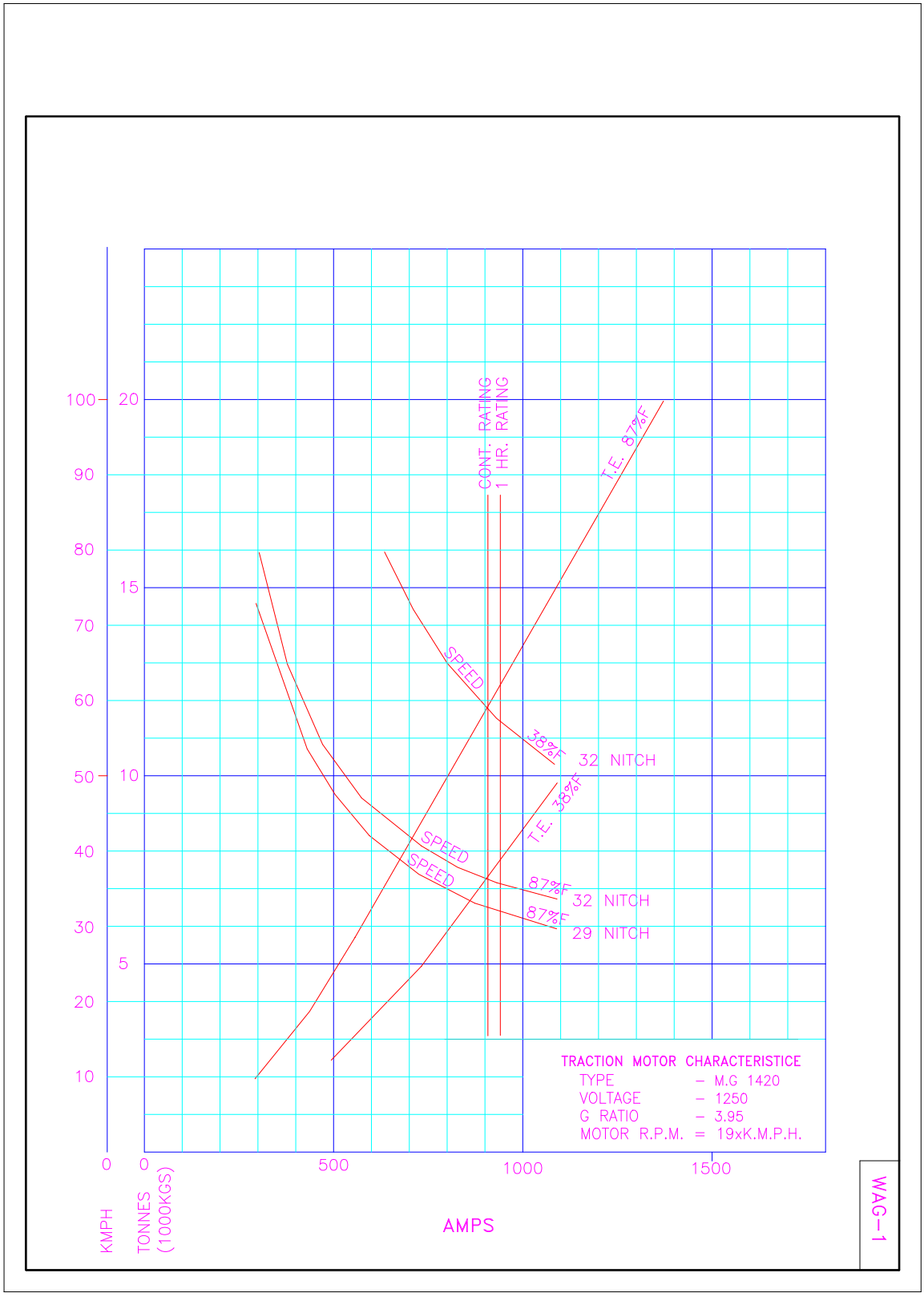


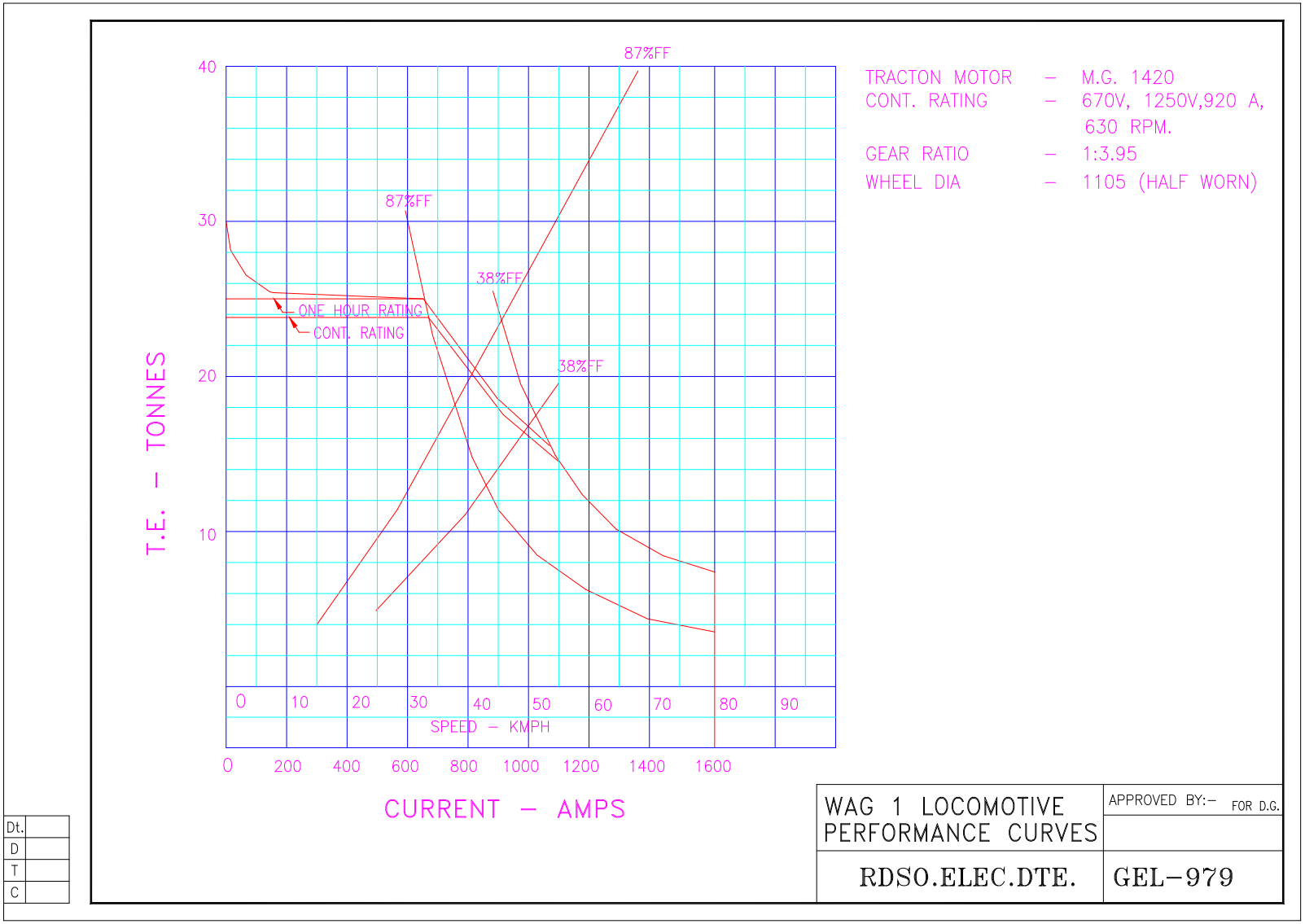
ITEM NO. DESCRIPTION

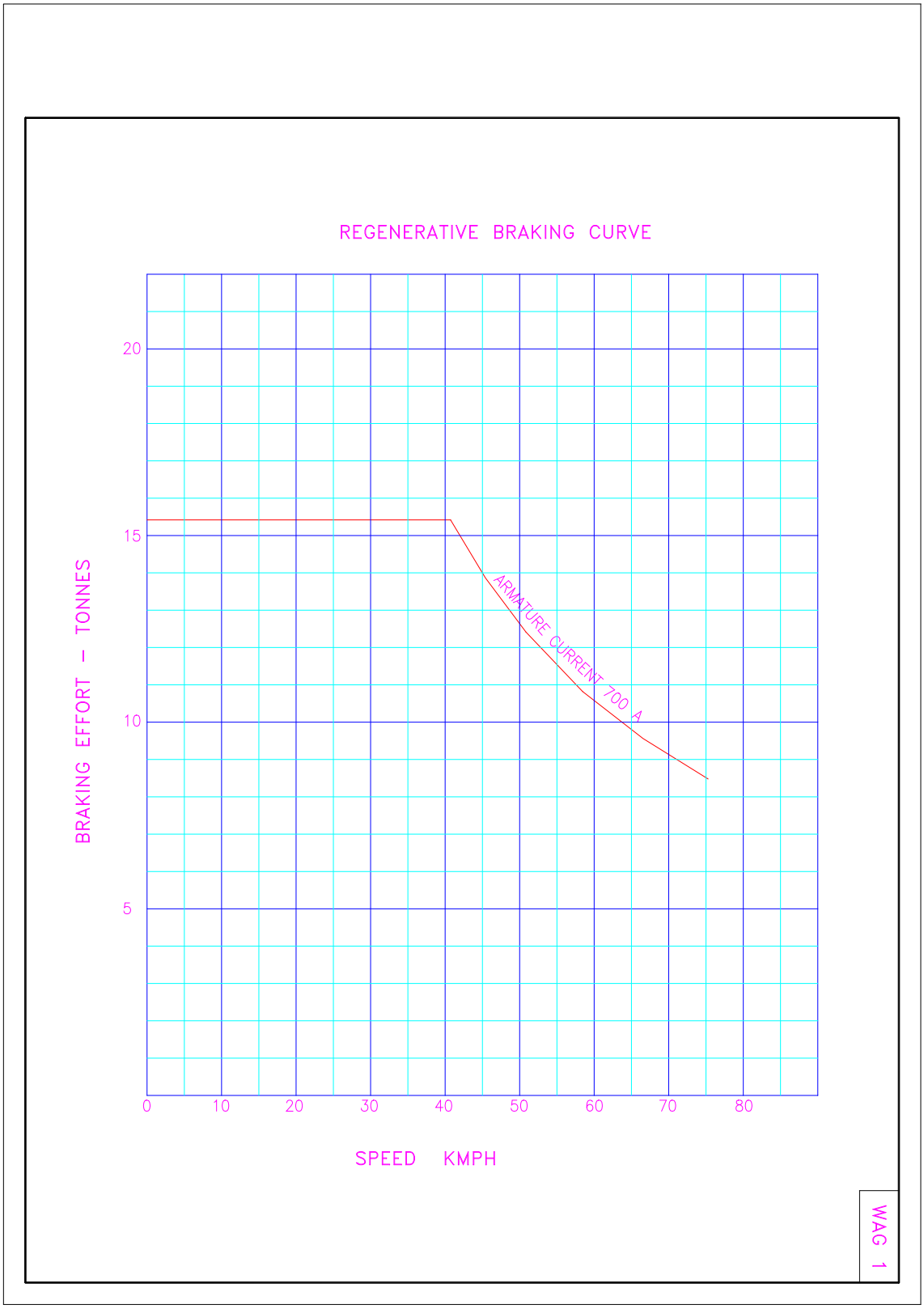
1. CUBICAL CABI
2. T.M. BLOWER
3. INDUCTIVE SHUNTS
4. AIR COMPRESSOR
5. PNEUMATIC EQUIP UNIT
6. EXHAUSTER SET
7. APPARATUS FOR EXCITRONS
8. EXCITRON RECTIFIERS
9. SHUNTING RESISTANCE
10. CONTROL EQUIP UNIT NO 1
11. MAIN TRANSRORMER
12. SMOOTHING REACTOR
13. REGEN BRAKING EQUIP
14. CONTROL EQUIP UNIT NO 2
15. SERVO CONTROLLER
16. AIR FILLTER
17. TRANSDUCTOR
18. ARNO



Dt.	26.06.82
D	---
T	R.C Sharma
C	----


100
90
80
70
60
50
40
30
20
10
0
KMPH
20
15
10
5
0
TONNES (1000KGS)
500
1000
1500
AMPS
CONT. RATING
1 HR. RATING
T.E. 87%F
SPEED
38%F
32 NITCH
T.E. 38%F
SPEED
87%F
32 NITCH
SPEED
87%F
29 NITCH
TRACTION MOTOR CHARACTERISTICE
TYPE – M.G 1420
VOLTAGE – 1250
G RATIO – 3.95
MOTOR R.P.M. = 19xK.M.P.H.
WAG–1


87%FF
40
30
87%FF
38%FF
ONE HOUR RATING
CONT. RATING
20
38%FF
T.E. – TONNES
10
0
10
20
30
40
50
60
70
80
90
SPEED – KMPH
0
200
400
600
800
1000
1200
1400
1600
CURRENT – AMPS
TRACTON MOTOR – M.G. 1420
CONT. RATING – 670V, 1250V,920 A, 630 RPM.
GEAR RATIO – 1:3.95
WHEEL DIA – 1105 (HALF WORN)
WAG 1 LOCOMOTIVE PERFORMANCE CURVES
APPROVED BY:– FOR D.G.
RDSO.ELEC.DTE.
GEL–979
Dt.
D
T
C


REGENERATIVE BRAKING CURVE
BRAKING EFFORT – TONNES
20
15
10
5
0
10
20
30
40
50
60
70
80
SPEED KMPH
ARMATURE CURRENT 700 A
WAG 1

WAG 1

HAULAGE CAPACITY OF WAG 1 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.95 (.....) T.M. MG-1420

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				4300	2740	2000					ABOVE 6000
		1/500	5140	5140	4910	3570	2400	1610	1240					5140
		1/200	2750	2750	2750	2070	1420	975	765					2750
		1/150	2120	2120	2120	1660	1190	800	645					2120
		1/100	1480	1480	1480	1190	820	565	430					1480
		1/50	945	945	820	620	420							945
	BOGIE WAGONS (BOX)	LEVEL	5950	5950	5950	5950	5950	4420	3360					5950
		1/500	4190	4190	4190	4190	3010	2080	1660					4190
		1/200	2890	2890	2890	2300	1620	1135	920					2890
		1/150	2480	2480	2400	1820	1290	910	740					2480
		1/100	1890	1890	1660	1270	890	620	480					1890
		1/50	1030	1020	840	640	440							1105
PASSENGER SERVICE	ICF COACH	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 2

CONT. RAIL P.S. 3180
B-B TYPE WAG 2 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAG2

B–B TYPE WAG2 CLASS ELECTRIC LOCOMOTIVES
1676 mm Gauge

Forty–five of these locos were ordered on Hitachi (Japan) and the first of these has been put into service in 1964. The locos are built for goods traffic operation. The continuous rail horse power is 3260 p.s. at 38 Km/h.

The locomotive is powered by two bogie mounted forced ventilated type DC traction motors permanently grouped in parallel. The speed control is achieved by a HT tan changer provided on the transformer primary.

These locomotives utilise silicon rectifiers for conversion of AC power in to D.C.

Compressed air brake for the loco and vacuum brake for the train are provided. In a addition these locomotives are provided with rheostatic braking also.

The locomotives can be used for multiple operation.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
RE/RS/200	30.03.63	HITACHI	1964–65	20804–20848	EL 104.62	WAG2	45	

CLASS	TYPE	CONTRACT NUMBER	CONTRACT DATE	BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
WAG2	B–B	RE/RS/200	30.03.63	HITACHI	1964–65	20804–20848	EL 104.62	WAG2	45

MAIN PARTICULARS OF LOCO

WAG2

GENERAL

SYSTEM OF CURRENT –	A.C.
LINE VOLTAGE –	25000V
WEIGHT IN W.O. –	85.2t
MAX. AXLE LOAD	21.3t
MIN. AXLE LOAD –	
1 HR. RATING:–	
P.S. –	3.450
T.E.–	27200Kg
SPEED –	34.6Km. ph
CONTINUOUS RATING –	
P.S. –	3.180
T.E. –	22600Kg
SPEED –	38Km ph
MAX. T.E. –	30,000Kg
MAX. SPEED –	80Km.ph(37%Ad)
WHEEL DIA –	NEW 1140mm
	HALF WORN 1102 mm
	FULL WORN 1064 mm

BOGIE

DRIVE ARGT –	GEAR PINION
DESIGN –	2 AXIS MONO–MOTOR FLEXICOIL.

BRAKES

LOCO –	AIR, HAND
TRAIN –	VACCUM

SANDING

NO. OF BOXES –	8
CAPACITY –	50 1 each

CONTROLS – PANTOGRAPH –

NOS –	2
MAKE –	FAIVELEY
TYPE –	AM 12

TRANSFORMER

MAKE –	HITACHI
TYPE & FORM –	AFI–AMOC
NUMBER –	1
WT. COMPLETE –	10000Kg
COOLING –	OIL
KVA –	Pry.3700 Sry.3560 Aux.125. Try 15

TYPE ON H.T.	32
VOLTS :– H.T.	: 22500
L.T.	: 1250(DC)
AMPS :– H.T.	: 164
L.T.	: 2300(DC)
INSULATION –	CLASS A

SILICON RECTIFIER

TYPE–FORM	AEV–4B
CAPACITY	2550Kw
	1250 V
	2040 A
CONNECTION	1–ø bridge
NO. OF CELLS	S P A
	8 9 4
SILICON RECTIFIER CELL	Dj 15L
COOLING	From TM blower set

SILICON MOTORS

MAKE	HITACHI
TYPE & FORM	EFCO–HKK
INSULATION	ARM(F) FIELD(F)
SUSPENSION	Bogie mounted
VENTILATION	(200m^3/s)FORCED
WT. COMPLETE	5300Kg
1 HR. RATING F.F	1270Kw
	1250V,1080A,695r.p.m.
CONTINUOUS RATING F.F.	1200Kw,1250V,1020A,710r.p.m.
TEMP. RISE	Arm. 120°c
	Field 135°c
	Com. 85°c
COIL RESISTANCE (110°C)	
ARMATURE	0.0138 Ω
MAIN POLE	0.0113 Ω
INTER POLE	0.139 Ω
AIR GAP :	
MAIN POLE	7mm
INTER POLE	8mm

BRUSHES :	
NO. OF HOLDERS	8
BRUSHES PER HOLDER	3
SIZE(LXWXH)	40X16X50(mm)
MIN HEIGHT	25 (mm)
MOTOR GROUPING	Parallel
GEAR RATIO	1:3:88

AUXILIARIES

AUXILIARY RECTIFIERS:–	
FOR BATTERY CHARGING :	
Type–form	AEV–4B
CAPACITY –	11Kw,110V,100V
CONNECTION	1 ø Bridge
NO. OF CELLS	1^S X1^P X4
TYPE OF CELL	Dj 15J
FOR BLOWER MOTORS :	
TYPE–FORM	AEV–4B
CAPACITY –	41Kw,200V,205A
CONNECTION	1 ø Bridge
NO OF CELLS	1^S X2^P X4
TYPE OF CELL	Dj 15J
FOR BRAKING CIRCUIT :	
TYPE FORM	AEV–2C
CAPACITY	30KW,49V,670A
CONNECTION	1 ø centre tap
NO OF CELLS	1^S X3^P X2^a
TYPE OF CELLS	DJ 15J
FOR COMPRESSOR & EXHAUTER:	
TYPE FORM	AEV–4B
CAPACITY	47Kw,127V,372A
CONNECTION	1 ø BRIDGE
NO OF CELLS	1^S X5^PX4^a
HEADLI GHTS:	2NOA,32V,350W
BATTERY	Alkaline,72 cells 110V,60AH(7 Hr.rate)
COMPRESSOR:	(1set)
MAKE	SESTINGHOUSE
TYPE	2EC38B
CAPACITY	1135 1/min(7Kb/cm^2)

MOTOR:	9Kw,110V~DC,1500r.p.m.
EXHAUSTERS	2 Sets
MAKE	NORTHEY
TYPE	250R^E
CAPACITY	7001/min(1500r.p.m.)
MOTORS :	13.5/9.5Kw,110V~DC 1500/1000r.p.m.

TRACTION MOTOR BLOWER:

SETS	2
CAPACITY	200 & 170 m /min
MOTORS:	17Kw,200V~DC 100 A,1500r.p.m.

TRANCEFORMAER BLOWER:

SETS	2
CAPACITY	75m^3/min,40mmWG
MOTORS :	1.5Kw,240–V AC,1450 r.p.m.

BRAKING RESISTORS BLOWER:

SETS	4
CAPACITY	250m^3/min,35mm WG
MOTORS	5Kw,240 V AC,1470 r.p.m.

TRANS. OIL PUMP MOTOR:
1–ø,240v,2,2Kw,1450r.p.m.

SMOOTHING REACTOR FOR TM

TYPE & FORM:	DRY OPEN
INSULATION :	Class HT
RATING	9 mH,1020A

COOLING: FORM TM BLOWER

SMOOTHING REACTOR FOR COMPRESSOR & EXHAUSTERS

TYPE & FORM :	D–FXQ
INSULATION:	CLASS H
RATING	2.1 mH,230 A
COOLING	FROM TM BLOWER

O limited to 30 due to bridges.

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WAG2	B–B	RE/RS/200	30.3.63	HITACHI	1964–65	20804–20848	EL–104.62	WAG2	45

MAIN PARTICULARS OF LOCO

WAG2

GENERAL

SYSTEM OF CURRENT – A.C.
LINE VOLTAGE – 25000V
WEIGHT IN W.O. – 85.2t
MAX. AXLE LOAD 21.3t
MIN. AXLE LOAD –
1 HR. RATING:–
P.S. – 3450
T.E.– 27200kg
SPEED – 34.2kmph
CONTINUOUS RATING –
P.S. – 3180*
T.E. – 22600kg
SPEED – 38kmph
MAX. T.E. – 30000kg
MAX. SPEED – 80kmph(37%Ad)
WHEEL DIA(NEW)– 1140 mm
BOGIE HALF WORN 1102 mm
FULL WORN 1064 mm
DRIVE ARGT – GEAR PINION
DESIGN – 2AXLE MONO
MOTOR FLEXICOIL

BRAKES

LOCO – AIR, HANDRHEOSTATIC
TRAIN – VACUUM

SANDING

NO. OF BOXES – 8
CAPACITY – 50 l.each

CONTROLS –

PANTOGRAPH –

NOS – 2
MAKE – FAIVELEY
TYPE – AM12

TRANSFORMER

MAKE – HITACHI
TYPE – AFI–AMCC
NUMBER – 1
WT.COMPLETE– 10000kg
COOLING– OIL
KVA Pry.3700,Sry.3560 Aug.125;Try.15
TAPS ON H.T.– 32
VOLTS:– H.T. 22500, L.T. 1250(DC)
AMPS:– H.T. 164, L.T. 2300(DC)
INSULATION:– CLASS A

SILICONE RECTIFIER

Type–Form AEV–4B
Capacity 2550 Kw, 1250 V, 2040 A
CONNECTION 10 bridge
NO.OF CELLS S 8, P 9, A 4
SILICON RECTIFIER CELL DJ 15L
COOLING From TM blower set

TRACTION MOTORS

MAKE– HITACHI
TYPE AND FORM EFCO–HKK
NUMBER– 2
INSULATION– ARM(F) FIELD (F)
SUSPENSION– Bogie mounted
VENTILATION– (200m^3/S)FORCED
WT. COMPLETE– 5300kg
1 HR RATING F.F.– 1270 Kw 1250V,1080A,695rpm
CONTINUOUS RATING F.F.– 1200 Kw,1250V,1020A,710rpm
TEMP. RISE – (By Resistance) ARM 120°C, FIELD 135°C, Comm. 85°C
COIL RESISTANCE:–(110°C)
ARMATURE – 0.01380 ohm
MAIN POLE – 0.0113 ohm
INTERPOLE – 0.0098 ohm
AIR GAP:–
MAIN POLE 7 mm
INTERPOLE 8 mm

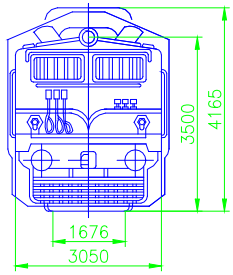
BRUSHES :–

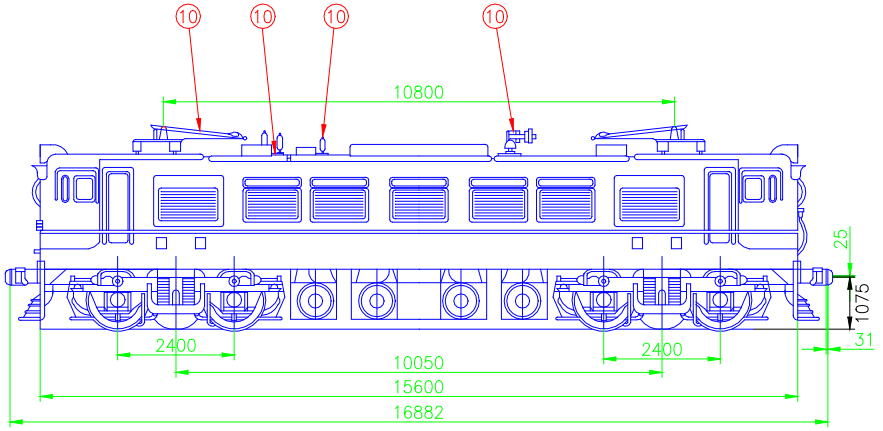
NO. OF HOLDERS – 8
BRUSH PER HOLDER – 3
SIZE (LxWxH) – 40x16x50(mm)
MIN. HEIGHT– 25(mm)
MOTOR GROUPING Parallel
GEAR RATIO – 1:3.88

AUXILIARIED

AUXILIARY RECTIFIERS:
FOR BATTERY CHARGING:
Type–form AEV–4B
CAPACITY 11Kw,110V,100A
CONNECTION 1–øBridge
NO.OF CELLS 1xLPx4a
Type of cell DJ 15L
FOR BLOWER MOTORS:–
TYPE–FORM AEV–4B
CAPACITY 41Kw,200V,205A
CONNECTION 1–øBridge
NO.OF CELLS 1xLPx4a
Type of cell DJ15L
FOR BRAKING CIRCUIT:
TYPE–FORM AEV–2C
CAPACITY 30Kw,45V,670A
CONNECTION 1–øcentre tap
NO.OF CELLS 1x3px2a
Type of cell DJ 15J
FOR COMPRESSOR & EXHAUSTER:
Type–form AEV–1B
CAPACITY 47Kw,127V,372A
CONNECTION 1–øBRIDGE
NO.OF CELLS 1x5px4a
HEADLIGHTS: 2Nos.32V,350W
BATTERY Alkaline, 72 Cells 110V,60AH(7Hr.rate)
COMPRESSOR (1set):–
MAKE – WESTINGHOUSE
TYPE – 2EC38B
CAPACITY– 11351/min.(7kg/cm^2)
MOTOR – 9Kw,110VDC,1500rpm 380V,15.5A,2860RPM
EXHAUSTER (2sets) :–
MAKE NORTHEY
TYPE – 250 RE
CAPACITY – 7001/min(1500rpm)
MOTORS– 13.5/9.5 Kw,110V DC, 1500/1000rpm
TRACTION MOTOR BLOWERS:
SETS 2
CAPACITY 200&170m^3/min.
MOTORS 17Kw,200V DC,100A 1500rpm
TRANSFORMER BLOWERS:–
SETS 2
CAPACITY 75m^3/min,40mmWO
MOTORS: 1.5Kw,240–V AC,1450rpm
BREAKING RESISTORS BLOWERS
SETS 4
CAPACITY 250m^3/min.35mmWG
MOTORS 5Kw,240VAC,1470rpm
TRANS.OIL PUMP MOTOR
1–ø,240V,2.2Kw,1450rpm
SMOOTHING REACTOR FOR TM TYPE & FORM: DRY OPEN CORE
INSULATION: Class H
RATING: 9mH,1020A
COOLING: FROM TM BLOWER
SMOOTHING REACTOR FOR COMPRESSOR & EXHAUSTERS
TYPE & FORM D–FXQ
INSULATION: Class H
RATING: 2.1mH, 230A
COOLING: FROM TM BLOWER
@Limited to 30t due to bridges

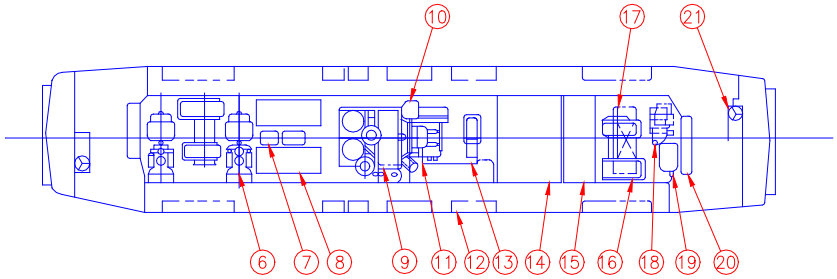
WAG2



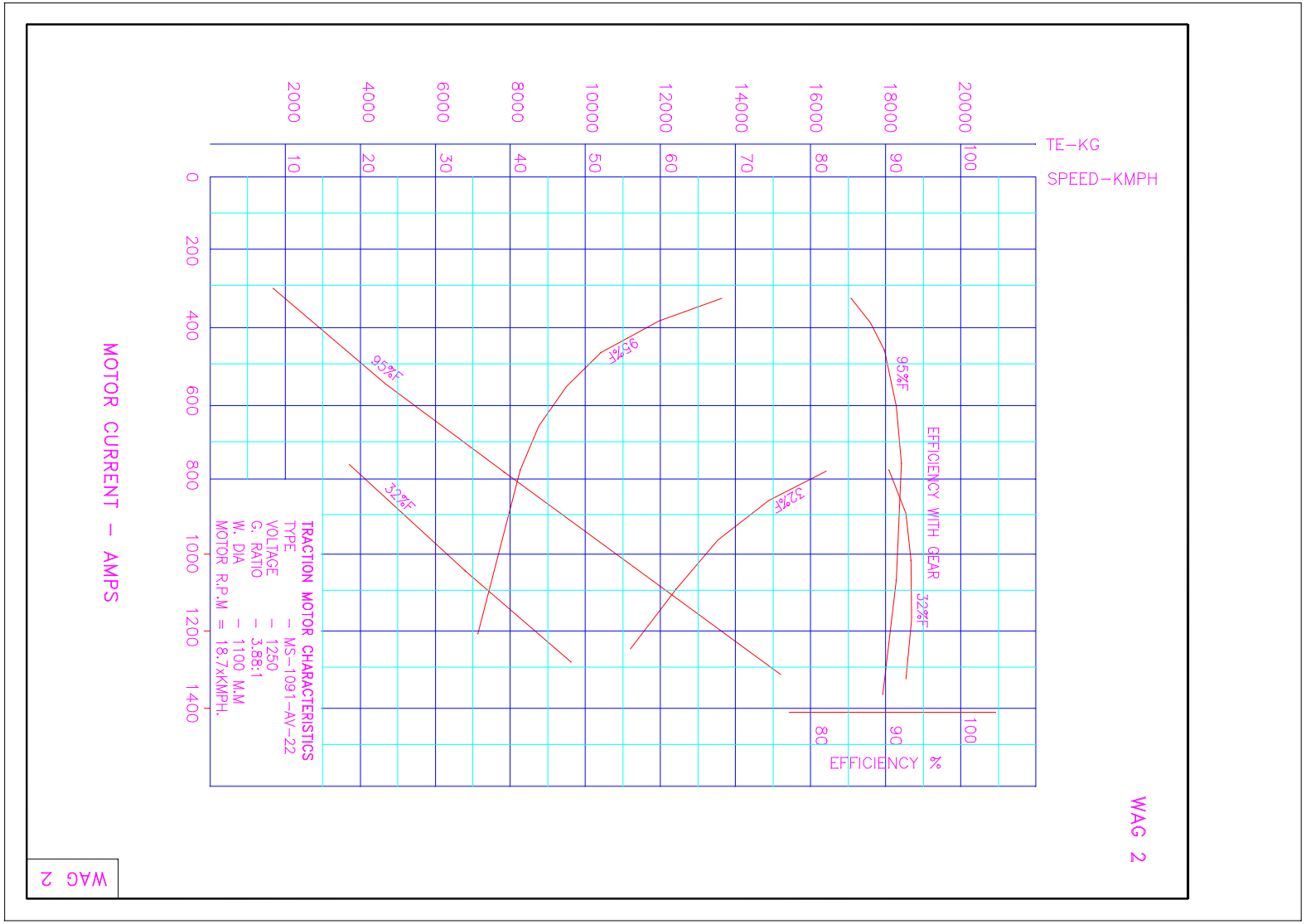


ITEM NO. DESCRIPTION

1. PANTOGRAPH.
2. EARTHING SWITCH.
3. MAIN TRANSFORMER BUSHING.
4. CIRCUIT BREAKER.
5. RESISTOR FOR DYNAMIC BRAKE.
6. EXHAUSTER.
7. AUXILIARY SMOOTHING REACTOR.
8. SILICON RECTIFIER.
9. MAIN TRANSFORMER.
10. TRANSFORMER FOR BRAKING CIRCUIT.
11. TAP CHANGER.
12. BATTERY.
13. INDUCTIVE SHUNT.
14. CONTROL BLOCK.
15. MAIN SMOOTHING REACTOR BLOCK.
16. BLOWER FOR T.M.
17. RESISTOR.
18. AIR COMPRESSOR.
19. CONTROL RESERVOIR.
20. CONTROL CABINET.
21. MASTER CONTROLLER.

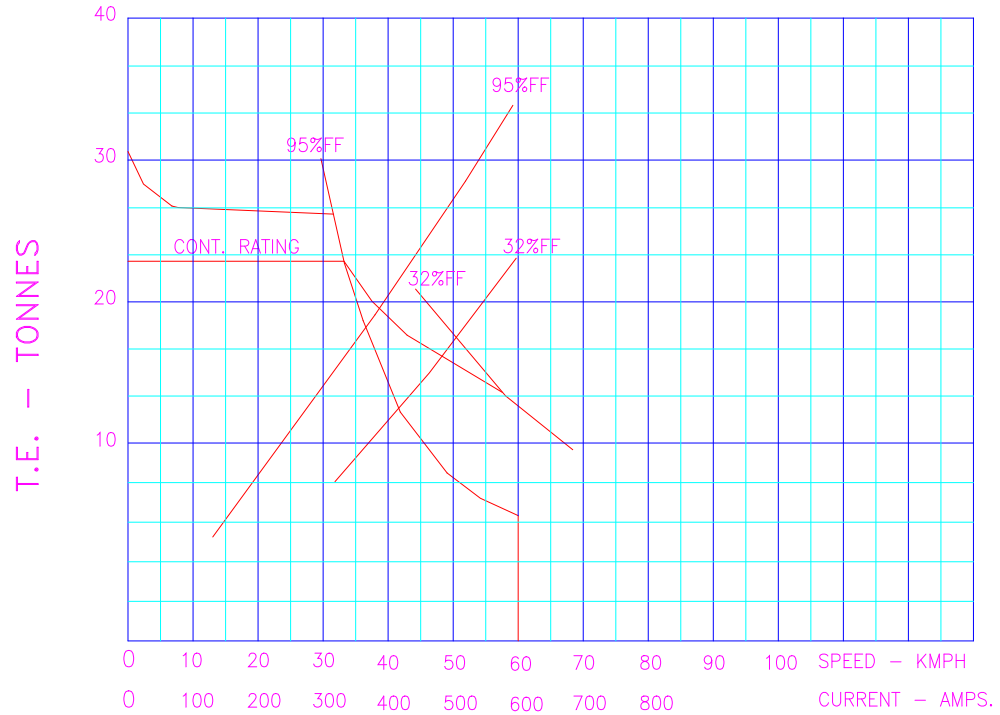


Dt.	26.06.82
D	---
T	R.C Sharma
C	----


TE–KG
SPEED–KMPH
MOTOR CURRENT – AMPS
EFFICIENCY %
EFFICIENCY WITH GEAR
95%F
32%F
95%F
32%F
95%F
32%F
TRACTION MOTOR CHARACTERISTICS
TYPE – MS–1091–AV–22
VOLTAGE – 1250
G. RATIO – 3.88:1
W. DIA – 1100 M.M
MOTOR R.P.M = 18.7xKMPH.
WAG 2
WAG 2

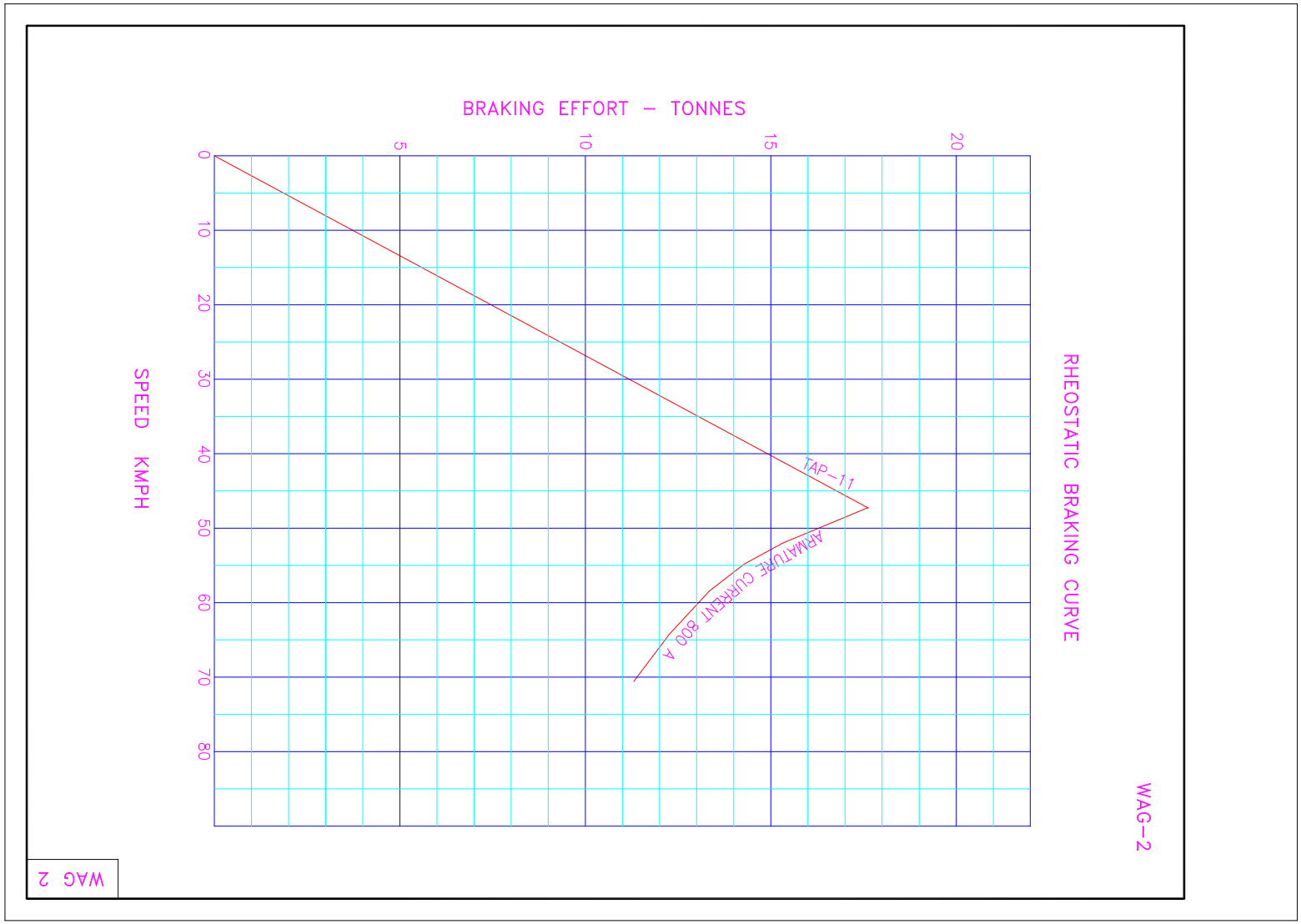
TRACTON MOTOR – M.G. 1420
CONT. RATING – 1280V, 1020V,710 RPM.

GEAR RATIO – 3.88:1
WHEEL DIA – 1100 mm. (HALF WORN)



Dt.	
D	
T	
C	

WAG 2 LOCOMOTIVE PERFORMANCE CURVES	APPROVED BY:– FOR D.G.
RDSO.ELEC.DTE.	GEL–480


BRAKING EFFORT – TONNES
5
10
15
20
0
10
20
30
40
50
60
70
80
SPEED KMPH
TAP–11
ARMATURE CURRENT 800 A
RHEOSTATIC BRAKING CURVE
WAG–2
WAG 2

WAG 2

HAULAGE CAPACITY OF WAG 2 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:3.88 (.....) T.M. EFCO–HKK

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5600	4080	2650					ABOVE 6000
		1/500	5720	5720	5400	4020	3140	2410	1640					5720
		1/200	3010	3010	3010	2340	1870	1480	1030					3010
		1/150	2350	2350	2350	1890	1530	1220	855					2350
		1/100	1620	1620	1620	1350	1090	875	615					1620
		1/50	960	950	705	705	575	460	315					1010
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						4450					ABOVE 6000
		1/500	4475	4475	4475	4475	3930	3120	2200					4475
		1/200	3070	3070	3070	2600	2130	1720	1235					3070
		1/150	2630	2630	2630	2070	1700	1380	995					2630
		1/100	1950	1930	1850.	1430	1180	960	685					2020
		1/50	985	975	940	730	600	480	330					1175
PASSENGER SERVICE	ICF COACH	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 3

CONT. RAIL P.S. 3150
B-B TYPE WAG 3 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAG3

B–B TYPE WAG3 CLASS ELECTRIC LOCOMOTIVES

1676 mm Gauge

Ten locomotive of this type were ordered on European Group. All these locomotives have been assembled in Europe. First locomotive was put in service in July 1965. The rail horse power of the locomotives is 3150 P.S. at 36.5 km/hr.

The typical feature of these locomotives is a monomotor bogie. This construction results in substantial saving in weight in traction equipment and gives better adhesion.

These locomotives utilise silicon rectifiers for conversion of A.C. power into D.C.

The traction motors are force ventilated and are fully suspended type. These motors are permanently grouped in parallel.

This can be used for a multiple unit operation to a maximum of four locomotives.

Compressed air brake for the loco and vacuum brake for the train are provided. In addition, these locomotives have been provided with rheostatic braking.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
R/ 2736/206/63	14.11.63	GROUP (EUROPEAN)	1965	20869–20678	R.D.S.O. EL.104.62	WAG 3	10	

MAIN PARTICULARS OF WAG3 LOCO

WAG3

GERNERAL

SYTEM OF CURRENT	a.c.
LINE VOLTAGE	25000V
WEIGHT IN W.O.	87.32t
MAX. AXLE LOAD	21.83t
MIN. AXLE LOAD	
1 HR. RATING	
P.S.	3590
T.E.	27100Kg
SPEED	35.8Km/h
CONTINUOUS RATING	
P.S.	3150
T.E.	23200Kg
SPEED	36.5Km/h
MAX.T.E.	30000Kg(34.4% Adh)
MAX.SPEED	80 Km/h
WHEEL DIA NEW	1140 mm
HALF WORN	1102 mm
FULL WORN	1064 mm

BOGIE

DRIVE ARGT.	GEAR PINION
DESIGN	2 AXLE MONOMOTOR

BRAKES

LOCO	AIR, HAND, RHEOSTATIC
	VACUUM

SANDING

NO. OF BOXES	8
CAPACITY	50.1 each

CONTROLS

MULTIPLE

PANTOGRAPH

NOS.	2
MAKE	FAIVELEY
TYPE	AM12

TRANSFORMER

MALE	OERLIKON
TYPE & FORM BOT	3460
NUMBER	1
WG COMPLETE	11500Kg
COOLING	OIL
KVA PRY. 3640 SRY	3460
AUX. 170 TRY.	10
TAPS OF H.T. :	32
L.T. :	1270 (DC)
AMPS : H.T. :	162
L.T. :	2000(DC)
INSULATION	CLASS A

SILICON RECTIFIER

NUMBER	2
TYPE & FORM	GL–82220/ 2000–1750W
CAPACITY	1270KW,1270V 1000 A
CONNECTION	1–ø bridge
NO OF CELLS	S P A 5 5 4
WEIGHT	650Kg
SILICON RECTIFIER CELL	L0570

TRACTION MOTORS

MAKE	AGEC
TYPE & FORM	1580 A1
NUMBER	2
INSULATION	ARM(H) FIELD(H)
SUSPENSION	Bogie Mounted
VENTILATION (244.5m /min)	FORCED
WT. COMPLETE	5850 Kg
1 HR. RATING F.F.	1270V,1040A,680 RPM
CONTINUOUS RATING F.F.	1270V,1000A,690 RPM

COIL RESISTANCE (110°C)

ARMATURE	0.0191 ohm
MAIN POLE	0.0224 ohm
INTER POLE	0.0102
AIR GAP	
MAIN POLE	8 mm
INTER POLE	5 mm
BRUSHES:	
GRADE	EG 97 B
NO OF HOLDERS	6
BRUSHES PER HOLDER	3
SIZE(LxWxH)	44x(2x19)x55 mm
MIN. WEIGHT	24 mm
MOTOR GROUPING	Parallel
GEAR RATIO	1:3.95

AUXILIARIES

BATTERY CHARGING DEVICE

TYPE	VBE 86,4/18 ar
PRI. RATING	368V ± 25% 50 c/s ± 5%
SEC. TATING	
a) IU CHARACTERISTIC	105V ± 1%
AT I–O.. 18A	DC adj. 100 & 110 ± 1%
b) R CHARACTERISTIC	I=9A : I=18A 129 V : 1CR V

AUX. TECTIFIER

TYPE	GL–B490/440–1750 W–1
CONT. CURRENT	1750 A
RATED VOLTAGE	130 RMS
MAX. STARTING CURRENT	2100 A/5 sec
CONNECTION	1– ø bridge
TYPE OF CELL	L 0570
CELL ARRANGEMENT	S P A 1 5 4

HEADLIGHTS:

NUMBER	2
RATING	32 V 350 W

BATTERY:

TYPE	KC 159 HG ALKALINE
CAPACITY	60 AH(10 Hr. RATE) 72 CELLS 110V

MAIN COMPRESSOR :

NUMBER	1
MOTOR	8.1 Kw 115V 2850 RPM
COMPRESSOR:	TYPE 2A 115
	CAPACITY 1000 1/min
	PRESSURE 9 Kg/cm^2
	WEIGHT 350 Kg
AUX. COPRESSOR :	NUMBER
MOTOR	450W,72V,1150 RPM
COMPRESSOR:	
CAPACITY	55 1/min
PRESSURE	5.5 atg
WT.OF COMPLETE SET	26 KG

EXHAUSTER:

NUMBER	2
MOTOR	115V 11.2KW/5.52KW 2930/1460 RPM
EXHAUSTER : TYPE	1A 720 P
CAPACITY	7520/3760 1/min
WEIGHT	230 Kg

TRACTION MOTOR BLOWER SET

NUMBER	2
MOTOR	cv 393a,18.4KW,110V 2900 RPM,235 Kg
BLOWER : TYPE	VBTZ 36
CAPACITY	3.4 m^3/min 2900 RPM
PRESSURE	290 mm WG
WEIGHT	65 Kg

SMOOTHING REACTOR BLOWER SET:

NUMBER	1
MOTOR	CV226,1.25 Kw,110V 2900 RPM, 54Kg
BLOWER	VHRZ 40
CAPACITY	1.25 m^3/min
PRESSURE	68 mm WG

BRAKING RESISTANCE BLOWER SET:

NUMBER	2
MOTOR	VR 13a, 15 KW, 95 V 5000 RPM
BLOWER : TYPE	VM 50 Z
CAPACITY	5.25 m^3/min,5000 RPM

OIL COOLER BLOWER SET:

NUMBER	1
MOTOR	G 257 Sond,10KW,110V 2200 RPM, 140 Kg
BLOWER	TYPE Ra 56–1/560/25
CAPACITY	370m^3/min,2200 RPM
	S.Pressure: 85 MM/WG
	D.Pressure: 34 mm/WG
WEIGHT	280 KG

SILICON RECTIFIER BLOWER SET:

NUMBER	4
MOTOR	aPR 426–2F,680W,368V 2820 RPM,23.55Kg
BLOWER	TYPE : a DEEV 35/Z 021
CAPACITY	51 m^3/min
S.PRESSURE	41 mm WG
D.PRESSURE	6 mm WG
WEIGHT	60 Kg

OIL PUMP FOR TRANSFORMER

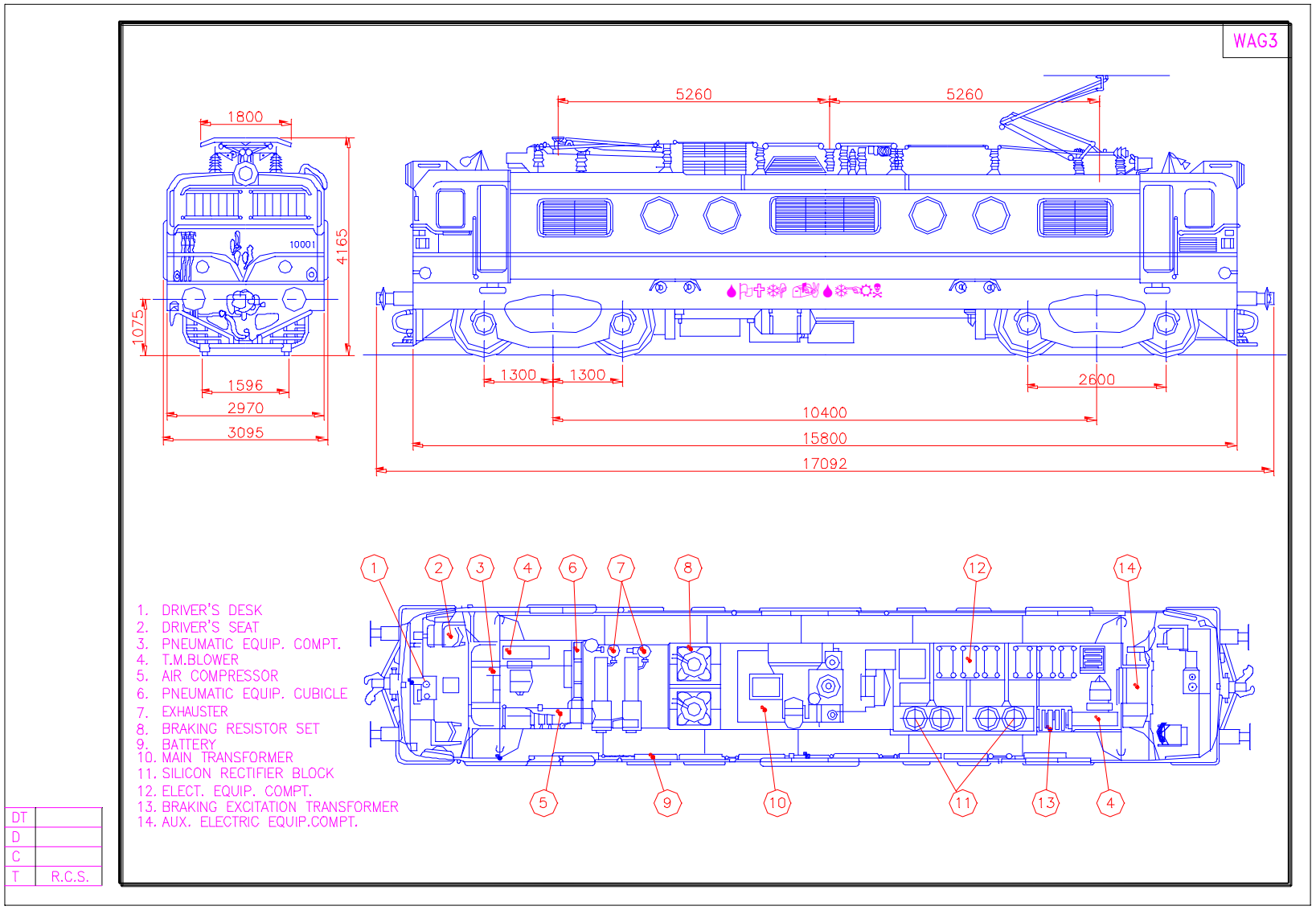
NUMBER	1
MOTOR	145f_2 ,2.28Kw,368 V, 2865 RPM, 70 Kg
PUMP:	
CAPACITY	630 1/min
PRESSURE	11 m oil

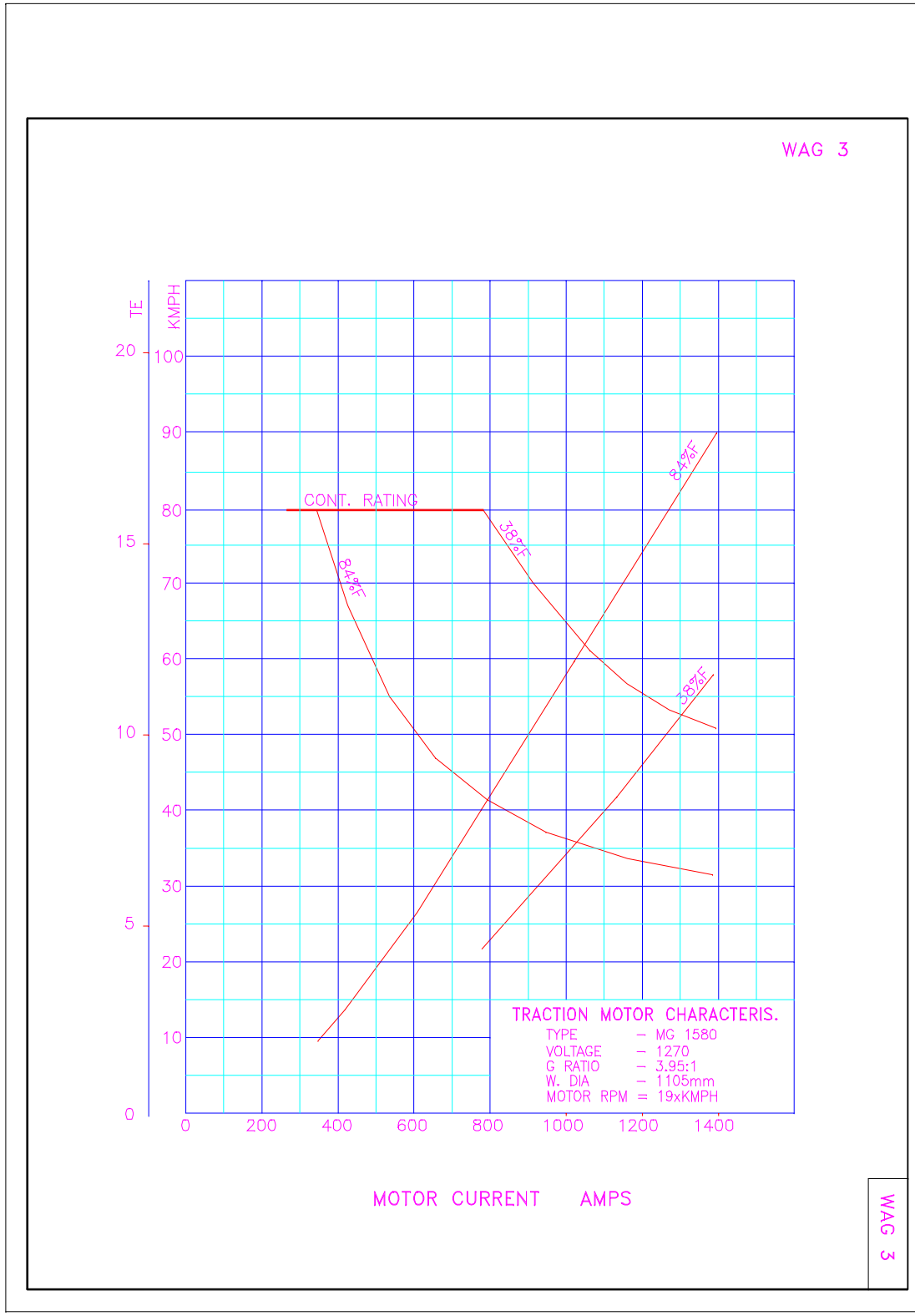
SMOOTHING REACTOR FOR TRACTION MOTOR:

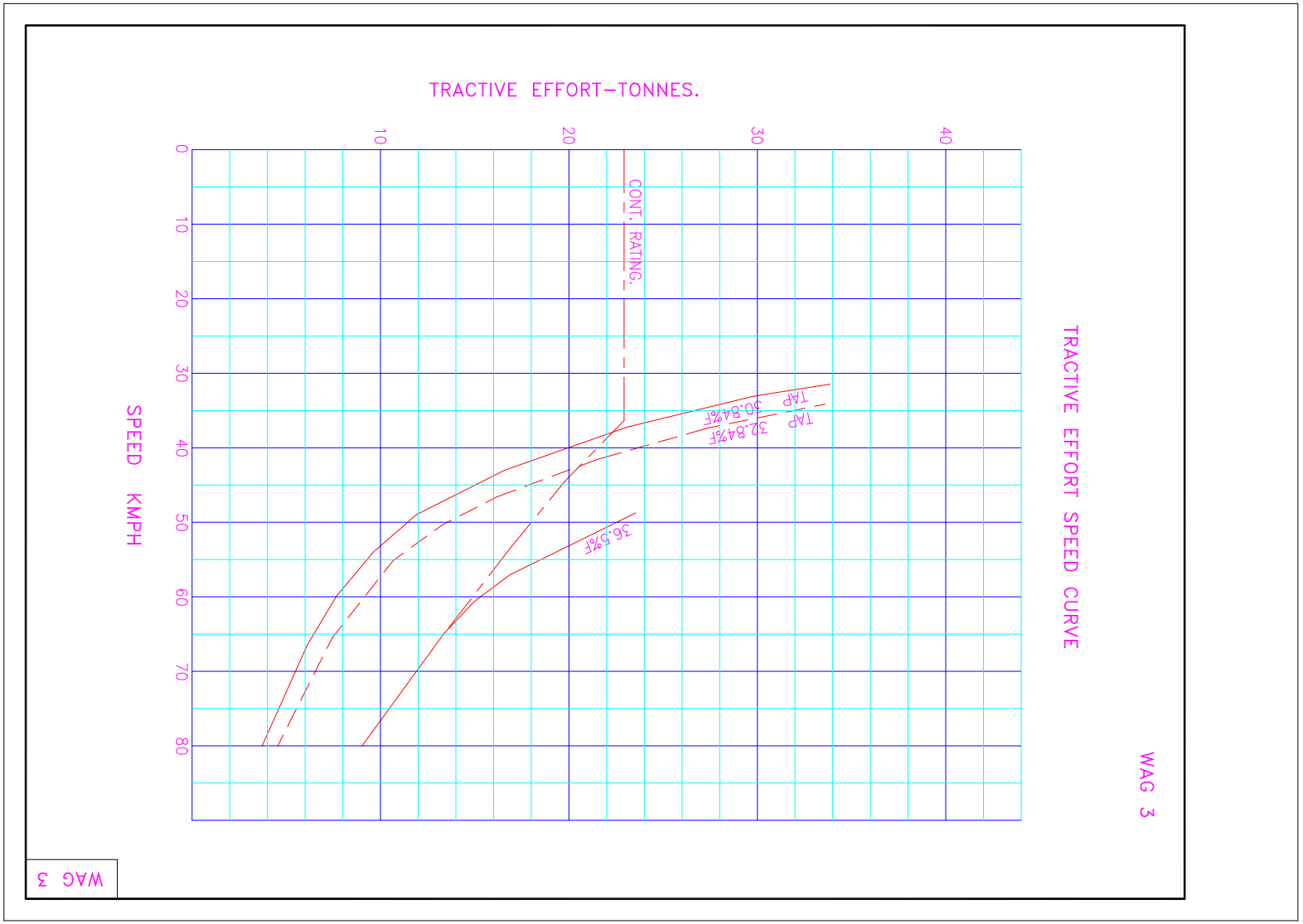
TYPE	SL 42
RATING	1250 V, 950 A
RESISTANCE AT 110°C:	0.00718 ohm
REACTANCE :	5.37 mH

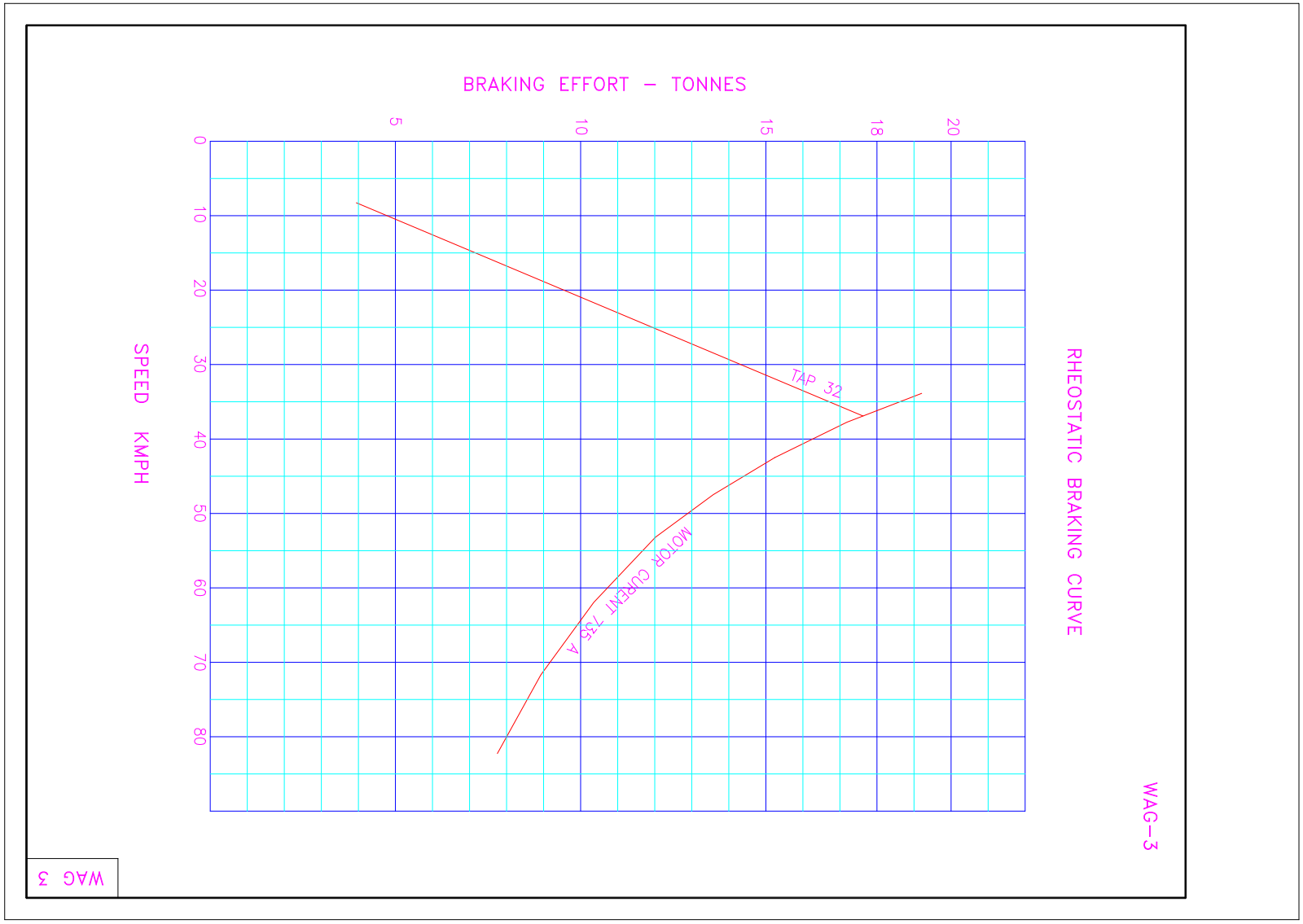
PROTECTIVE DEVICES:

DEAD MAN CONTROL	NO
WHEEL SLIP	YES
MAIN O/L RELAY	YES
MOTOR O/L RELAY	YES
MOTOR O/L RELAY	YES
OVER VOLTAGE RELAY	YES
NO VOLT RELAY	YES
EARTH FAULT RELAY(P)	YES
EARTH FAULT RELAY(A)	YES
OVER TEMP. RELAY(REC.)	YES
OVER TEMP. RELAY(TRA.)	YES
MULTIPLE OPERATION	4 UNITS


WAG3
1800
4165
1075
1596
2970
3095
10001
5260
5260
1300
1300
2600
10400
15800
17092
1. DRIVER'S DESK
2. DRIVER'S SEAT
3. PNEUMATIC EQUIP. COMPT.
4. T.M.BLOWER
5. AIR COMPRESSOR
6. PNEUMATIC EQUIP. CUBICLE
7. EXHAUSTER
8. BRAKING RESISTOR SET
9. BATTERY
10. MAIN TRANSFORMER
11. SILICON RECTIFIER BLOCK
12. ELECT. EQUIP. COMPT.
13. BRAKING EXCITATION TRANSFORMER
14. AUX. ELECTRIC EQUIP.COMPT.
DT
D
C
T
R.C.S.


WAG 3
TE
KMPH
20
100
90
15
80
70
10
60
50
40
5
30
20
10
0
0
200
400
600
800
1000
1200
1400
CONT. RATING
84%F
38%F
84%F
38%F
TRACTION MOTOR CHARACTERIS.
TYPE – MG 1580
VOLTAGE – 1270
G RATIO – 3.95:1
W. DIA – 1105mm
MOTOR RPM = 19xKMPH
MOTOR CURRENT AMPS
WAG 3


TRACTIVE EFFORT—TONNES.
10
20
30
40
0
10
20
30
40
50
60
70
80
CONT. RATING.
TAP
30.84%F
TAP
25.84%F
36.5%F
SPEED KMPH
TRACTIVE EFFORT SPEED CURVE
WAG 3
WAG 3


BRAKING EFFORT – TONNES
5
10
15
18
20
0
10
20
30
40
50
60
70
80
SPEED KMPH
TAP 35
MOTOR CURENT 735 A
RHEOSTATIC BRAKING CURVE
WAG–3
WAG 3

WAG 3

HAULAGE CAPACITY OF WAG 3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.95 (.....) T.M. MB-1580A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5350	2780	2530					ABOVE 6000
		1/500	5140	5140	5140	4200	3080	2230	1570					5140
		1/200	2750	2750	2750	2240	1770	1360	980					2750
		1/150	2120	2120	2120	1820	1450	1120	815					2120
		1/100	1480	1480	1480	1300	1040	800	580					1480
		1/50	945	945	890	700								945
	BOGIE WAGONS (BOX)	LEVEL	5950	5950	5950	5950	5950	5950	4240					5950
		1/500	4190	4190	4190	4190	3850	2880	2100					4190
		1/200	2890	2890	2890	2500	2020	1750	1170					2890
		1/150	2480	2480	2480	2000	1610	1270	945					2480
		1/100	1890	1890	1790	1380	1110	880	650					1890
		1/50	1015	1010	920	720								1105
PASSENGER SERVICE	ICF COACH	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												

Dt	21.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 4

CONT. RAIL P.S. 3150
B-B TYPE WAG 4 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAG4

B–B TYPE WAG4 CLASS ELECTRIC LOCOMOTIVE

1676 mm Gauge

Major equipments for first fifty six locomotives of type were procured from Europeac Group. Auxiliary machines and some control equipments have been procured from indigenous sources. All these locomotives are being built by C.L.W. The rail horse–power of the locomotives is 3150 at 36.5 km/h.

The typical feature of these locomotives is a monomotor bogie. This construction results in substantial saving in weight in traction equipment and gives better adhesion.

These locomotives utilise silicon rectifiers for conversion of A.C. power into D.C.

The traction motors are force ventilated and are fully suspended type. These motors are permanently grouped in parallel.

This can be used for a multiple unit operation to a maximum of four locomotives.

Compressed air brake for the loco and vacuum brake for the train are proviede. In addition, these locomotives have been provided with rheostatic braking.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
R 2965/167/64	30.12.84	C.L.W.	1967	20900–20955	R.D.S.O. EL.104.62	WAG4	56	(IR–5)
– do – (Amendment No. 3)	15.04.65	C.L.W.	1968	20956–21015	–do–	WAG4	60	(IR–7)
R63/RSF/459/1	3.8.66	C.L.W.	1969	21016–21085	–do–	WAG4	70	(IR–8)

MAIN PARTICULARS OF WAG4 LOCO

GERNERAL

SYTEM OF CURRENT		A.C.
LINE VOLTAGE		25000V
WEIGHT IN W.O.		87.6 t
MAX. AXLE LOAD		21.90 t
MIN. AXLE LOAD		
1 HR. RATING		
P.S.		3590
T.E.		27100Kg
SPEED		35.8Km/h
CONTENUOUS RATING		
P.S.		3150
T.E.		23200Kg
SPEED		(36.5 Km/h)*
MAX.T.E.		30000Kg(34.4% Adh)*
MAX.SPEED		80 Km/h
WHEEL DIA	NEW	1140 mm
	HALF WORN	1102 mm
	FULL WORN	1064 mm

BOGIE

DRIVE ARGT.	GEAR PINION
DESIGN	2 AXLE MONOMOTOR

FBRAKES

LOCO	AIR, HAND, RHEOSTATIC
TRAIN	VACUUM

SANDING

NO. OF BOXES	8
CAPACITY	50.1 each

CONTROLS

MULTIPLE

PANTOGRAPH

NOS.	2
MAKE	FAIVELEY
TYPE	AM12

TRANSFORMER

MAKE		OERLIKON
TYPE & FORM		BOT 3460– A1
NUMBER		1
WT. COMPLETE		9.88t
COOLING		OIL
KVA	PRY. 3640 SRY. 3460	AUX. 180
TAPS ON	H.T.	32
VOLTS	H.T.	22500
	L.T.	389
AMPS	H.T.	162
	L.T.	462.5 A
INSULATION		CLASS A

SILICON RECTIFIER

NUMBER		2
TYPE & FORM		GL–82220/2000–1750W
RATED VOLTAGE		1375 V
MAX. NO LOAD VOLTAGE		2120V RMS CONT.
CONNECTION		GRAETZ BRIDGE
NO OF CELLS		S P A
		5 5 4
WEIGHT		650 Kg
SILICON RECTIFIER CELL		LO 570

TRACTION MOTORS

MAKE		ACEC
TYPE & FORM		MG 1580 A1
NUMBER		2
INSULATION		ARM(H) FIELD(H)
SUSPENSION		Bogie Mounted
VENTILATION		(244.5m^3/min) FORCED
WT. COMPLETE		5850 Kg
1 HR. RATING		F.F.
		1270V, 1040A, 680 RPM
CONT. RATING		F.F.
		1270V,1000A, 690 RPM
TEMP. RISE	ARM.	140°C
	FIELD	160°C
	COMM.	85°C
COIL RESISTANCE (110°C)		
	ARMATURE	0.0191 ohm
	MAIN POLE	0.0224 ohm
	INTER POLE	0.0102 ohm
AIR GAP:		
MAIN POLE		8 mm
INTER POLE		5 mm
BRUSHES:		
GRADE		EG 97 B
NO OF HOLDERS		6
BRUSHES FOR HOLDER		3
SIZE(LXWXH)		44X(2X19)X55 mm
MIN. HEIGHT		24 mm
MOTOR GROUPING		Parallel
GEAR RATIO		1 : 3 : 95
WEIGHT		5.86 t

* Corrected on 06.04.74

AUXILIARISE

BATTERY CHARGING DEVICE

TYPE	COMPOUND WOUND BIPOLAR
MAKERS	EIMOT ENGINEERING CO. BOMBAY
CAPACITY	3 KW AT 110V DC CONTINUOUS
R.P.M	1450
FULL TIME CURRENT	27.27 AMPS
ARMATURE RESISTANCE	0.31 ohms
SHUNT FIELD RESISTANCE	148 ohms
SERIES FIELD RESISTANCE	0.1 ohms

HEADLIGHTS:

NUMBER	2
RATING	2V, 250W, AC

BATTERY:

TYPE	49 TP–90M
CAPACITY	90 AH(3 HR. RATE)
	49 CELLS, 110±1%V

MAIN COMPRESSOR

NUMBER	1
MOTOR	7.5 KW 380V 15A 1390 RPM
	CLASS B ENSULATION
COMPRESSOR	
TYPE	2 EC. 38 B
CAPACITY	28 cub. ft./min.
	(729 litres/min)
PRESSURE	9 kgm/cm^2 (128 P.SIG)
WEIGHT	335 kg

AUX.COPRESSOR:

NUMBER	1
MOTOR	1 hp, 100V DC, 8.4 A, 1500RPM
WEIGHT	37 kg
CAPACITY	4 cub. ft./min.
	(115 litres/min)
WT. OF COMPRESSOR ALONE	12 kg

ARNO CONVERTER	1No, 1420 r.p.m.
1 PHASE	150 kVA, 380V, 395A
3 PHASE	120 kVA, 380V, 190A

EXHAUSTERS:

NUMBER	2
MOTOR	380±22%V,1450/960RPM,12/8hp
EXHAUSTER	
TYPE	VL 30 (SIM)
CAPACITY	1246/1869 (litres/min.)
WEIGHT	650 kg
OR	
TYPE	NORTHEY VACUUM BRAKE EXHAUSTERS 250 R.E.
SPEED	1500/1000 RPM
CAPACITY	250 cu. ft./min.

TRACTION MOTOR BLOWER SET:

NUMBER	2
MOTOR	BHARAT BIJLEE AC 3-PHASE 50 c/s, 380±22%V, 30 hp.
BLOWER	
TYPE	MCBR 40
AIR QUANTTY	12400 m^3/hr.
STATIC PRESSURE AT 20°C	303mm WG
FAN SPEED	2920 RPM
POWER CONSUMPTION AT 20°C	22 hp
WEIGHT	0.28 t

OIL COOLER BLOWER SET:

NUMBER	1
MOTOR	BHARAT BIJLEE AC 3-PHASE 50 c/s 380±22% V 30 hp
BLOWER	
TYPE	MCBR 60
AIR QUANTITY	24000m^3/hr.
STATIC PRESSURE AT 20°C	130 m WG
FAN SPEED	1460 RPM
POWER CONSUMPTION AT 20°C	21 hp
WEIGHT	

SMOOTHING FRACTOR BLOWER SET:

NUMBER	1
MOTOR	2 kW, AC, 3-PHASE, 50 c/s 380±22% V

BLOWER

TYPE	PMA-50
AIR QUANTITY	4500 m^3/hr.
STATIC PRESSURE AT 20°C	62 mmWG
FAN SPEED	2860 RPM
POWER CONSUMPTION AT 20°C	2.3hp
OR	
TYPE	2 PNM-40
AIR QUANTITY	7600 m^3/hr.
STATIC PRESSURE AT 20°C	110mm WG
FAN SPEED	2850 RPM
POWER CONSUMPTION AT 20°C	4.4 hp

SILICON RECTIFIER BLOWER SET:

NUMBER	4
MOTOR	2 hp BRARAT BIJLEE AC 3-PHASE, 50 c/s 380±22%V
BLOWER	PMCB-40 AW-6
1) TYPE	PMCB-40 AW-6
AIR QUANTITY	3400 m^3/hr.
STATIC PRESSURE AT 20°C	45mm WG
FAN SPEED	2860 RPM
POWER CONSUMPTION AT 20°C	1.46 hp
2) TYPE	CALCUTTA FAN WORKS
AIR QUANTITY	3400 m^3/hr.
STATIC PRESSURE AT 20°C	47 mm W.G.
SPEED	2860 RPM
POWER CONSUMPTION AT 20°C	2 hp

BRAKING RESISTANCE BLOWER SET:

NUMBER	2
MOTOR TYPE VR 13(DC) 95V,5000RPM	15KW
BLOWER	
TYPE	VM 50 Z
CAPACITY	5.25m^3/min. 5000RPM

OIL PUMP FOR TRANSFORMER:

NUMBER	1
PUMP	
CAPACITY	750 Litres/min
PRESSURE	11 m. W.G.
WEIGHT	76.21 kg
MOTOR	4.3hp, 380±22%V,2865 RPM

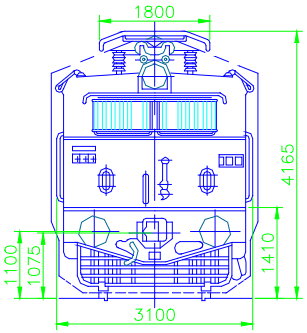
SMOOTHING REACTOR FOR TRACTION MOTOR:

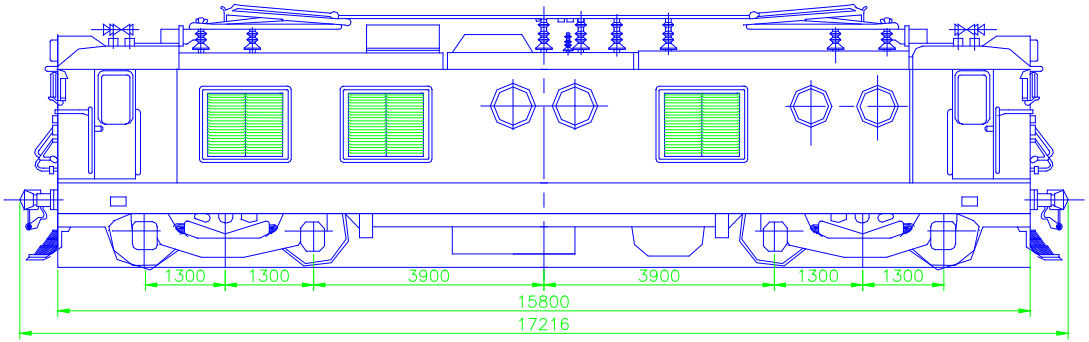
TYPE	SL 42
RATING	1270V, 1000A
RESISTANCE AT 111°C	0.00707 ohms
REACTANCE	5 mH
WEIGHT	1385 kg

PROTECTIVE DEVICES:

DEAD MAN CONTROL	NO
WHEEL SLIP	YES
MAIN O/L RELAY	YES
MOTOR O/L RELAY	YES
OVER VOLTAGE RELAY	YES
NO VOLT RELAY	YES
EARTH FAULT RELAY(P)	YES
EARTH FAULT RELAY(A)	YES
OVER TEMP. RELAY(REC.)	YES
OVER TEMP. RELAY(TRA.)	YES
MULTIPLE OPERATION	4 UNITS

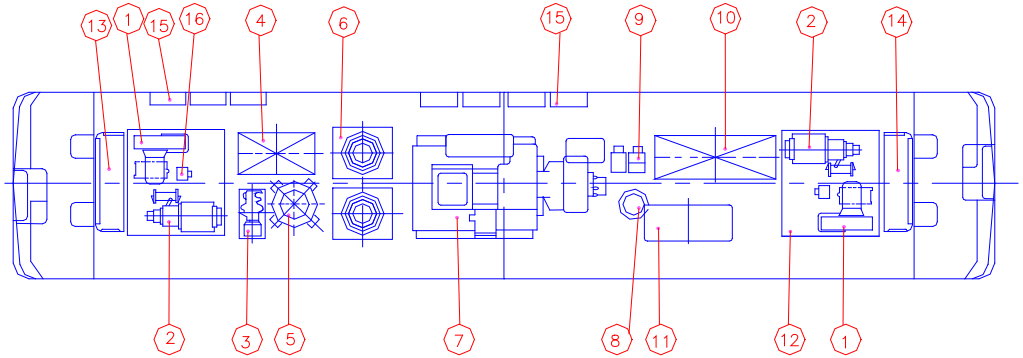
WAG 4



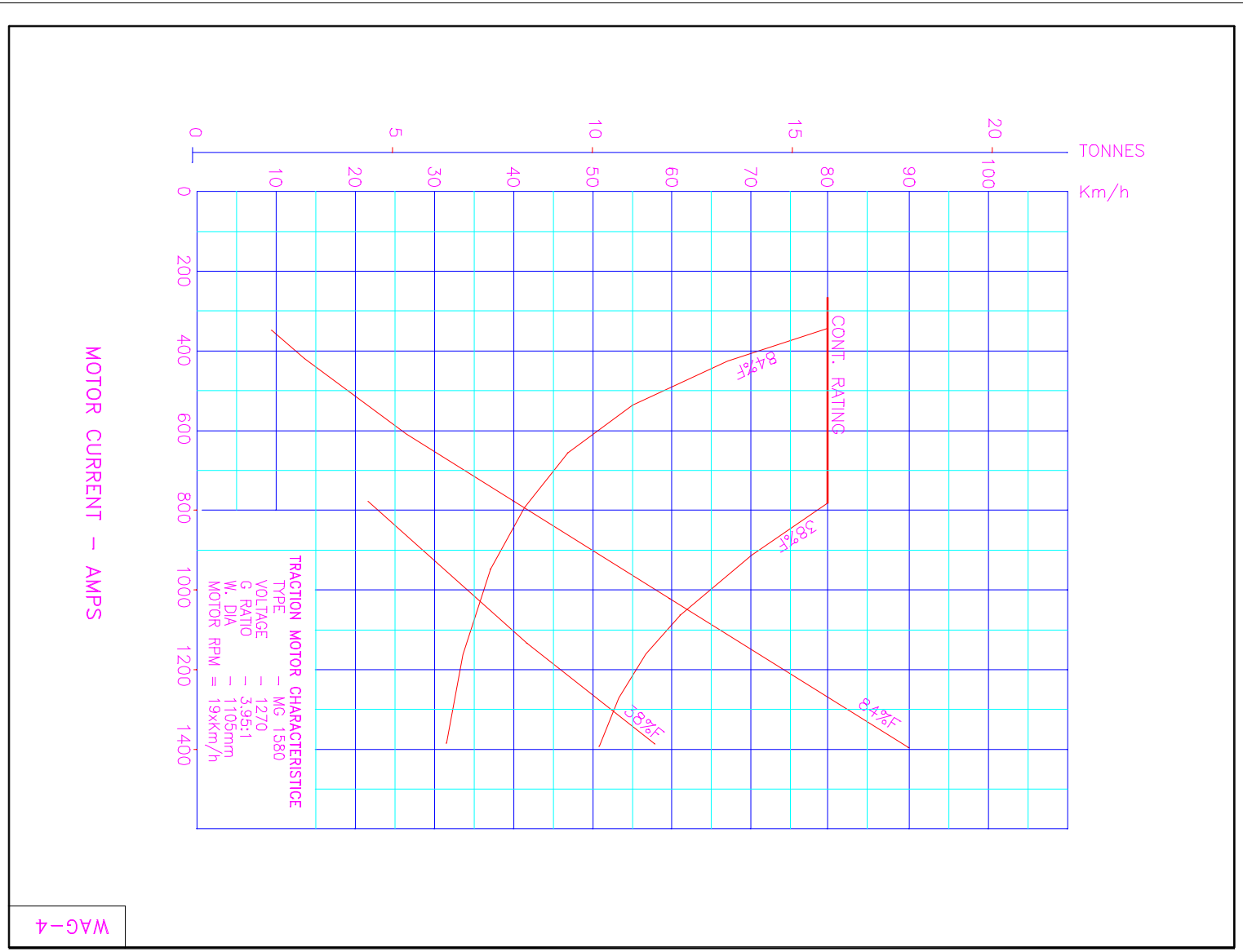


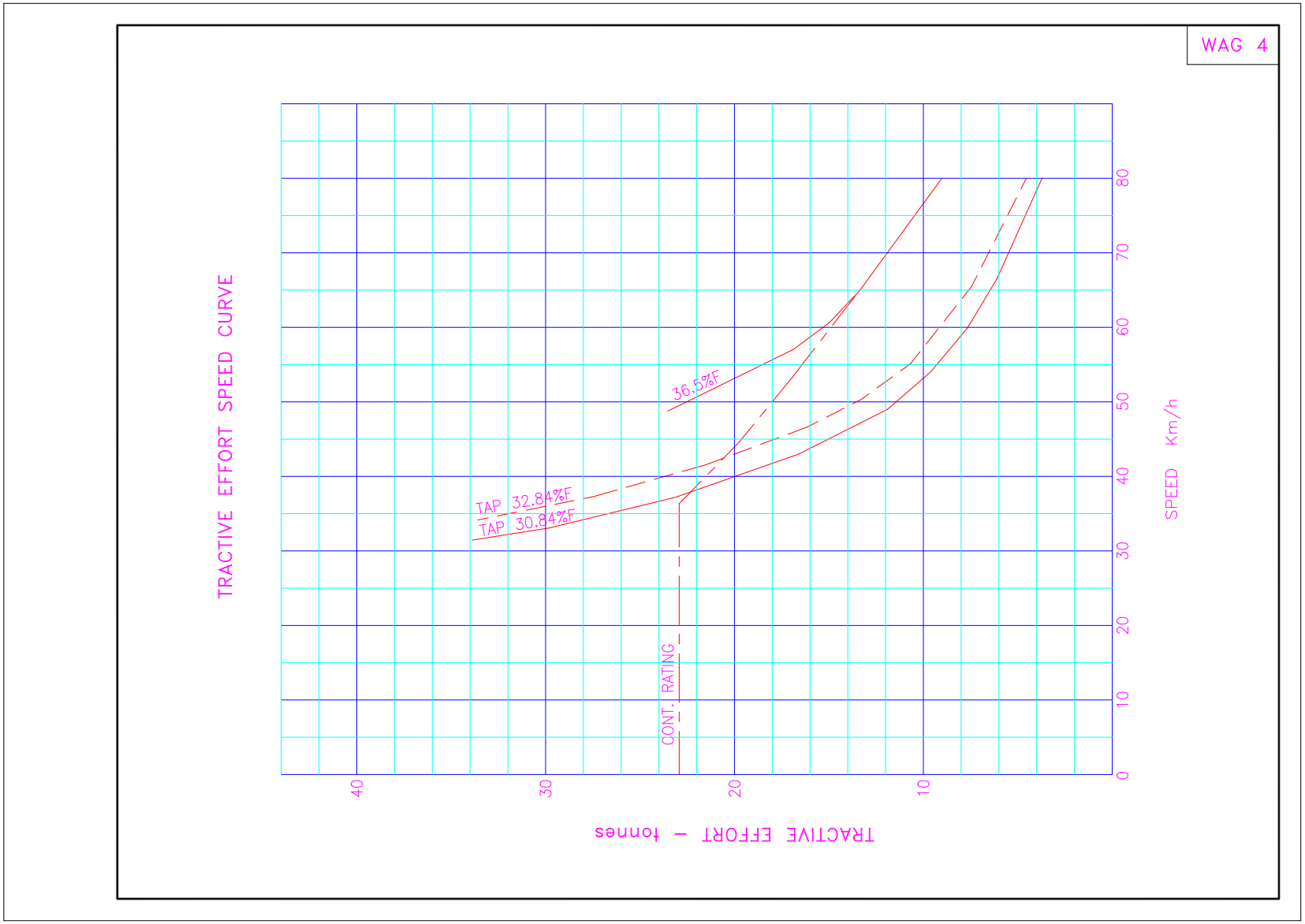
ITEM NO. DESCRIPTION

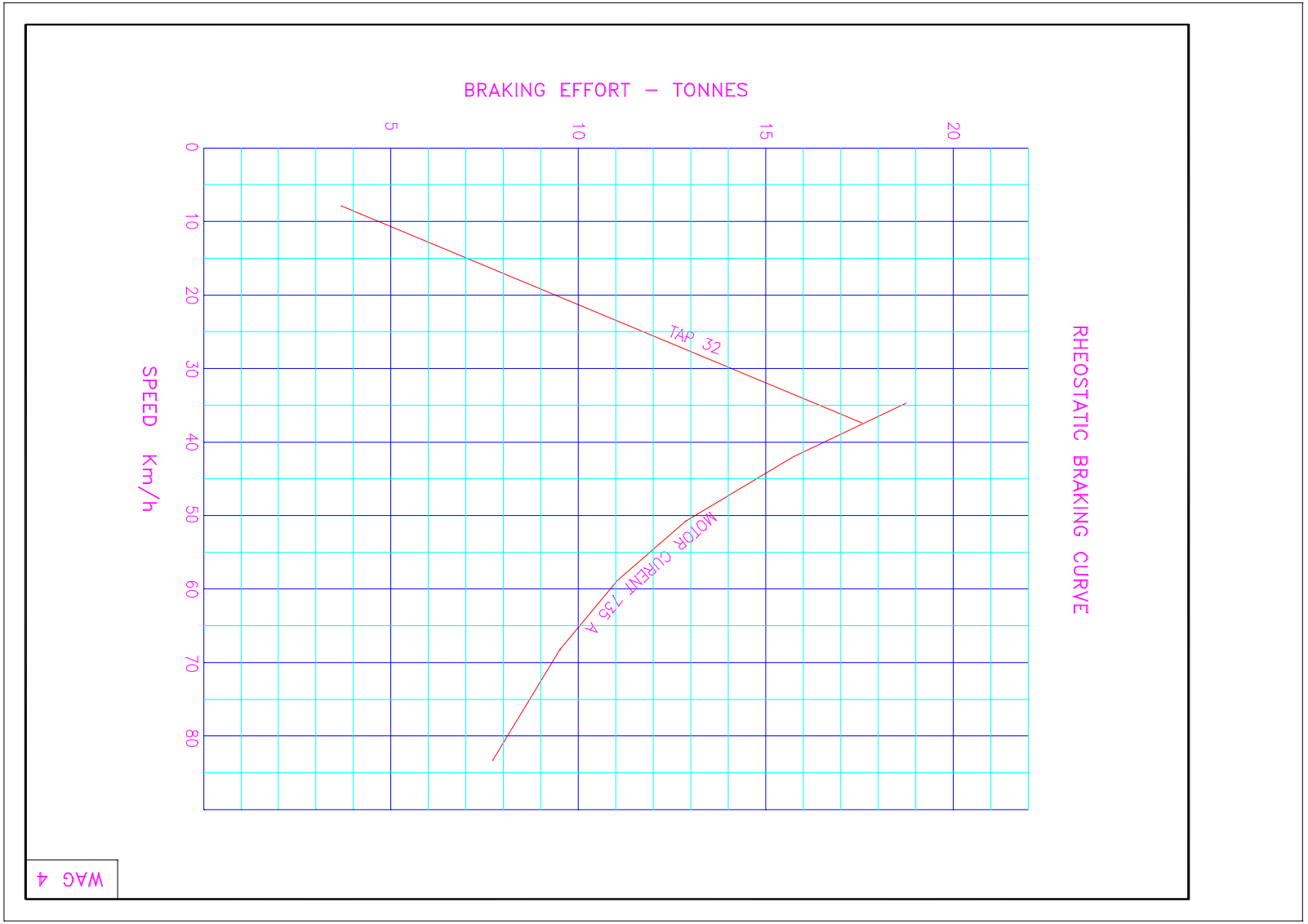
1. TRACTION MOTOR BLOWER
2. EXHAUSTER
3. COMPRESSOR
4. PNEUMATIC BLOCK
5. ARNO CONVERTOR
6. RESISTOR BLOCK
7. TRANSFORMER
8. SMOOTHING REACTER
9. INDUCTIVE SHUNTS UNIT
10. ELEC. CUBICLE
11. SILICON RECTIFIER
12. EXCITATION TRANSFORMER
13. CABINET 1
14. CABINET 2
15. BATTERIES
16. VOLTAGE STABLIZER



Dt.	26.06.82
D	---
T	R.C Sharma
C	----


TONNES
Km/h
MOTOR CURRENT - AMPS
CONT. RATING
84%
100%
78%
64%
TRACTION MOTOR CHARACTERISTICE
TYPE - MG 1580
VOLTAGE - 1270
G RATIO - 3.95:1
W. DIA - 1105mm
MOTOR RPM = 19xKm/h
WAG-4


WAG 4
TRACTIVE EFFORT SPEED CURVE
36.5%F
TAP 32.84%F
TAP 30.84%F
CONT. RATING
SPEED Km/h
TRACTIVE EFFORT – tonnes
0
10
20
30
40
50
60
70
80
40
30
20
10


BRAKING EFFORT – TONNES
5
10
15
20
0
10
20
30
40
50
60
70
80
SPEED Km/h
TAP 32
MOTOR CURRENT 735 A
RHEOSTATIC BRAKING CURVE
WAG 4

WAG 4

HAULAGE CAPACITY OF WAG 4 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.95 (.....) T.M. MG-1580A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5350	2780	2530					ABOVE 6000
		1/500	5140	5140	5140	4200	3080	2230	1570					5140
		1/200	2750	2750	2750	2240	1770	1360	980					2750
		1/150	2120	2120	2120	1820	1450	1120	815					2120
		1/100	1480	1480	1480	1300	1040	800	580					1480
		1/50	945	945	890	700								945
	BOGIE WAGONS (BOX)	LEVEL	5950	5950	5950	5950	5950	5950	4240					5950
		1/500	4190	4190	4190	4190	3850	2880	2025					4190
		1/200	2890	2890	2890	2500	2020	1570	1125					2890
		1/150	2480	2480	2480	2000	1610	1230	895					2480
		1/100	1890	1890	1790	1380	1110	820	620					1890
		1/50	1015	1010	920	720	580	425	300					1105
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →						4305					ABOVE 6000
		1/500	4880	4880	4880	5220	4020	2920	2080					4880
		1/200	3225	3225	3225	2710	2135	1580	1145					3225
		1/150	2710	2710	2620	2130	1700	1250	905					2710
		1/100	2035	2005	1810	1480	1170	870	625					2040
		1/50	1015	1010	915	745	585	430	300					1155

Dt	21.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 5

CONT. RAIL P.S. 3850
CO-CO TYPE WAG 5B ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WAG 5 class Electric Locomotive
1676 mm Gauge

Thirty five locomotives of this type wear ordered on Chittaranjan Locomotive Works to the design of RDSO, First locomotive was put in service in 1980. The continuous rail horse power of the locomotive is 3850 PS at 50.5 km/h.

The locomotive is powered by six axle hung, nose suspended ventialated type dc traction motors. Speed control is achieved by connecting the motors in parallel combinations, <in and by field weakening the motors.

These locomotives,utilise silicon rectifier for conversion of ac power into dc.

These can be used for a multiple operation to a maximum of four locomotives. Compressed air brakes for the locomotive and dual brake for the trains are provided. In addition, these locomotives are provided with Rheostatic braking.

P R O C U R E M E N T P A R T I C U L A R S

Contracts		BUILDER	Year put in line	I. R. Loco Numbers	Particular Spec. No.	As Made drawing set	Total No. Ordered.	Remarks
Number	Date							
		RDSO/CLW	1980	22100–22134	RDSO CWAM.006	WAG 5 B	35	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WAG5B	Co–Co			RDSO / CLW	1980	22100–22134	RDSO. C.WAM–006	WAG5	35

WAG5

MAIN PARTICULARS OF LOCO

GENERAL

SYSTEM OF CURRENT –	A.C.
LINE VOLTAGE –	25000V
WEIGHT IN W.O. –	118.8t
ADHESIVE WEIGHT –	118.8t
AXLE LOAD	19.8t

CONTINUOUS RATING –

P.S. –	3850
T.E. –	20.6t
SPEED –	50.5 kmph
MAX. T.E. –	33.5 t
MAX. SPEED–	80Kmph
WHEEL DIA– (Half worn)	1055 mm
(Full worn)	1016 mm
(NEW)	1092 mm

BOGIE

DRIVE ARGT –	GEAR PINION
DESIGN –	3 AXLE Trimount –cast frame.

BRAKES

LOCO –	Air,Hand,
TRAIN – Dual Brake.	Rheos

SANDING

NO. OF BOXES –	16
CAPACITY	

CONTROLS –

No.	MULTIPLE 4 UNITS

No.	2
MAKE –	FAIVELEY
TYPE –	A M 12
WEIGHT(including 4 insulators)	285 kg.

TRANSFORMER

MAKE –	BHEL
TYPE –	HETT–3900
NUMBER –	1
WT. COMPLETE –	11730kg.
COOLING –	FORCED OIL
INSULATION –	A
TAPS ON H.T. –	32
RATING	
PRIMARY –	3900 KVA 22.5 KV,182A
SECONDARY –	3900 KVA 865 V(AC) 2x2250A
TERTIARY –	180 KVA/250KVA 380V.

SILICON RECTIFIER

NUMBER –	2
CONT.RATING –	2700(EACH CUBICLE),1050V(RMS)
MAX.STARTING CURR –	3300A
COOLING –ENT	FORCED AIR
TYPE OF DIODE –	S–18FN–350(Hind Rectifier)
CONNECTION –	BRIDGE
NO. OF CELLS –	64 PER BRIDGE S P A 2 8 4

TRACTION MOTORS

MAKE –	AISTHOM/CLW
TYPE –	TAO 659
NUMBER –	6
INSULATION – ARM	FIELD
	H H
SUSPENSION –	AXLE HUNG NOSE SUSPENDED
VENTILATION –	FORCED
WT. COMPLETE –	2800kg
TEMP. RISE –	ARM FIELD
(By Resistance)	140°C 160°C
COIL RESISTANCE –	110°C
ARMATURE –	0.012 ohms
MAIN POLE –	0.011170 ohms
INTERPOLE –	0.008 ohms
RATING–CONT. –	770HP,750V 840A,1095RPM
1HR –	750V,1070RPM 870A
AIR GAP–	
MAIN POLE	5.5 mm
INTERPOLE	6.0 mm
BRUSHES–	
GRADE –	EG 367
NO.OF HOLDERS–	6
BRUSH PER HOLDER –	3
SIZE (XL) –	2x(8x43)
MIN. HEIGHT	
NEW –	52
Worn –	27

MOTOR GROUPING –
6 MOTORS IN PARALLEL
GEAR RATIO – 62:15
PERMANENT SHUNT – 5%

AUXILIARIES

HEAD LIGHT – 2 NOS
BATTERY – 32V, 250W
LEAD ACID,
50 CELLS
110V,75 AH
(5 HR.RATE)
TRANSFORMER – 380/32,24V,16V
50C/S,500VA

ARNO CONVERTER 1 NO.
1420 RPM
1 PHASE – 150 KVA,380V
395A
3 PHASE – 120 KVA,380V
190A

COMPRESSOR

NO. – 3
MAKE – ELGI
TYPE –
CAPACITY 1000 l/m at 9.0Kg/cm^2
MOTOR – 3 NOS
12.5 HP, 380V.

EXHAUSTER

NO. – 2
MAKE – NORTHEY
TYPE – 250 RE
CAPACITY – 4500 l/m
MOTOR – 7.5
2Nos, 7.5/11KW,
380V,970/1460 RPM

TRACTION MOTOR BLOWER

NUMBER – 2
MAKE – SF INDIA LTD
TYPE – MLBR–42,51–1–H4
MOTOR –
NUMBER – 2
MAKE – SIEMENS
RATING – 22KW, 380V, 41A,
3000 RPM

SMOOTHING REACTOR BLOWER

NUMBER – 2
MAKE – SF INDIA LTD
TYPE – PFTA–50,ARR 6
CAPACITY – 4200 m^3/hr.
80 mm WG
MOTOR –
2No,3.0 HP,380V,2860 RPM

BREAKING RESISTOR BLOWER

MAKE – BHEL
NUMBER – 1
TYPE – Dy–3423M
CAPACITY – 300 m^3/Min.
MOTOR –
1No, 52 KW/70 HP,325 V,
175A,3500 RPM

SILICON RECTIFIER BLOWERS

NUMBER – 2
MAKE – SF INDIA LTD
TYPE – AXIAL
CAPACITY – 3100 TO 3200m^3/HR
45 to 47 mm WG
MOTOR –
2 NOS, 25KW, 380V, 4.4A, 2880 RPM
TOTAL WEIGHT – 60 KG APPROX.

OIL COOLER BLOWER

NUMBER – 1
MAKE – SF INDIA LTD
TYPE – MLBH 60–1–H2
CAPACITY – 22,200 m/HR,170mm^3 WG
MOTOR –
1 NO., 30HP, 380V, 43A, 1450 RPM

OIL PUMP FOR TRANSFORMER

NUMBER – 1
MAKE – BEST & CO.PVT LTD
TYPE – 750 l/m at 11 mm WG
MOTOR –
1 NO, 3.3 KW, 380V, 6.6A, 2865 RPM

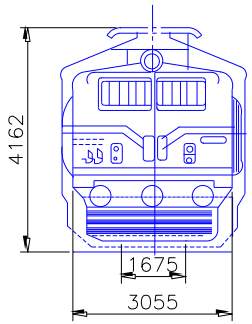
SMOOTHING REACTOR FOR TRACTION MOTOR

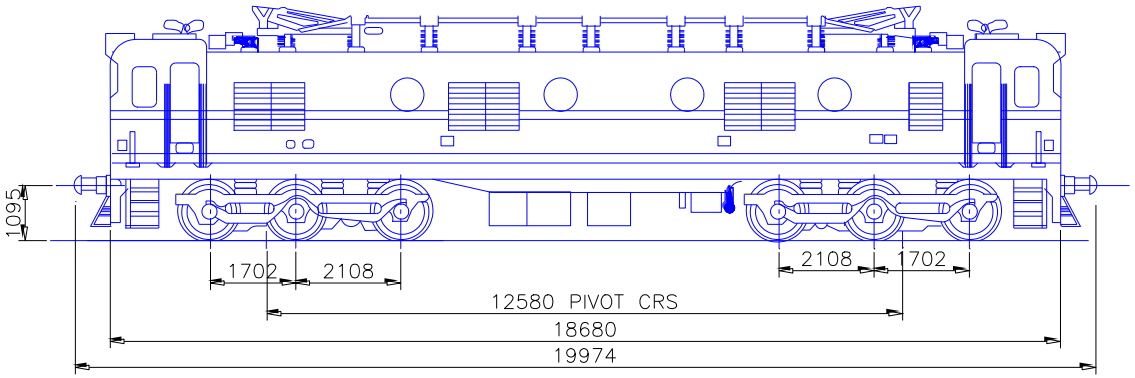
NUMBER – 2
TYPE – SL42
RATING – 1250V, 950A
REACTANCE – 5.37mH
RESISTANCE AT 110°C – 0.00718 Ohm.

PRITECTIVE DEVICE

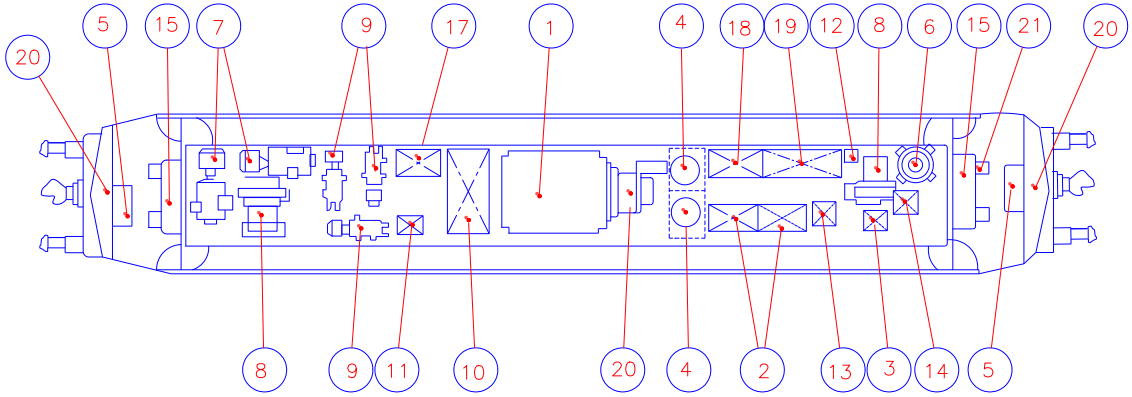
DEAD MAN CONTROL – NO
SLIP CONTROL – YES
MAIN OVERLOAD RELAY – YES
OVER VOLTAGE RELAY – YES
NO VOLT RELAY – YES
EARTH FAULT RELAY – YES
LOW PRESSURE GOVERNOR – YES
VACUUM CON. GOV. – YES
BRAKE CYLINDER C/O VALVE – YES

WAG5

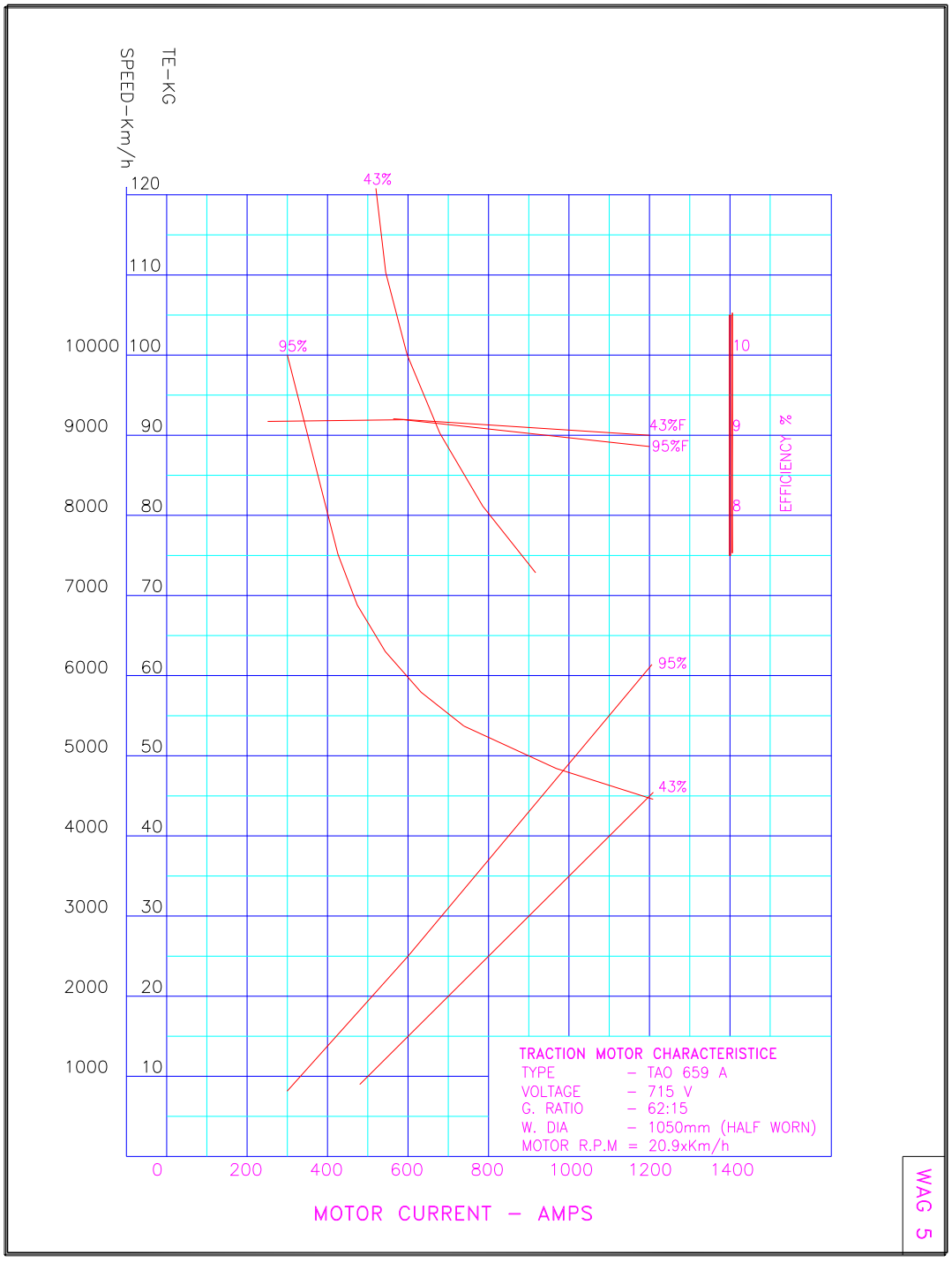


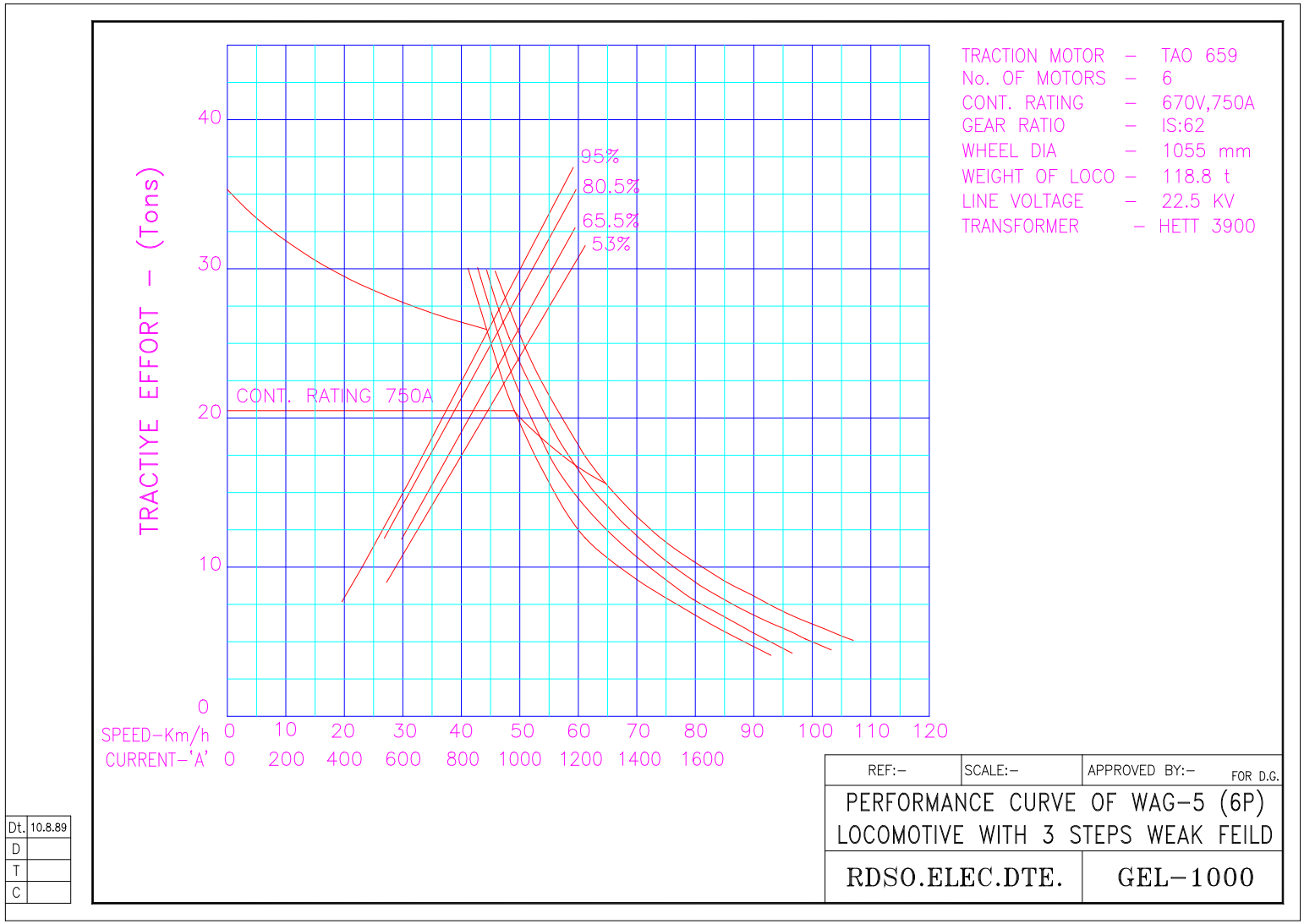


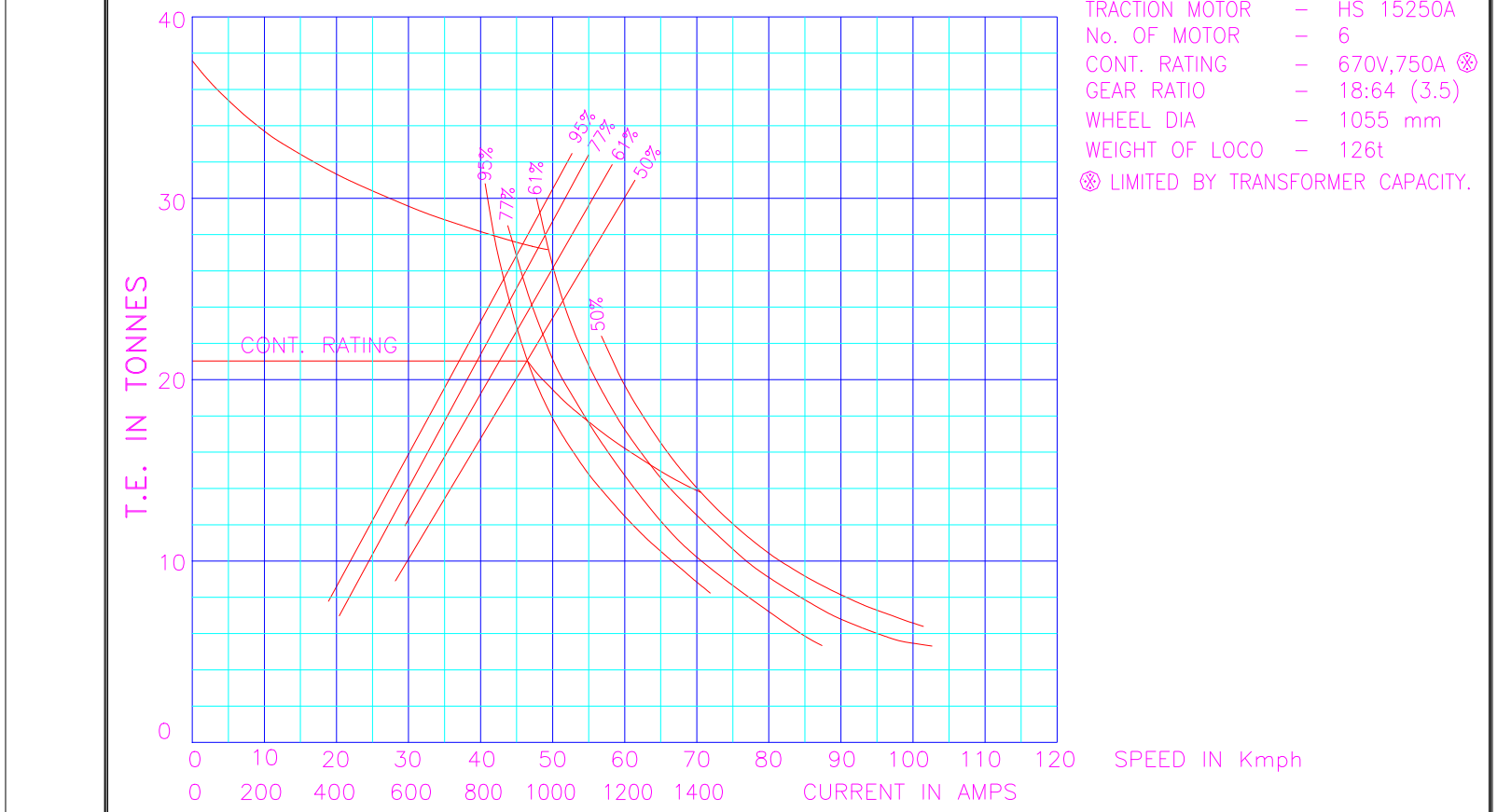
1. TRANSFORMER.
2. SILICON RECTIFIER.
3. BATTERY CHARGER.
4. SMOOTHING RREACTOR.
5. MASTER CONTROLLER.
6. ARNO.
7. EXHAUSTER.
8. T.M.BLOWER.
9. COMPRESSOR.
10. BRAKE RESISTOR.
11. EXCITATION TRANSFORMER.
12. HEAD LIGHT TRANSFORMER.
13. DAMPING NETWORK.
14. ARNO STARTING RESISTOR.
15. PNEUMATIC CABINET.
16. AUXILIARY CABINET.
17. Ba–PANEL.
18. Ba–2 PANEL
19. Ba–3 PANEL
20. DRIVERS DESK.



C	T	D	DT
	R.C.S.		


TE-KG
SPEED-Km/h
120
110
100
90
80
70
60
50
40
30
20
10
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
43%
95%
43%F
95%F
95%
43%
10
9
8
EFFICIENCY %
0
200
400
600
800
1000
1200
1400
MOTOR CURRENT – AMPS
TRACTION MOTOR CHARACTERISTICE
TYPE – TAO 659 A
VOLTAGE – 715 V
G. RATIO – 62:15
W. DIA – 1050mm (HALF WORN)
MOTOR R.P.M = 20.9xKm/h
WAG 5


TRACTIVE EFFORT – (Tons)
40
30
20
10
0
95%
80.5%
65.5%
53%
CONT. RATING 750A
SPEED–Km/h 0 10 20 30 40 50 60 70 80 90 100 110 120
CURRENT–'A' 0 200 400 600 800 1000 1200 1400 1600
TRACTION MOTOR – TAO 659
No. OF MOTORS – 6
CONT. RATING – 670V,750A
GEAR RATIO – IS:62
WHEEL DIA – 1055 mm
WEIGHT OF LOCO – 118.8 t
LINE VOLTAGE – 22.5 KV
TRANSFORMER – HETT 3900
REF:–
SCALE:–
APPROVED BY:– FOR D.G.
PERFORMANCE CURVE OF WAG–5 (6P)
LOCOMOTIVE WITH 3 STEPS WEAK FEILD
RDSO.ELEC.DTE.
GEL–1000
Dt. 10.8.89
D
T
C



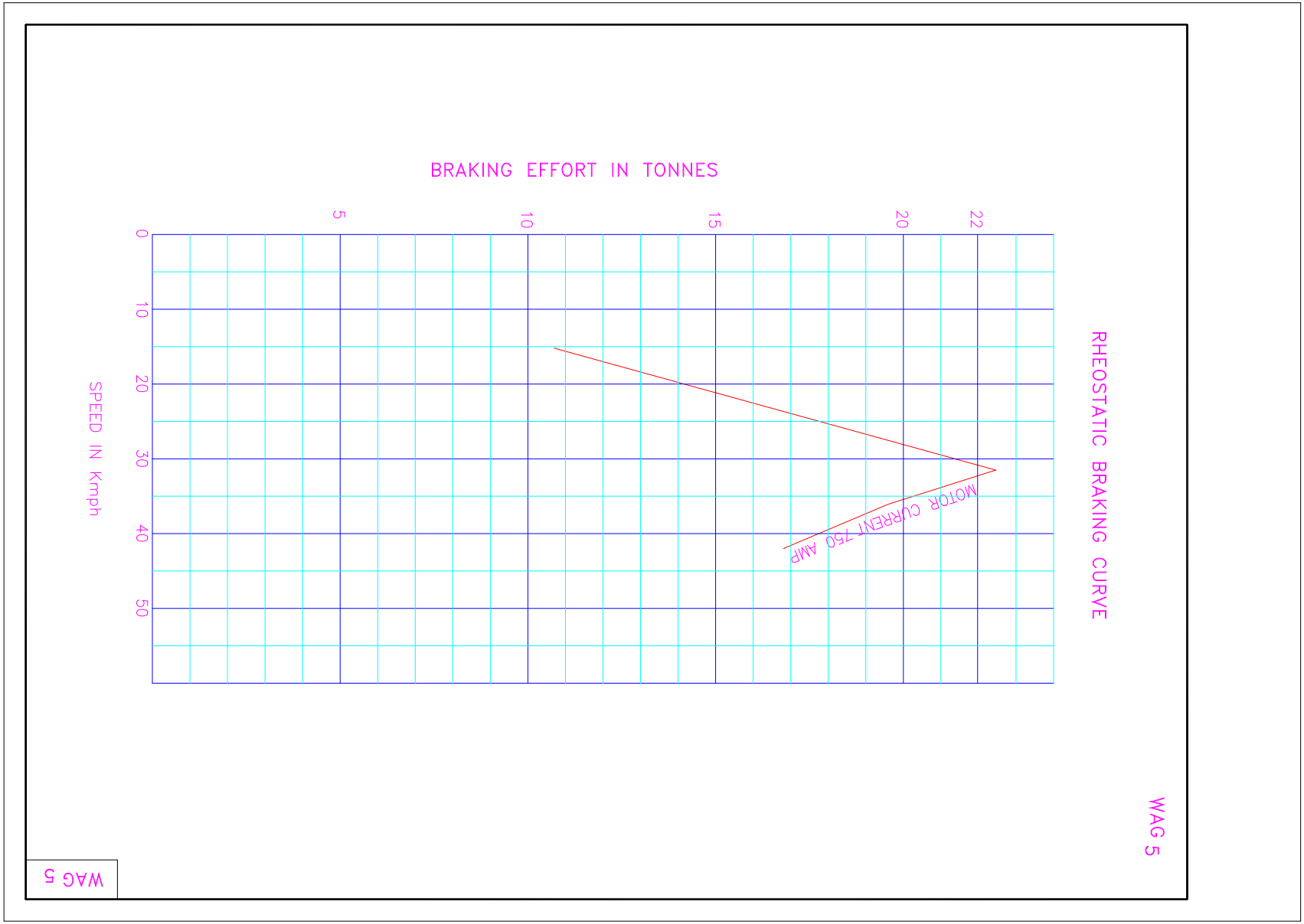
TRACTION MOTOR – HS 15250A
No. OF MOTOR – 6
CONT. RATING – 670V,750A ⊗
GEAR RATIO – 18:64 (3.5)
WHEEL DIA – 1055 mm
WEIGHT OF LOCO – 126t
⊗ LIMITED BY TRANSFORMER CAPACITY.

REF:–	SCALE:–	APPROVED BY:– FOR D.G.

PERFORMANCE CURVE OF WAG–5
ELECTRIC LOCO MOTIVE (WITH REGULATION)

RDSO.ELEC.DTE. GEL–1036

Dt.	10.8.89
D	
T	
C	


BRAKING EFFORT IN TONNES
5
10
15
20
22
0
10
20
30
40
50
SPEED IN Kmph
MOTOR CURRENT 750 AMP
RHEOSTATIC BRAKING CURVE
WAG 5
WAG 5

WAG5 (H.B.)

HAULAGE CAPACITY OF WAG 5 (HB) LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:3.55 (18:64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →					4229	2671					ABOVE 6000
		1/500	5933	5645	5308	4947	4141	2490	1645					ABOVE 6000
		1/200	3182	3093	2985	2861	2464	1511	1018					3600
		1/150	2519	2461	2390	2308	2002	1231	831					2800
		1/100	1759	1730	1692	1648	1440	884	595					1940
		1/50	890	880	869	855	751	448	290					1150
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						4478					ABOVE 6000
		1/500	4950	4950	4950	4950	4950	3221	2209					4950
		1/200	3429	3365	3286	3195	2806	1761	1219					3429
		1/150	2682	2632	2582	2523	2224	1395	964					2924
		1/100	1839	1814	1789	1758	1555	969	664					2246
		1/50	911	903	896	886	783	471	309					1300
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →						4713					ABOVE 6000
		1/500	5770	5775	5775	5775	5121	3382	2266					5775
		1/200	3602	3512	3411	3310	2714	1762	1233					3810
		1/150	2782	2726	2663	2599	2140	1390	972					3198
		1/100	1890	1863	1832	1798	1485	994	700					2407
		1/50	920	912	902	893	742	483	310					1354

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 5

HAULAGE CAPACITY OF WAG 5 (3 STEP WEAK FIELD) LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:4.13 (15:62) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	105	110	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						4870	3235	2340	1825		ABOVE 6000
		1/500	4650	4650	4650	4650	4420	3370	2400	1655	1235	975		4650
		1/200	3235	3170	3100	3010	2390	1850	1330	920	690	540		3235
		1/150	2525	2480	2430	2375	1890	1460	1050	725	545	420		2740
		1/100	1730	1705	1680	1650	1310	1020	730	495	365	275		2105
		1/50	855	845	835	830	650	500	340	220	150	100		1215
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →						5120	3335	2380	1840		ABOVE 6000
		1/500	5500	5500	5500	5500	4620	3490	2470	1680	1245	975		5500
		1/200	3350	3300	3200	3100	2440	1880	1350	930	695	540		3600
		1/150	2600	2550	2500	2400	1920	1490	1070	730	545	420		3150
		1/100	1800	1750	1700	1650	1330	1030	730	500	365	275		2200
		1/50	850	850	850	850	660	500	350	220	270	100		1300

Dt	08.09.94
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 5

HAULAGE CAPACITY OF WAG 5 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:4.53 (17:77) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →					4280	2820					ABOVE 6000
		1/500	4950	4950	4950	4900	2980	2000	1370					4950
		1/200	3430	3430	3400	2640	1590	1070	730					3430
		1/150	2780	2730	2680	2080	1250	840	570					2920
		1/100	1910	1880	1850	1440	860	570	380					2240
		1/50	950	940	930	720	410	250	150					1300
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →					4600	2970					ABOVE 6000
		1/500	5770	5770	5770	5250	3120	2070	1400					5770
		1/200	3700	3610	3510	2710	1630	1100	750					3810
		1/150	2860	2800	2740	2130	1270	850	570					3200
		1/100	1950	1920	1890	1460	870	580	380					2400
		1/50	960	950	940	720	410	260	150					1350

Dt	22.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 5

HAULAGE CAPACITY OF WAG 5 (3 STEP WEAK FIELD) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:4.13 (15:62) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	105	110	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGON (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1590	1230		ABOVE 1500
		1/500	← ABOVE 1500 →							1315	980	765		-DO-
		1/200	← ABOVE 1500 →						1175	800	595	465		-DO-
		1/150	← ABOVE 1500 →					1385	950	650	480	370		-DO-
		1/100	← ABOVE 1500 →				1270	985	670	455	335	250		-DO-
		1/50	850	840	825	810	645	495	325	210	140	90		1300

Dt	8.9.94
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 6A

CONT. RAIL P.S. 6280
BO-BO-BO TYPE WAG 6A CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAG6A

Bo–Bo–Bo Type WAG6A Class Electric Locomotive
1676 mm gauge

Six locomotives of this type were opered by IR on M/s. ASEA Traction, Sweden as per RDSO's Specification No. E–17/03. First locomotive was put in service in 1988. The continuous rail horse power of the locomotives is 6280 PS at 53.0 kmph.

The locomotive is powered by six bogie mounted forced ventilated type separately excited dc traction motors. Speed control is achieved through phase angle control of Thyristor convertor combimed with separate control of field current.

Multiple connection of the locomotives is possible. These locomotives have micro–processor based control and fault indication system. The creep control system, comparing wheel speed with true ground speed permits maximum utilisation of available adhesion.

Air and dynamic brake system for the locomotive and air brake for the train are provided.

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO No.	TENDER SPEC. NO.	AS MADE DRAWING SET	TOTAL No. OF ORDERS	REMARKS
NUMBER	DATE							
85/RSF/459/ 2/(LT–33)	06.09.85	ASEA BROWN BOVERI, SWEDEN	1988	26000– 26005	R.D.S.O. E–17/03	WAG6A	6	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	TENDER SPECN.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WAG6A	Bo–Bo–Bo	85/RSP/459/2 (LT–33)	6.9.85	ASEA BROWN BOVERI	1988	26000–26005	E–17/03	WAG 6A	6

MAIN PARTICULARS OF LOCO

WAG 6A

GENERAL

SYSTEM OF CURRENT –	A.C.
LINE VOLTAGE –	25000V
WEIGHT IN W.O. –	123t ±1%
ADHESIVE WEIGHT –	123t±1%
AXLE LOAD	20.5t±2%

CONTINUOUS RATING:

P.S. –	6280
T.E.–	32.0t
SPEED –	53.0 km/h

MAX. T.E.	46.0t
MAX. SPEEP	100.0 Km/h
SPEED –	65.0knph
MAX. T.E. –	28200kg(25%Ad)
MAX. SPEED –	120.7kmph
WHEEL DIA –	NEW 1092mm
	Half WORN 1052 mm
	Full worn 1012 mm

BOGIE

DRIVE ARGT – Flexible Secondary hollow shaft drive of ASEA make Auxiliary

DESIGN 2–axle type of double stage field excitation

BRAKES

PANTOGRAPH

NO	2
MAKE	STEMMANN
TYPE	BS 95
WEIGHT(WITHOUT INSULATORS)	156 kg

TRANSFORMER

MAKE	ASEA
TYPE	TMZ 21
NUMBER	1
WT. COMPLETE	16650 Kgs
COOLING	OFAF
INSULATION	A

RATING

PRIMARY 7533 KVA 22.5KV,334.8A

POWER CONVERTOR

NUMBER	2
TYPE	Semi Controlled
CONT. RATING	2 x 511 V
MAX. STARTING CURRENT	2 x 4500 A
COOLING	Forced oil
TYPE OF THYRISTOR	YST 45–26P24C
TYPE OF DIODE	YSD35–0IP26
CONNECTION	Bridge
NO OF DIODES	24
NO OF THYRISTORS	24

TRACTION MOTOR

MAKE	ASEA
TYPE	L3 M 450–2
NUMBER	6
INSULATION	Class H
SUSPENSION	Fully Suspended
VENTILATION	Forced air
WEIGHT	3100kG

CONVERTOR INTERNAL BLOWER

MAKE	–
NO	2
CAPACITY	–
MOTOR	2 Nos.
RATING	2.2 KW, 380V, 3000RPM

OIL COOLER BLOWER:

MAKE	ASEA
NO.	2
CAPACITY	–
MOTOR	2 Nos.
RATING	10 KW, 415 V, 2920 RPM

CONVERTOR OIL PUMP:

MAKE	–
NO.	1
CAPACITY	450 l/min
MOTOR RATING	12.7 KW,380/415V,3000 RPM

TRANSFORMER OIL PUMP:

MAKE	
NO.	1
CAPACITY	–
MOTOR RATING	3.8 KW,380V, 1500 RPM

DUST SEPARATOR BLOWER

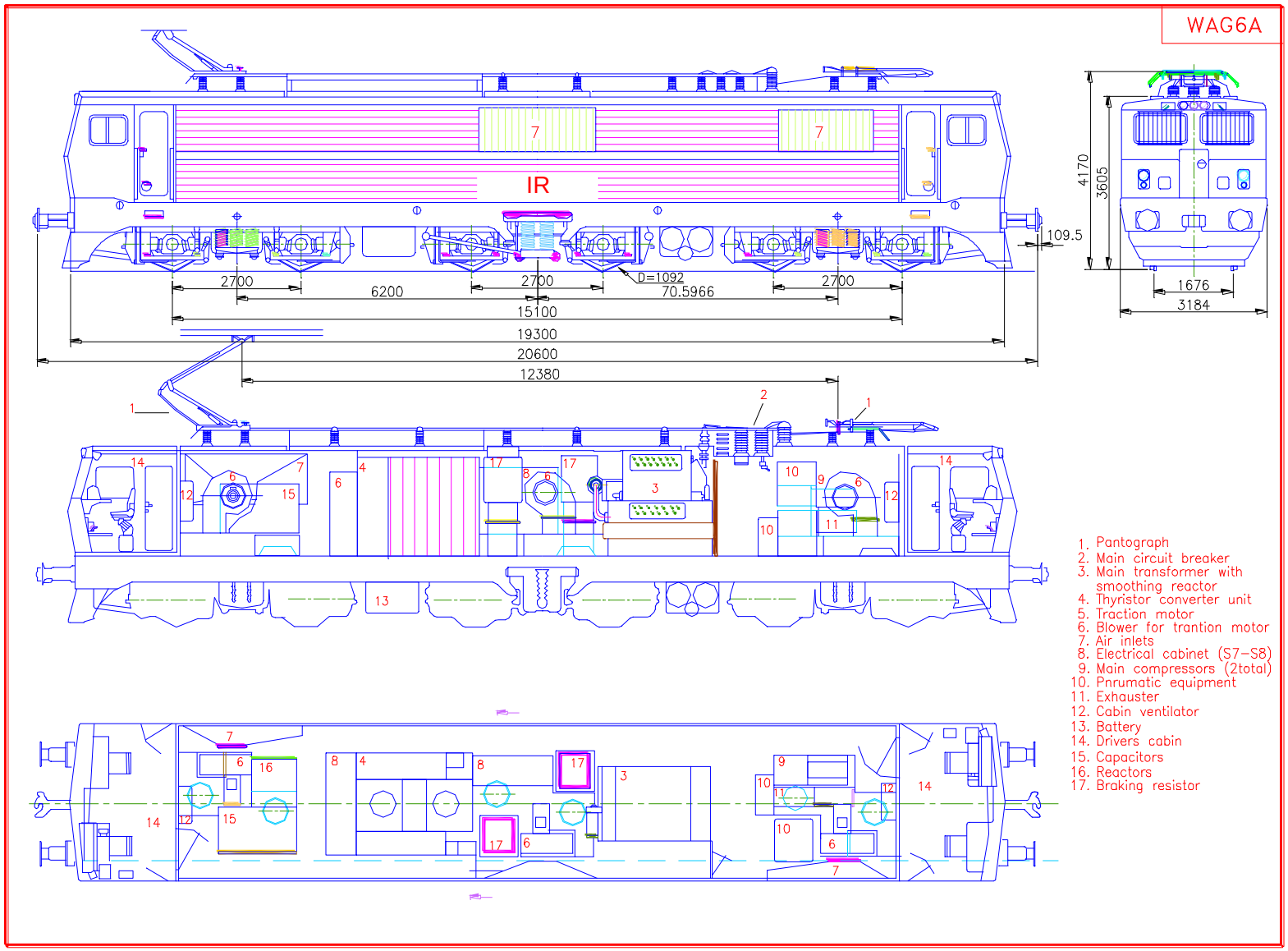
MAKE	ASEA
NO.	3
CAPACITY	–
MOTOR RATING	4 KW, 415V, 2815 RPM

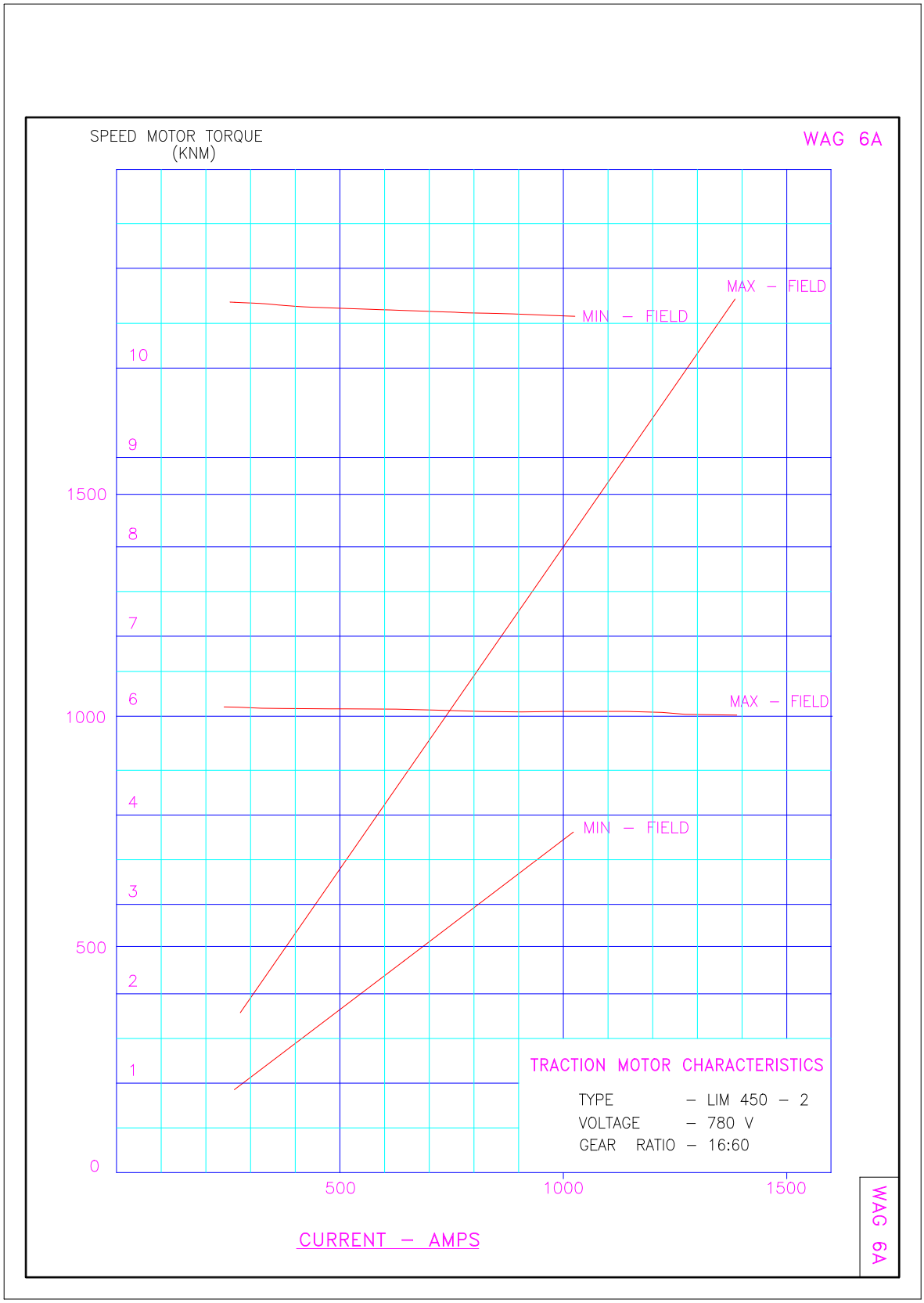
PROTECTIVE DEVICES

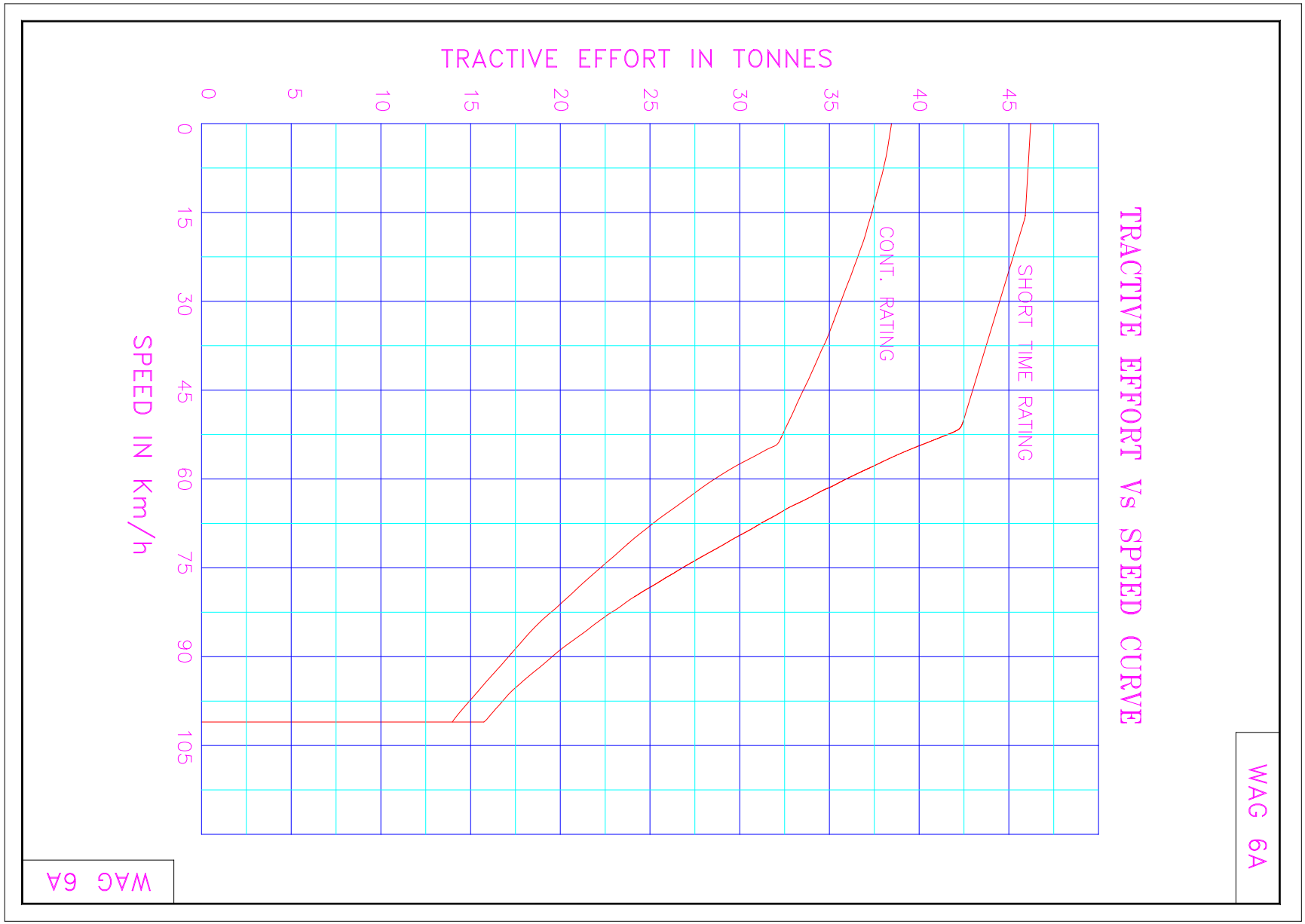
VIGILANCE CONTROL	YES
SLIP/SLIDE CONTROL	YES
MAIN OVERLOAD RELAY	YES
NO VOLT RELAY	YES
OVER VOLTAGE RELAY	YES
EARTH FAULT RELAY	YES
LOW Pr. Gov.	YES
BRAKE CYL. C/O VALVE	YES

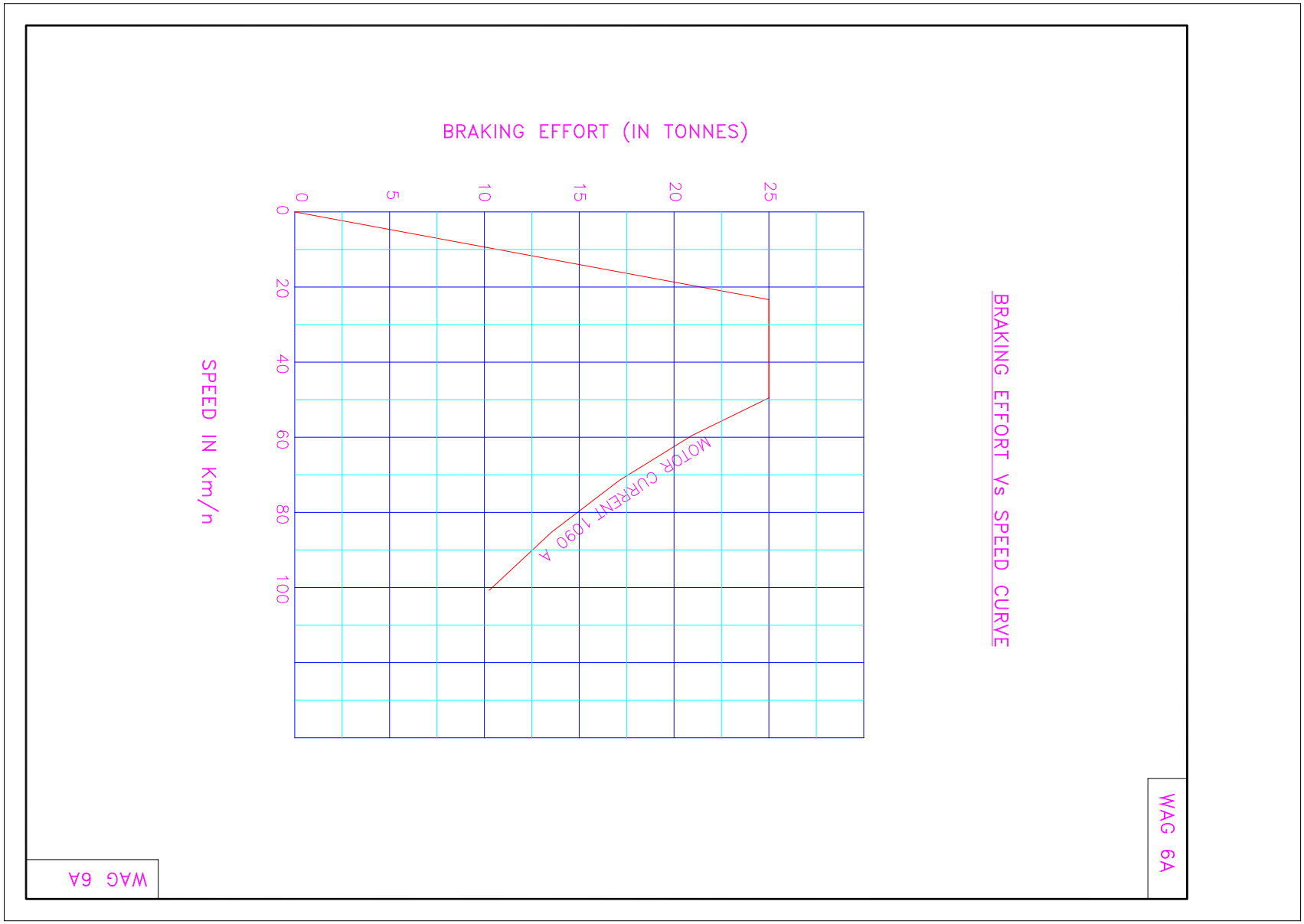
SMOOTHING REACTOR FOR TRACTION MOTOR:

NO.	2
Type :	–
RATING	1090 A/MOTOR
REACTANCE	6 x 2.9 mH with 10.90 A
RESISTANCE AT 110°C	–


WAG6A
IR
7
7
2700
6200
2700
D=1092
70.5966
2700
15100
19300
20600
12380
109.5
4170
3605
1676
3184
1. Pantograph
2. Main circuit breaker
3. Main transformer with smoothing reactor
4. Thyristor converter unit
5. Traction motor
6. Blower for trantion motor
7. Air inlets
8. Electrical cabinet (S7-S8)
9. Main compressors (2total)
10. Pnrumatic equipment
11. Exhauster
12. Cabin ventilator
13. Battery
14. Drivers cabin
15. Capacitors
16. Reactors
17. Braking resistor


SPEED MOTOR TORQUE
(KNM)
WAG 6A
MAX – FIELD
MIN – FIELD
MAX – FIELD
MIN – FIELD
10
9
8
7
6
4
3
2
1
0
1500
1000
500
500
1000
1500
CURRENT – AMPS
TRACTION MOTOR CHARACTERISTICS
TYPE – LIM 450 – 2
VOLTAGE – 780 V
GEAR RATIO – 16:60
WAG 6A


TRACTIVE EFFORT IN TONNES
0
5
10
15
20
25
30
35
40
45
SPEED IN Km/h
0
15
30
45
60
75
90
105
CONT. RATING
SHORT TIME RATING
TRACTIVE EFFORT Vs SPEED CURVE
WAG 6A
WAG 6A


BRAKING EFFORT (IN TONNES)
0
5
10
15
20
25
0
20
40
60
80
100
SPEED IN Km/n
MOTOR CURRENT 1090 A
BRAKING EFFORT Vs SPEED CURVE
WAG 6A
WAG 6A

WAG 6A

HAULAGE CAPACITY OF WAG 6A LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.75 (.....) T.M. LJM-450-2

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WEGONS (BOXN)	LEVEL	← ABOVE 7500 →							7450	5500			ABOVE 7500
		1/500	7500	7500	7500	7500	7500	6200	4850	3850	2950			7500
		1/200	5000	5000	5000	4950	4150	3550	2700	2200	1700			5000
		1/150	4200	4200	4200	3900	3300	2700	2150	1750	1400			4200
		1/100	3150	3150	2900	2700	2300	1900	1500	1250	1000			3150
		1/50	1650	1550	1500	1400	1150	950	750	600	500			1800

Dt	22.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 6B & C

CONT. RAIL P.S. 6050
BO-BO-BO TYPE WAG 6B & CO-CO TYPE
ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAG6B&C

BO–BO–BO TYPE WAG–6B & CO–CO TYPE WAG–6C CLASS ELECTRIC LOCOMOTIVE
1676mm gauge

Six WAG6B locomotives and six WAG–6C locomotives were ordered by IR on M/s Sumitomo Corporation, Japan as per RDSO'S Specification No. E–17/03. The first locomitive was put in service in 1988. The continuous Rail horse power of these locomotive is 6000 PS at 51.1 Kg/h. WAG–6B locomotive with bogie mounted tractrion motors and with coupling drive and WAG–5C locomotive with unidirectional axle hung nose suspended traction motors have been incorporated to achieve higher adhesion. The traction motors are forced ventilated and compound wound type do motors.

Speed control is achieved through phase angle control of thyristor convertor combined with separate control of field current.

Multiple connection of the locomotive is possible . These locomotives have microprocessor based control and fault indication system.

Air and dynamic brake system for locomotive and air brake for the train are provided.

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	TENDER SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
85/RSF/459/1/ (LT–33)	09.09.85	HITACHI JAPAN	1988	WAG6B–26010–26016 WAG60 26020–26025	E–17/03	WAG6B&C	WAG6B–6 WAG6C–6	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	TENDER SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WAG6B&C	Bo–Bo–Bo & Co–Co	85/RSF/459/1 (LT–33)	09.09.85	HITACHI	1988	WAG6B–260 10–26015 WAG6C–260 20–26025	E–17/03	WAG6B&C	WAG6C–6 WAG6C–6

WAG 6B–C

GENERAL

SYSTEM OF CURRENT –	A.C.
LINE VOLTAGE –	25000V
WEIGHT IN W.O. –	123t
ADHESIVE WEIGHT –	123t
AXLE LOAD	20.5t

CONTINUOUS RATING:

P.S. –	6050
T.E.–	32.0 t
SPEED –	51.1 km/h
MAX. T.E.	45.0 t
MAX. SPEEP	100.0 Km/h
WHEEL DIA –	NEW 1140mm
	Half WORN 1102mm
	Full worn 1065mm

BOGIE	WAG 6B	WAG 6C
DRIVE ARGT –	'WN' type –flexible coupling gear	through pinion gear 3 axle type
DESIGN	2–axle type of double stage suspension	of double stage suspension

SANDING	WAG 6B
	12
CAPACITY	40 litres

PANTOGRAPH

NO	2
MAKE	Faiveley
TYPE	LV2600
WEIGHT	215 kg

TRANSFORMER

MAKE	Hitachi
TYPE	AFIC–MS
NUMBER	1
WT. COMPLETE	9750 kgs.
COOLING	OFAF
INSULATION	A

RATING	
PRIMARY	6746 KVA 22.5KV, 299.8A
SECONDARY	6325 KVA 2x549V, 2x2880A
AUXILARY	264 KVA 377 V, 700A
FIELD EXCI–TATION	157 KVA 2x06 V, 380A
SUSPENSION	HOTEL LOAD

POWER CONVERTOR

NUMBER	2	
TYPE	Semi Controlled	
CONT. RATING	2x2448 KW,850V	
MAX. STARTING CURRENT	2x720A	
TYPE OF THYRISTOR	CGOIDA	
TYPE OF DIODE	DSP2500A	
CONNECTION	Bridge	
NO OF DIODES	WAG6B	WAG6C
	24	24
NO OF THYRISTORS	24	32

TRACTION MOTOR

MAKE	Hitachi	
TYPE	WAG6B –HS–15556–OIR	
	WAG6C –HS–15256–UIR	
NUMBER	6	
INSULATION	Class C	
SUSPENSION	WAG6B Bogie Mounted	
	WAG6C Axle hung nose	
	WAG6C Axle hung nose	
VENTILATION	Forced air	
WEIGHT	WAG6B	WAG6C
	3200kg	3650kg

GAURANTED TEMP. RISE	
ARMATURE	120°C
SERIES FIELD	135°C
INTER POLE	135°C
SEPARATE FIELD	140°C
COMMUTATOR	85°C
RESISTANCE AT 110°C	
ARMATURE	138 m
SERIES FIELD	4.91 m
ENTER POLE	8.9 m
SEPARATE FIELD	50.4 m
RATING—CONT.—	760 KW, 850V
	960A, 970 RPM
1 Hr.—	
AIR GAP	
MAIN POLE	9.7 mm
INTER POLE	11 mm
BRUSHES GRADE	EG 1055
NO. OF HOLDERS	6
BRUSH/HOLDER	3
SIZE	20mmx40mmx64mm
MIN. HEIGHT	
NEW	64 mm
WORN	25 mm
MOTOR GROUPING	6 motor in parallel
GEAR RATIO	16 : 68
AUXILIARIES	
HEAD LIGHT	2 Nos.,32V,200 W
BATTERY	Nickel—Cadmium
	72 Cells
	86.4V, 100 AH/5 h
AUXILIARY	Rotating Arno
CONVERTOR	
OUTPUT	415V,150KVA, 0.78PF
COMPRESSOR	
NO.	2
MAKE	NABCO
TYPE	CM—2041—C—2000M
CAPACITY	1580
MOTOR	2 Nos.
RATING	120KW, 415V, 1475 RPM
TRACTION MOTOR BLOWER	
NO.	2
MAKE	—
TYPE	POS—MH
CAPACITY	3310 m /min
MOTOR	2 Nos.
TYPE	DRTI—G
RATING	30KW, 415V,1450 RPM
SMOOTHING REACTOR BLOWER	
Smoothing reactor is housed in transformer tank.	
BRAKING RESISTOR BLOWER	
MAKE	CUTLER HAMMER
NO.	2
CAPACITY	330.6 m^3/min
MOTOR	2
RATING	1.5KW, 415V, 2950 RPM

TRANSFORMER OIL COOLER BLOWER

NO.		2
MAKE	–	Hitachi
CAPACITY	–	90m 3/min
MOTOR	–	2NOS.
RATING	–	4.5KW, 415V, 1450 RPM

POWER CONVERTOR BLOWER

NUMBER	–	2
MAKE	–	NARASHINO WORKS
CAPACITY	–	90 m3/min.
MOTOR	–	2 Nos.
RATING	–	3.0 KW, 415V, 1450 RPM

TRANSFORMER OIL PUMP

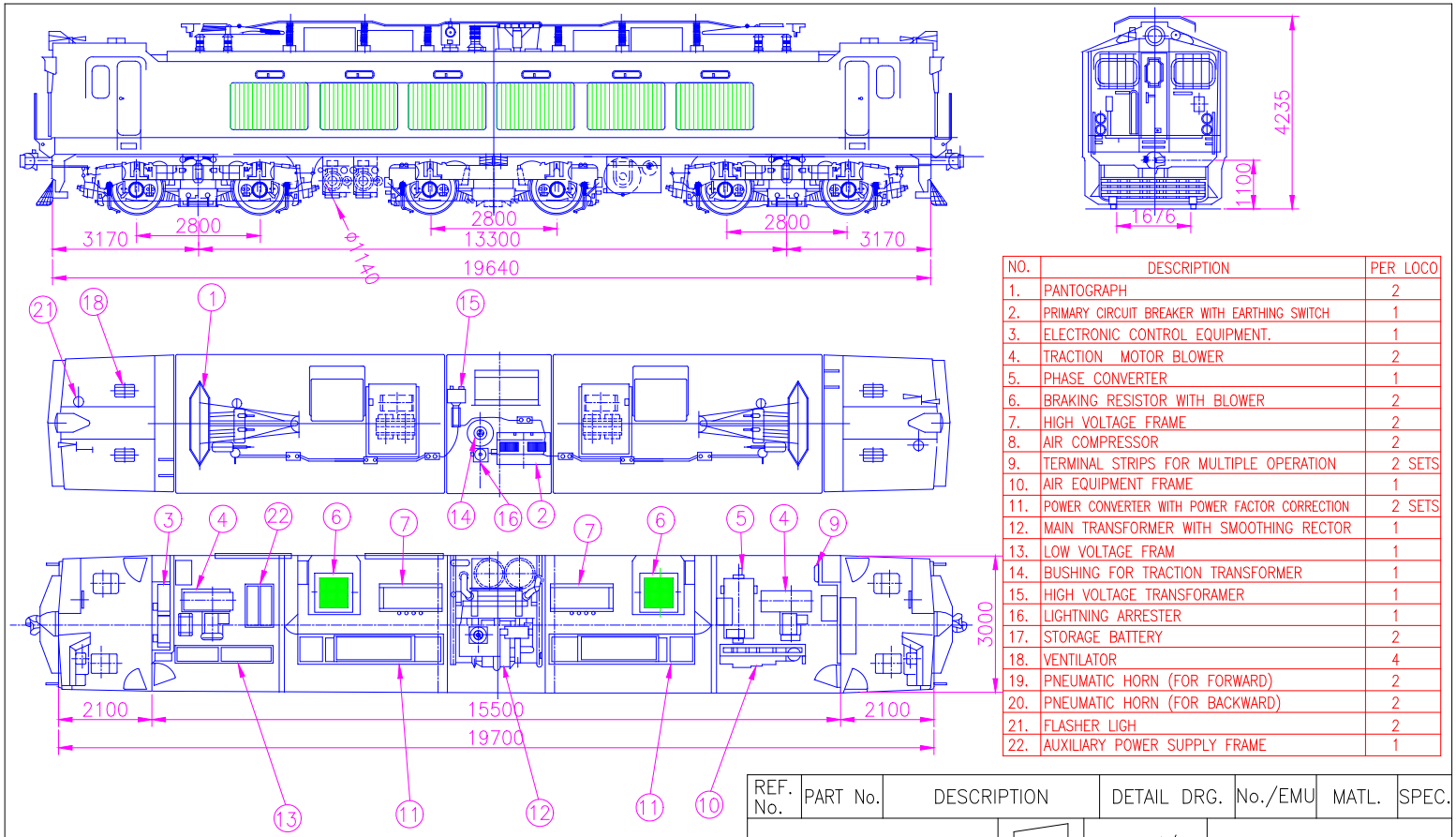
NUMBER	–	1
MAKE	–	TEIKOKU ELECT. CO.
CAPACITY	–	1000 l/min.
MOTOR	–	1 Nos.
RATING	–	3KW, 415, 1450 RPM

SMOOTHING REACTOR FOR TRACTION MOTOR

NO.	2
TYPE	AFIC–FXW/Hitachi
RATING	960A/motor
REACTANCE	2.976 mH/Traction Motor
RESISTANCE AT 75°C	0.00895 / Traction Motor

PROTECTIVE DEVICES

VIGILANCE CONTROL	YES
SLIP/SLIDE CONTROL	YES
MAIN OVEREAD RELAY	YES
NO. VOLT RELAY	YES
OVERVOLTAGE RELAY	YES
EARTH FAULT RELAY	YES
LOW Pr. GOVERNOR	YES
BRAKE CYLINDER C/S VALVE	YES



NO.	DESCRIPTION	PER LOCO
1.	PANTOGRAPH	2
2.	PRIMARY CIRCUIT BREAKER WITH EARTHING SWITCH	1
3.	ELECTRONIC CONTROL EQUIPMENT.	1
4.	TRACTION MOTOR BLOWER	2
5.	PHASE CONVERTER	1
6.	BRAKING RESISTOR WITH BLOWER	2
7.	HIGH VOLTAGE FRAME	2
8.	AIR COMPRESSOR	2
9.	TERMINAL STRIPS FOR MULTIPLE OPERATION	2 SETS
10.	AIR EQUIPMENT FRAME	1
11.	POWER CONVERTER WITH POWER FACTOR CORRECTION	2 SETS
12.	MAIN TRANSFORMER WITH SMOOTHING RECTOR	1
13.	LOW VOLTAGE FRAM	1
14.	BUSHING FOR TRACTION TRANSFORMER	1
15.	HIGH VOLTAGE TRANSFORAMER	1
16.	LIGHTNING ARRESTER	1
17.	STORAGE BATTERY	2
18.	VENTILATOR	4
19.	PNEUMATIC HORN (FOR FORWARD)	2
20.	PNEUMATIC HORN (FOR BACKWARD)	2
21.	FLASHER LIGH	2
22.	AUXILIARY POWER SUPPLY FRAME	1

REF. No.	PART No.	DESCRIPTION	DETAIL DRG.	No./EMU	MATL.	SPEC.

REF. | SCALE 1/40 | APPD. BY (FOR DG.)

GENERAL ARRANGEMENT

FIRST ISSUED

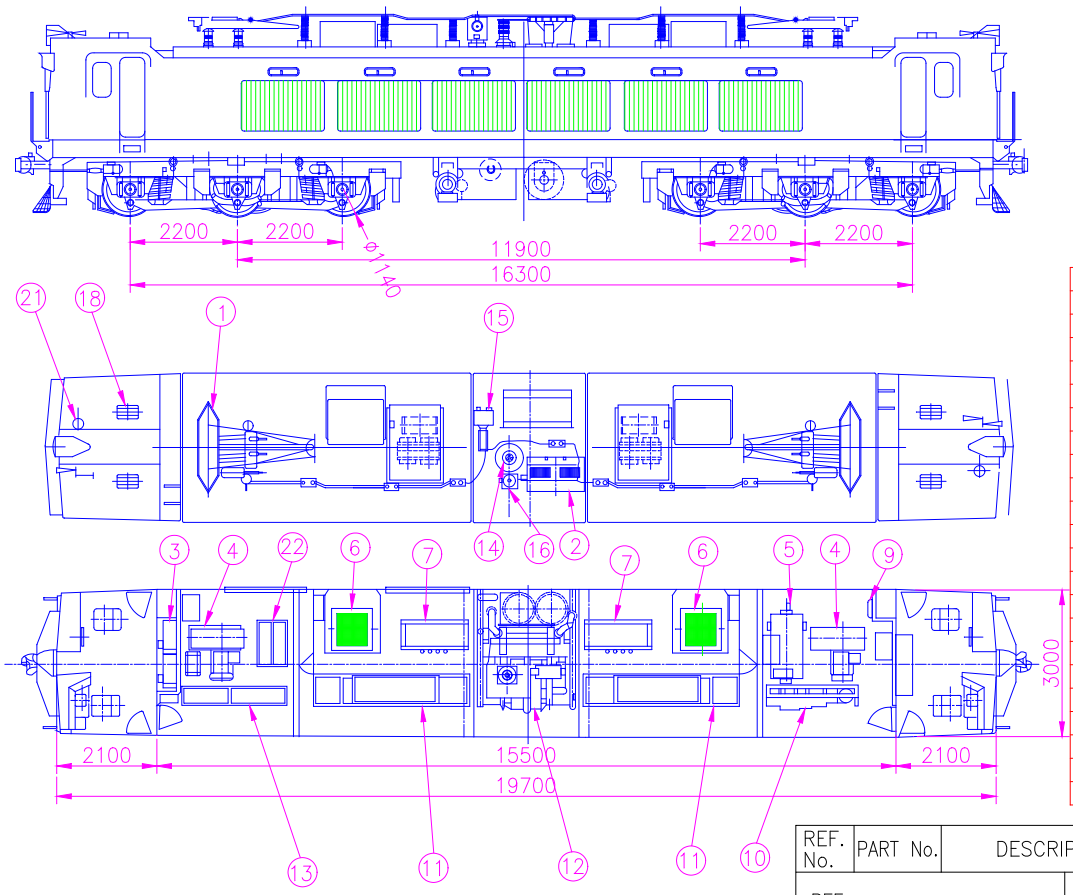
SUPEREDES

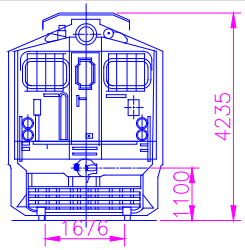
DRG. No. WAG6b A002

SUPEREDES BY

Dt.	
D	
C	
T	

STATUS	ALT.	REF.No.	DESCRIPTION	APPD.BY	DATE





NO.	DESCRIPTION	PER LOCO
1.	PANTOGRAPH	2
2.	PRIMARY CIRCUIT BREAKER WITH EARTHING SWITCH	1
3.	ELECTRONIC CONTROL EQUIPMENT.	1
4.	TRACTION MOTOR BLOWER	2
5.	PHASE CONVERTER	1
6.	BRAKING RESISTOR WITH BLOWER	2
7.	HIGH VOLTAGE FRAME	2
8.	AIR COMPRESSOR	2
9.	TERMINAL STRIPS FOR MULTIPLE OPERATION	2 SETS
10.	AIR EQUIPMENT FRAME	1
11.	POWER CONVERTER WITH POWER FACTOR CORRECTION	1
12.	MAIN TRANSFORMER WITH SMOOTHING RECTION	1
13.	LOW VOLTAGE FRAM	1
14.	BUSHING FOR TRACTION TRANSFORAMER	1
15.	HIGH VOLTAGE TRANSFORAMER	1
16.	LIGHTNING ARRESTER	1
17.	STORAGE BATTERY	2
18.	VENTILATOR	4
19.	PNEUMATIC HORN (FOR FORWARD)	2
20.	PNEUMATIC HORN (FOR BACKWARD)	2
21.	FLASHER LIGH	2
22.	AUXILIARY POWER SUPPLY FRAME	1

REF. No.	PART No.	DESCRIPTION	DETAIL DRG.	No./EMU	MATL.	SPEC.

REF. | SCALE 1/40 | APPD. BY (FOR DG.)

GENERAL ARRANGEMENT

FIRST ISSUED

SUPEREDES

DRG. No. WAG6c A002

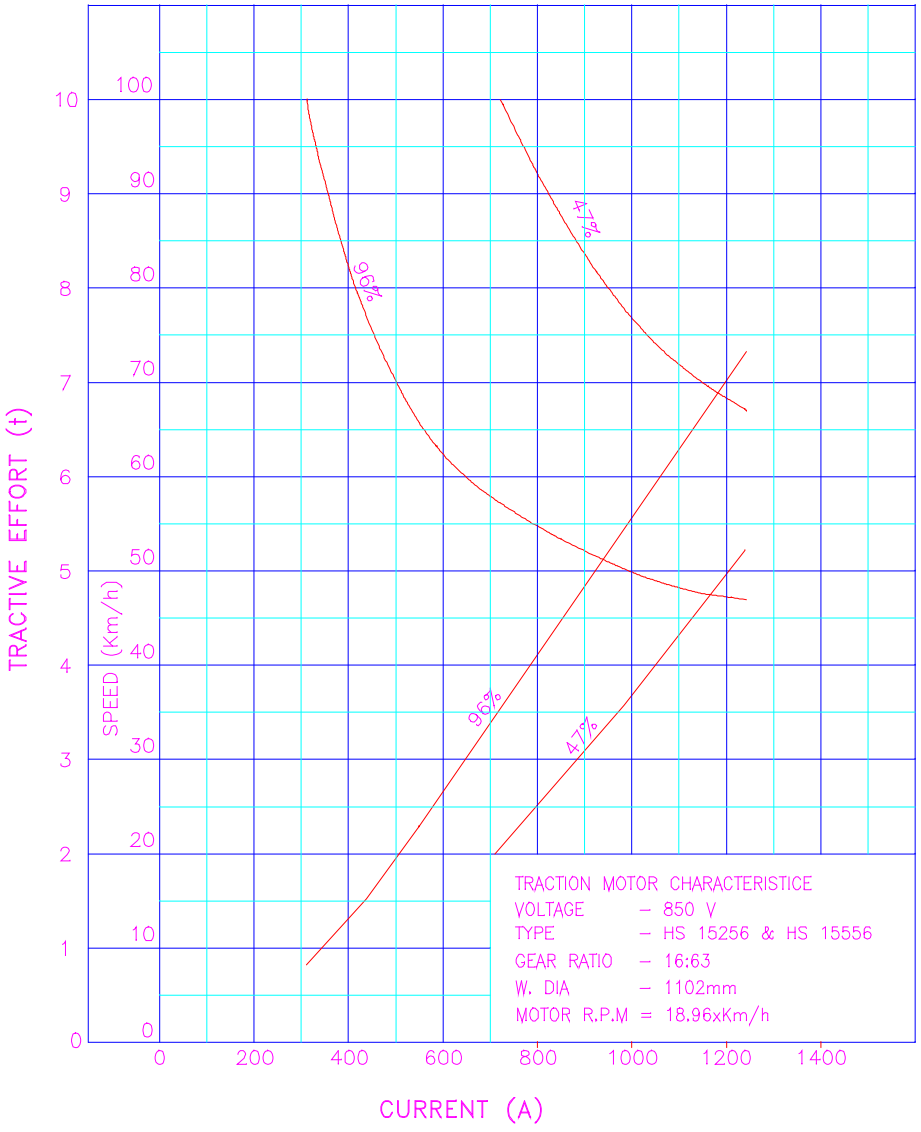
SUPEREDES BY

Dt.	
D	
C	
T	

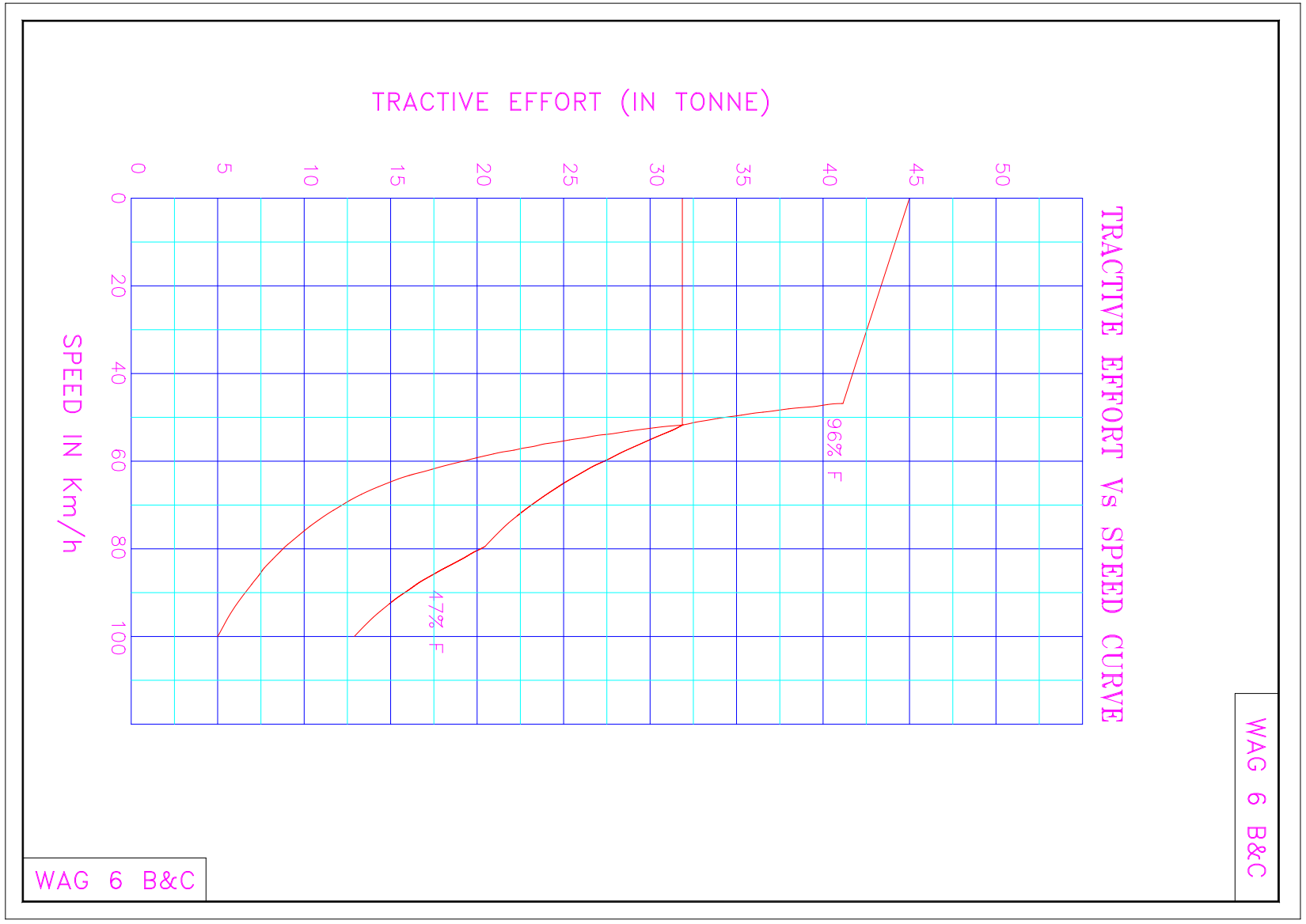
STATUS	ALT.	REF.No.	DESCRIPTION	APPD.BY	DATE

WAG 6 B&C

MAX. SERVICE SPEED – 1896 R.P.M.



WAG-6 B&C


TRACTIVE EFFORT (IN TONNE)
0
5
10
15
20
25
30
35
40
45
50
SPEED IN Km/h
0
20
40
60
80
100
96% F
47% F
TRACTIVE EFFORT Vs SPEED CURVE
WAG 6 B&C
WAG 6 B&C

BRAKING EFFORT (IN TONNES)
0
5
10
15
20
SPEED IN Km/h
0
20
40
60
80
100
MOTOR CURRENT 960 A
BRAKING EFFORT Vs SPEED CURVE
WAG6 B&C
WAG6 B&C

WAG 6B&C

HAULAGE CAPACITY OF WAG 6B&C LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.94 (.....) T.M. WAG6B-HS-15556-O/R
WAG6C-HS-15256-O/R

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WEGONS (BOXN)	LEVEL	← ABOVE 7500 →							6800	4900			ABOVE 7500
		1/500	7300	7300	7300	7300	7300	5950	4900	3500	2600			7300
		1/200	4800	4800	4800	4800	4100	3250	2700	2000	1500			4800
		1/150	4100	4000	3950	3850	3150	2600	2150	1600	1200			4100
		1/100	2800	2750	2700	2700	2200	1800	1550	1100	850			3100
		1/50	1400	1400	1400	1350	1100	950	800	550	400			1750

Dt	22.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 7

CONT. RAIL P.S. 5000
CO-CO TYPE WAG7 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

CO–CO TYPE WAG7 ELECTRIC LOCOMOTIVE 1676 mm GAUGE

1. First prototype of this class of locomotive turned out by CLW is 1992 based on RDSO design.

High adhesion bogies with uni–directional, axle hung, nose suspinded traction motor has been used on this locomotive to achieve high tractice effort. A higher rated smoothing reactor type SL–30 to suit the higher current has been used.

Hitachi traction motor type H.S. 15250A have been permanently connected in parallel and speed control is achieved through a tap–changer and by field weakening. Four locomotives can work in multiple operation.

Locomotive is provided with air and dynamic brake however, it can haul vacuum as well as air brake stock.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	TENDER SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
–	–	RDSO/CLW	1992	27001	RDSO 17/17	WAG.7	2	Prototype

MAIN PARTICULARS OF LOCO

WAG7

GENERAL

System of current	—	AC
Line Voltage	—	25000V
Weight In WO	—	123t
Adhesive weight	—	123t
Max.Axle Load	—	20.5t
Min.Axle Load	—	

CONTINUOUS RATING

PS	—	5000
TE	—	30800Kg
Speed	—	45 kmph
Max. TE	—	44t
Max. Speed	—	100 Kmph(Des)
Wheel dia Half worn	—	1055 mm
Full worn	—	1016 mm
New	—	1092 mm

BOGIE

Drive Arrgt.	—	Gear Pinion
Design	—	3 Axle fabri-cated box type With cross transom

BRAKES

Loco	—	Air,Hand, Rheos.
Train	—	Vacuum

SANDING

No. of Boxes	—	8
Capacity	—	

PANTOGRAPH

No.	—	2
Make	—	Stone India/ Calcutta
Type	—	AN-12
Weight (including 4 insulators)	—	285 kg.

TRANSFORMER

Make	—	CCL
Type	—	CGTT-5400
Wt. Complete	—	12200kg.
Cooling	—	Forced Oil
Insulation	—	A
Tapson HT	—	32

Rating

Primary	—	5670KVA 22.5 KV,252A
Secondary	—	5400KVA 1000V,5400A
TERTIARY	—	270V

SILICON RECTIFIER

No.	—	2
Cont.Rating	—	2700A(each cubicle) 1050V
Max.Starting current	—	3300A RMS
Cooling	—	Forced air
Type of cell	—	S18FN350 M/s.Hind Rectifier
No. of cells	—	64 PER BRIDGE S P A 2 8 4

TRACTION MOTORS

Make	—	CLW/BHEL
Type	—	HS-15250A
No.	—	6
Class of insulation :-		
Arm	—	C
Field	—	C
Suspension	—	Axle hung nose Suspended
Ventilation	—	Forced 80m^3/mt.
Weight complete	—	3650kg
Temp.Rise Arm	—	90°c
Field	—	70°c
Comm.	—	85°c
Coil Resist. at 110°c:-		
Arm	—	0.0126 ohms
Main Pole	—	0.0117 ohms
Inter pole	—	0.0089 ohms
Rating:Cont.	—	630kw,750v 900A, 895 rpm
1 Hour	—	670KW,750V, 960A,877 rpm
Air gap :	—	
Main Pole	—	6.35 mm
Inter Pole	—	10 mm

Brushes

Grade	—	EG1055/BG 1165 (Morganite)
Type	—	2 spilt
No.of holders	—	6, br.per holder
Size	—	200 x 40 x 64mm
Br. Wear Limit	—	25 mm
Length	—	

MOTOR GROUPING

6 Motors in Parallel

Gear Ratio	—	65:18
Permanent shunt	—	5%

AUXILIARIES

Head Light	—	2 Nos. 32V,250W
Battery	—	Lead Acid 50 cells 110V,75AH (5 Hr.Rate)
380/32,24V,	—	Transformer 16V, 50C/S, 500VA
Arno Convertor	—	1 Nos.
1 Phase	—	216KVA,415V, 520A.
3 Phase	—	150KVA,415V, 210A,1485RPM

COMPRESSOR

No.	—	2
Make	—	Rigi
Type	—	TRC–2000
Capacity	—	2000/1/m at 10.5 Kg/cm sq.
Motor	—	2 Nos.30 HP, 415V,930RPM.

EXHAUSTER

No.	—	2
Make	—	Northey
Type	—	250 RE
Capacity	—	4500 l/m
Motor	—	2 Nos. 7.5KW 415V, 970RPM.

TRACTION MOTOR BLOWER

No.	—	2
Make	—	SF (I) Ltd.
Type		MLBRx–42–5–1–H4
Air	—	276m^3/min at
delivery	—	308mm WG

Motor

No.	—	2
Make	—	Siemens
Rating	—	415V,26KW,50A 2920 RPM

SMOOTHING REACTOR BLOWER

No.	—	2
Make	—	SF (I) Ltd.
Type	—	PFT–59
Capacity	—	4200m^3/min at
Motor	—	2.2KW, 415V, 2 Nos.,2860RPM

BREAKING RESISTOR BLOWER

Make	—	KEC
No.	—	2
Type	—	KDBR–1
Capacity	—	510m^3/min. at 200 mmWG
Motor	—	1 No.30KW,450V DC 76A,3300RPM

SILICON RECTIFIER BLOWER

No.	—	2
Make	—	SF (I) Ltd.
Type	—	PHMX–40–6
Capacity	—	3100to3200 m^3/HR at 45 to 47 mmWG
Motor	—	2 Nos. 2.2KW, 415V, 4.8A, 2860 RPM

COIL COOLER BLOWER

No.	—	1
Make	—	SF (I) Ltd.
Type	—	MLBH–60–1–H2
Capacity	—	22,200 m^3/hr. at 190 mmWG
Motor	—	22KW, 415V, 45A, 1450 RPM, 1 No.

OIL PUMP FOR TRANSFORMER

No.	—	1
Make	—	Best & Co.Pvt.Ltd.
Capacity	—	740 l/m at 11000mmWG
Motor	—	1 No., 3.2KW, 415V,2865 RPM.

SMOOTHING REACTOR FOR TM

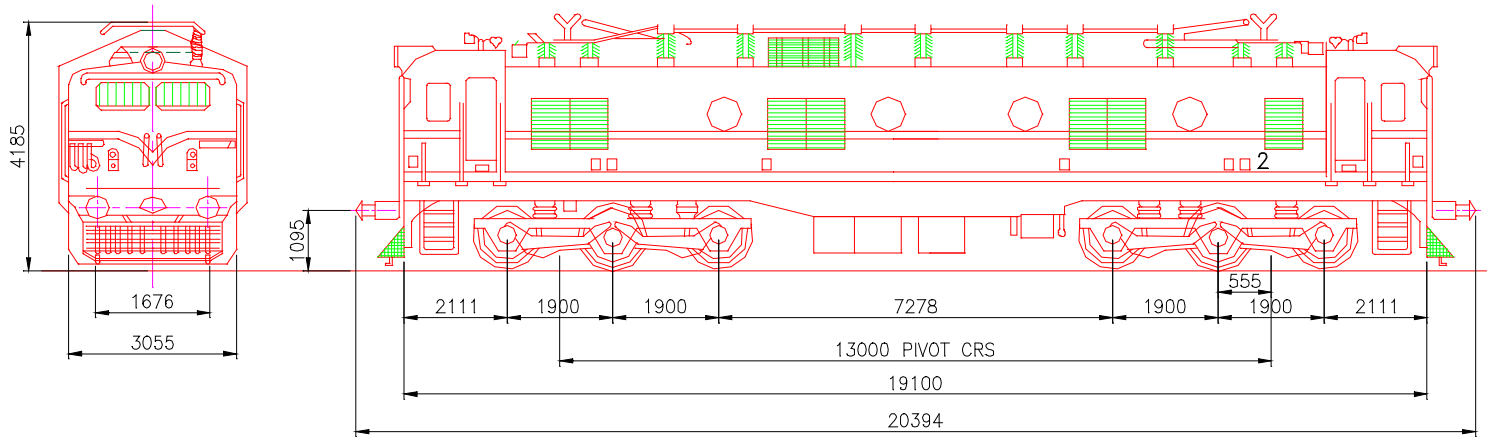
No.	—	2
Type	—	SL 30
Rating	—	1250V,1350A
Reactance	—	2.68 mH.

Resistance at 110°c–0.00344 ohms

PROTECTIVE DEVICE

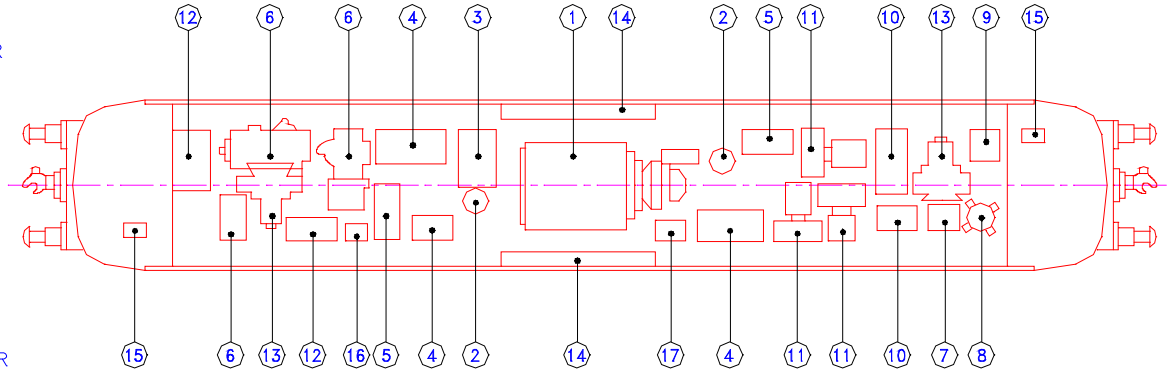
Dead Man Control	—	No
Slip Control	—	Yes
Main overload Relay	—	Yes
Other Voltage Relay	—	Yes
No Volt Relay	—	Yes
Earth Fault Relay	—	Yes
Low.Pressure Gov.	—	Yes
Vacuum Control Gov	—	Yes
Brake Cy. C/O Valve	—	Yes

WAG-5 UPGRADED (WAG-7)

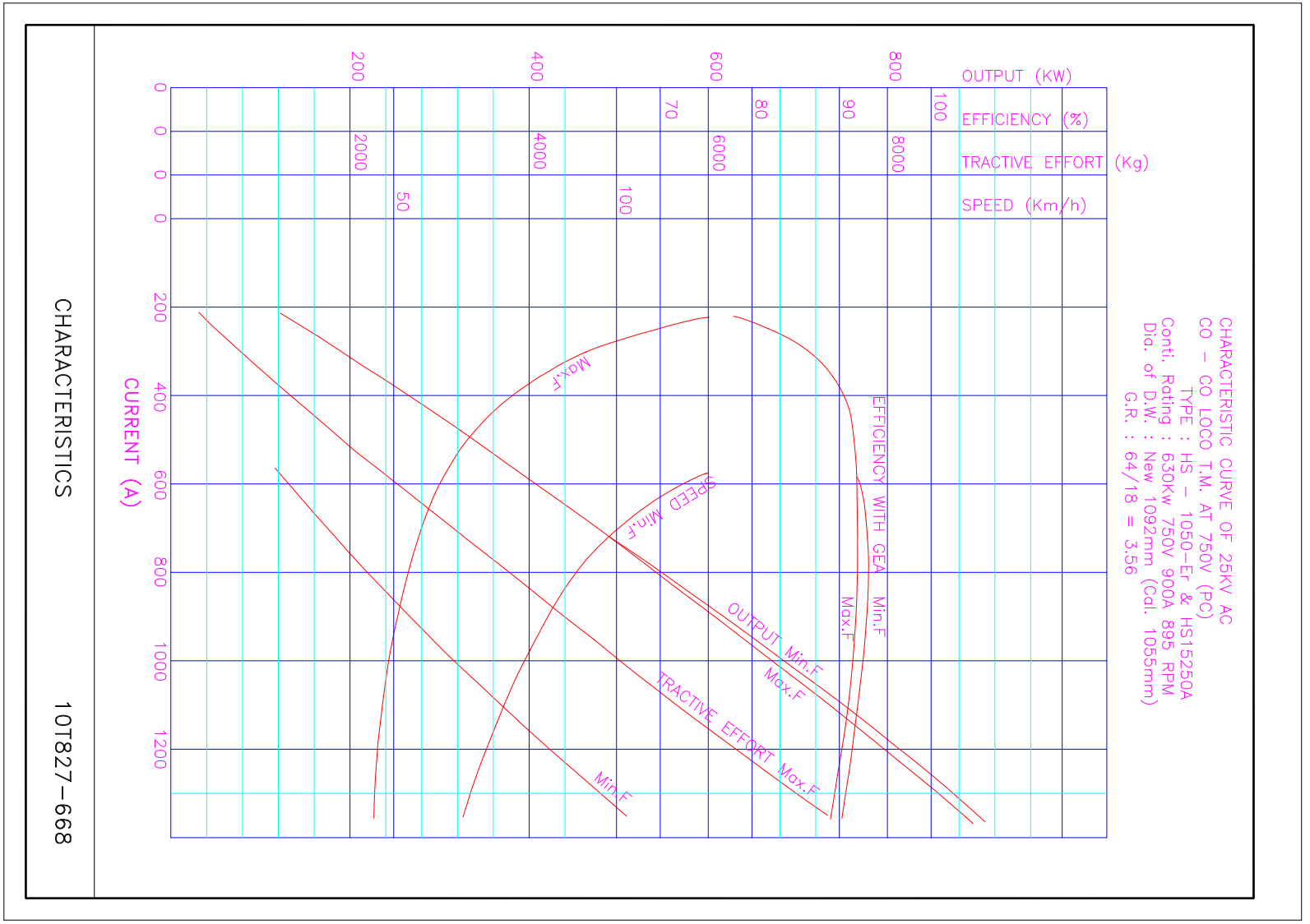


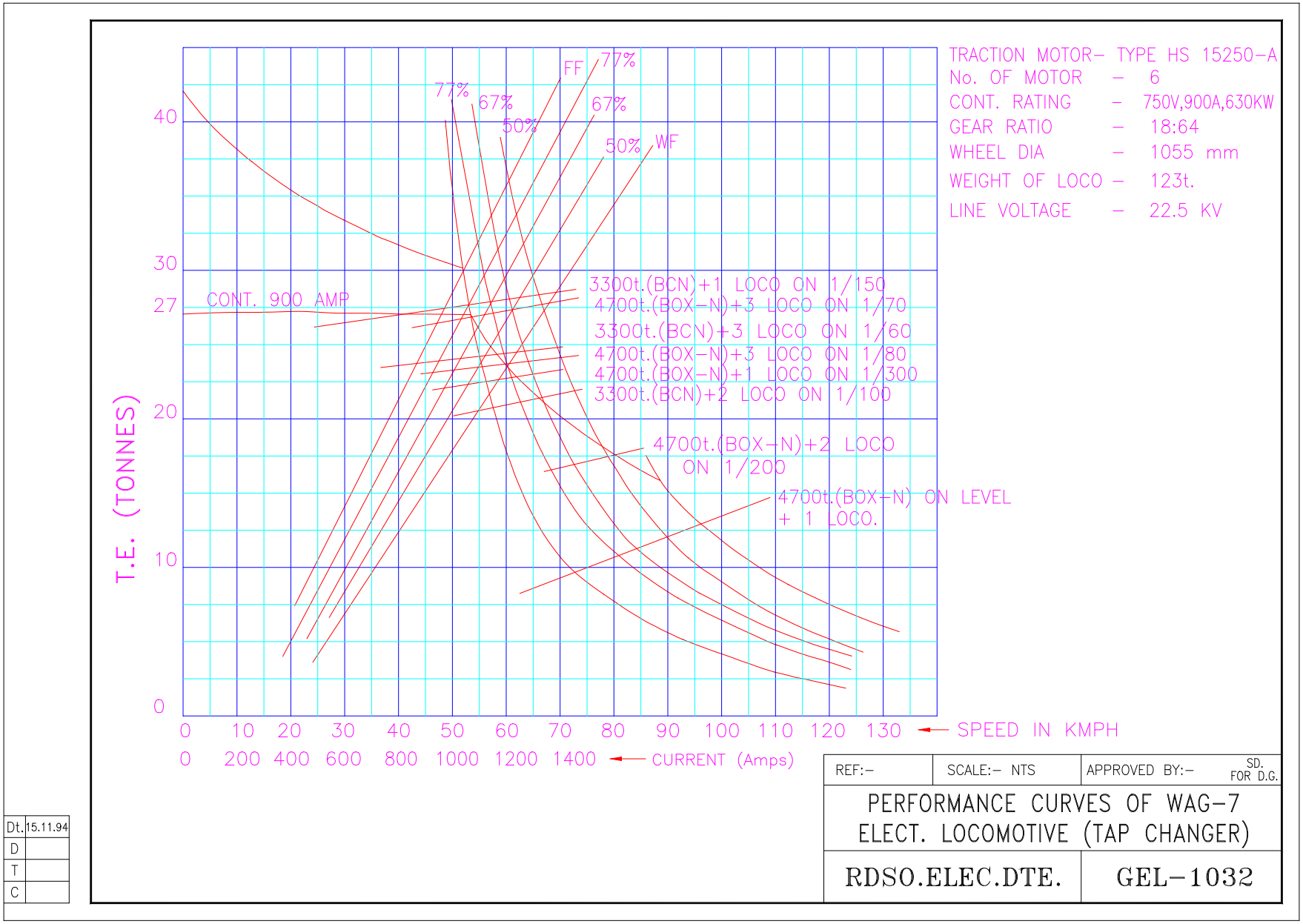
ITEM NO. DESCRIPTION

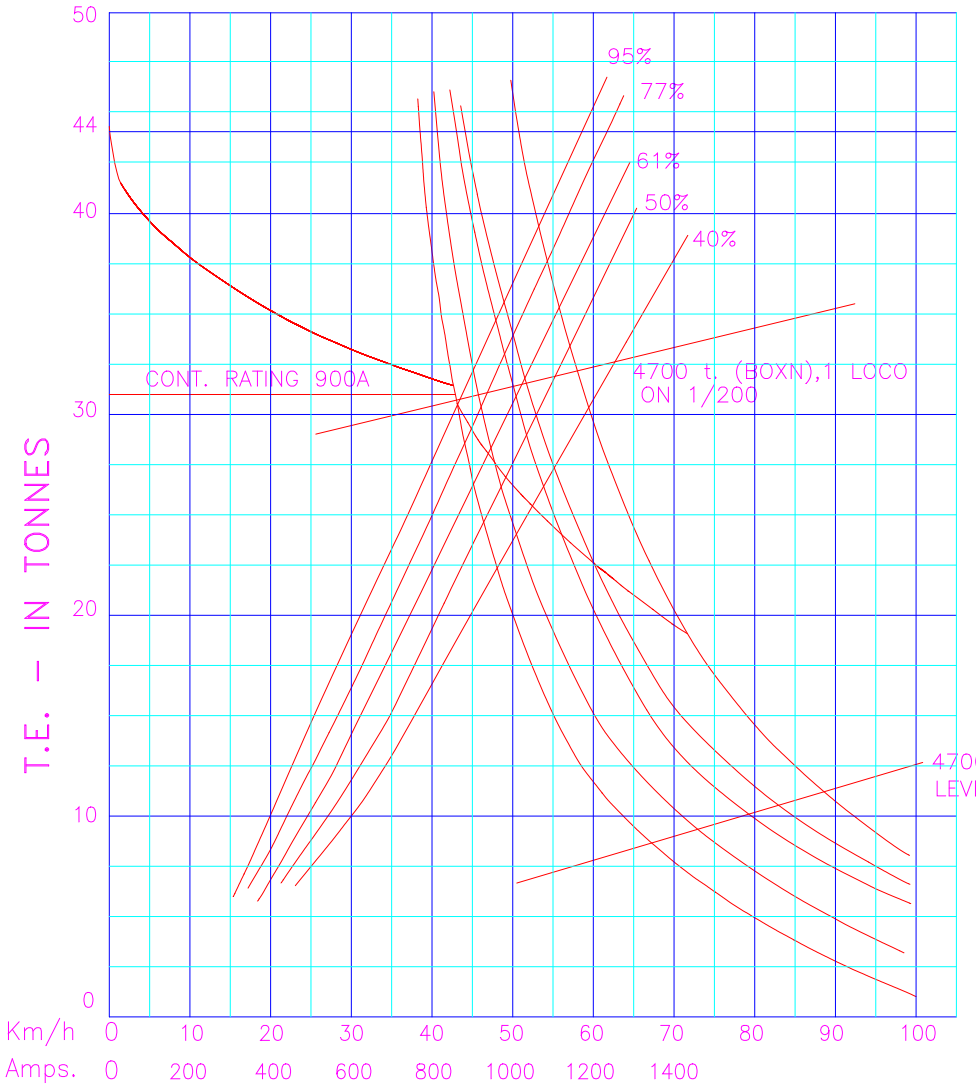
1. MAIN TRANSFORMER
2. SMOOTHING REACTOR
3. DYNAMIC BRAKE RESISTER
4. H.T. PANNEL
5. RECTIFIER.
6. EXHAUSTER.
7. BATTERY CHARGER.
8. ARNO.
9. ARNO STARTING RESISTER
10. PNEUMATIC PANNELS. (BRAKE & CONTROL.)
11. MAIN COMPRESSOR.
12. L.T. PANNELS.
13. T.M. BLOWERS.
14. BATTERIES. (Ni cd.)
15. DRIVERS SEAT
16. HEAD LIGHT TRANSFORMER
17. DAMPING NET WORK.



Dt.	15.02.91
D	---
T	--
C	----


CHARACTERISTIC CURVE OF 25KV AC
CO – CO LOCO T.M. AT 750V (PC)
TYPE : HS – 1050–Er & HS15250A
Conti. Rating : 630Kw 750V 900A 895 RPM
Dia. of D.W. : New 1092mm (Cal. 1055mm)
G.R. : 64/18 = 3.56
OUTPUT (KW)
EFFICIENCY (%)
TRACTIVE EFFORT (Kg)
SPEED (Km/h)
CURRENT (A)
Max.F
EFFICIENCY WITH GEA Min.F
Max.F
OUTPUT Min.F
Max.F
TRACTIVE EFFORT Max.F
Min.F
SPEED Min.F
CHARACTERISTICS
10T827–668


TRACTION MOTOR– TYPE HS 15250–A
No. OF MOTOR – 6
CONT. RATING – 750V,900A,630KW
GEAR RATIO – 18:64
WHEEL DIA – 1055 mm
WEIGHT OF LOCO – 123t.
LINE VOLTAGE – 22.5 KV
T.E. (TONNES)
40
30
27
20
10
0
CONT. 900 AMP
FF
77%
67%
50%
WF
3300t.(BCN)+1 LOCO ON 1/150
4700t.(BOX–N)+3 LOCO ON 1/70
3300t.(BCN)+3 LOCO ON 1/60
4700t.(BOX–N)+3 LOCO ON 1/80
4700t.(BOX–N)+1 LOCO ON 1/300
3300t.(BCN)+2 LOCO ON 1/100
4700t.(BOX–N)+2 LOCO ON 1/200
4700t.(BOX–N) ON LEVEL + 1 LOCO.
0 10 20 30 40 50 60 70 80 90 100 110 120 130
SPEED IN KMPH
0 200 400 600 800 1000 1200 1400
CURRENT (Amps)
REF:–
SCALE:– NTS
APPROVED BY:– SD. FOR D.G.
PERFORMANCE CURVES OF WAG–7
ELECT. LOCOMOTIVE (TAP CHANGER)
RDSO.ELEC.DTE.
GEL–1032
Dt. 15.11.94
D
T
C



TRACTION MOTOR – HS 15250A
No. OF MOTOR – 6
CONT. RATING – 750V, 900A
GEAR RATIO – 16:65
WHEEL DIA – 1055 mm
WEIGHT OF LOCO – 123 t
LINE VOLTAGE – 22.5 Kv
TRANSFORMER – 5400 KVA
STARTING T.E.44.0 t AS PER REPORT No.M–531

REF:–	SCALE:– N.T.S.	APPROVED BY:– SD. FOR D.G.

PERFORMANCE CURVES OF WAG7

RDSO.ELEC.DTE. GEL–1077

Dt.	20.3.98
D	
T	
C	

WAG 7

HAULAGE CAPACITY OF WAG 7(TAP CHANGR) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.55 (18:64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 7500 →							5236	3732			ABOVE 7500
		1/500	5859	5859	5859	5859	5765	4555	3808	2714	2003			5859
		1/200	4065	4065	4065	3982	3125	2510	2135	1540	1148			4065
		1/150	3330	3272	3210	3145	2476	1995	1703	1229	916			3468
		1/100	2294	2265	2234	2201	1736	1401	1198	861	638			2669
		1/50	1149	1140	1131	1121	879	704	599	419	300			1512
	BOGIE WEGONS (BOXN)	LEVEL	← ABOVE 7500 →							5404	3793			ABOVE 7500
		1/500	6836	6836	6836	6836	6016	4712	3904	2759	2021			6836
		1/200	4433	4328	4209	4088	3198	2558	2166	1555	1154			4516
		1/150	3425	3361	3288	3212	2523	2026	1723	1238	920			3790
		1/100	2340	2308	2272	2233	1759	1416	1208	866	640			2859
		1/50	1161	1152	1141	1130	885	708	602	420	300			1575

Dt	22.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAG 7

HAULAGE CAPACITY OF WAG 7 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:4.06 (16:65) T.M. HS-15250A LOCO WT 123T

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)									START *
			20	30	40	50	60	70	80	90	100	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL										
		1/500										
		1/200										
		1/150										
		1/100										
		1/50										
	BOGIE WAGONS (BOX)	LEVEL										
		1/500										
		1/200										
		1/150										
		1/100										
		1/50										
	BOGIE WEGONS (BOXN)	LEVEL	← ABOVE 7500 →						7302	4619	2785	10815
		1/500	7169	7169	7169	7169	6192	5005	3465	2345	1465	7169
		1/200	4738	4738	4738	4085	3285	2715	1915	1295	820	4738
		1/150	3960	3880	3795	3210	2590	2150	1515	1020	645	3977
		1/100	2705	2665	2625	2225	1805	1500	1055	725	450	3002
		1/50	1345	1335	1320	1120	905	750	515			1700

* 44T starting TE as per RDSO report No. M-531

Dt	
D	
T	
C	

WAG 7H

CONT. RAIL P.S. 5000
CO-CO TYPE WAG 7H ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Annexure–I

WAG–7H

CO–CO TYPE WAG7H ELECTRIC LOCOMOTIVE 1676 MM GAUGE

1. First prototype of this class of locomotive turned out by CLW in 1995 based on RDSO design.

High adhesion bogies with uni–directional, axle hung, nose suspended traction motor has been used on this locomotive to achieve high tractive effort, a higher rated smoothing reactor type SL–30 to suit the higher current has been used. Underframe of loco has been provided with higher thickness plates to increase the weight of loco so to extract higher starting tractive effort.

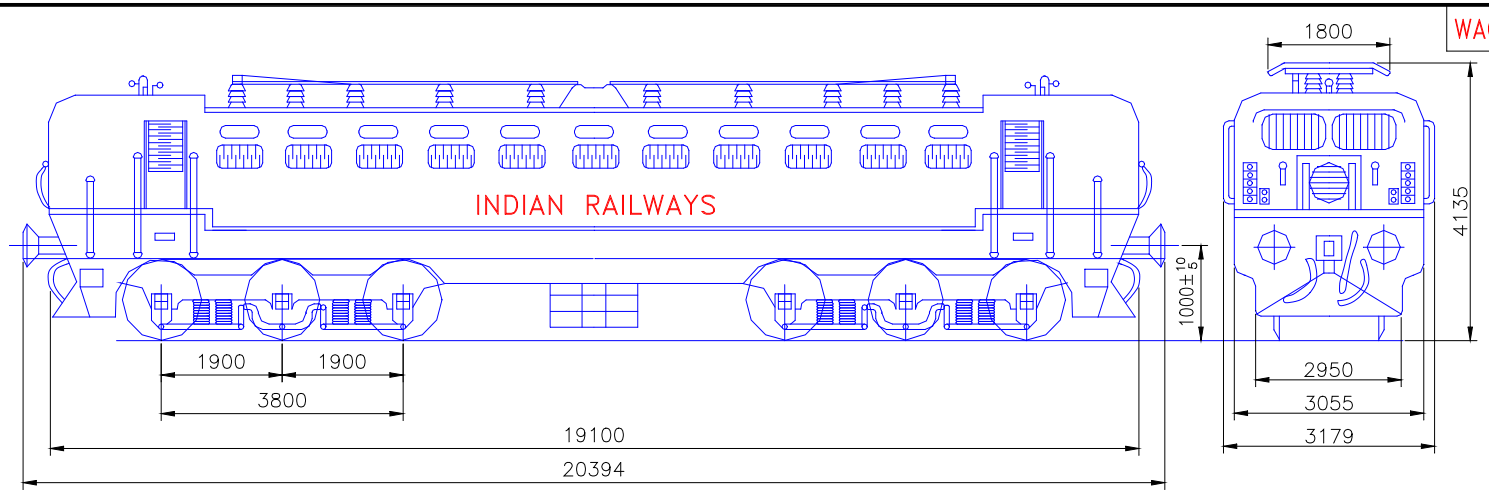
Hitachi traction motor type H.S. 15250A have been permanently connected in parrallel and speed control is achieved through a tap–changer and by field weakening. Four locomotives can work in multiple operation.

Locomotive is provided with air and dynamic brake.

PROCUREMENT PARTICULARS

Contracts		BUILDER	Year put in line	I. R. Loco Numbers	Particular Spec. No.	As Made drawing set	Total No. Ordered.	Remarks
Number	Date							
–	–	RDSO/CLW	1995	27061	–	WAH7H	2	Prototype OSC. Trial conductor on 27002 ofter ballasting

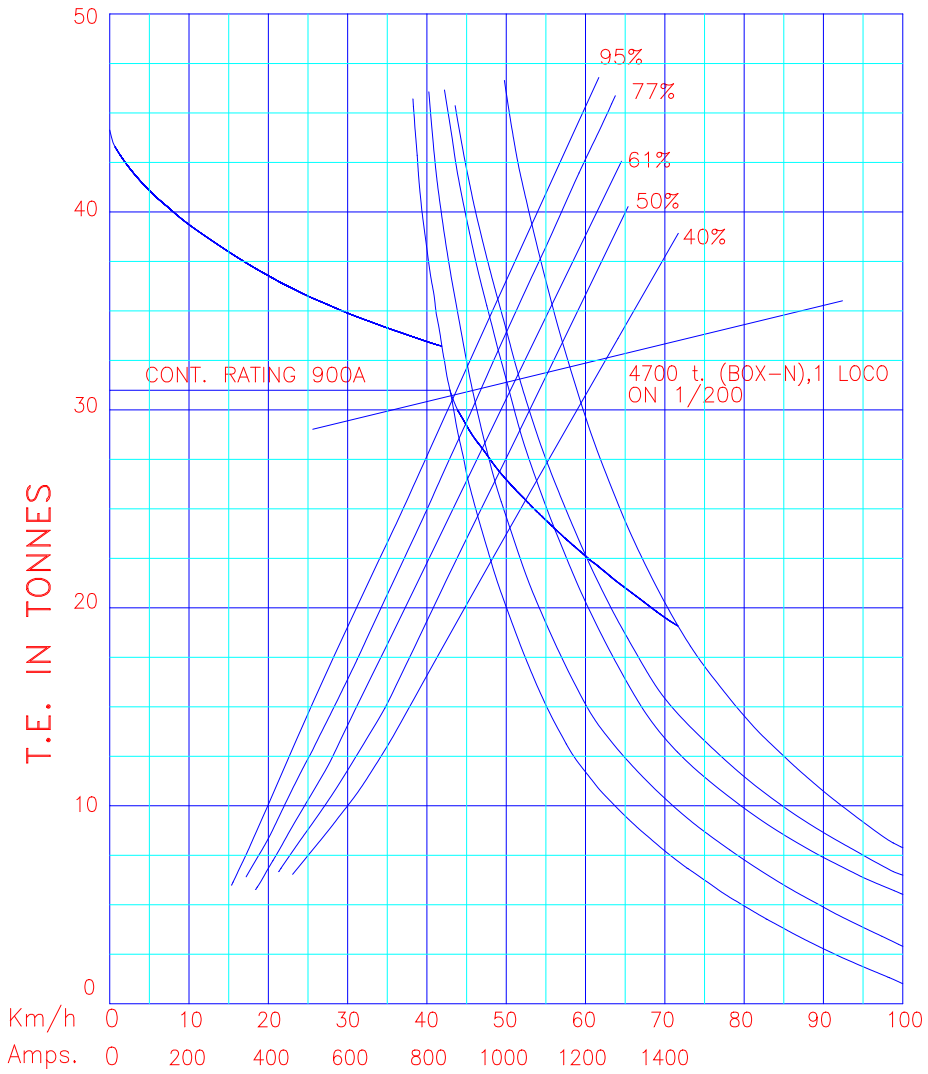
WAG7H



LOCO DIAGRAM WAG 7H – 5000 H.P. FREIGHT LOCO

1.	TYPE OF SERVICE	FREIGHT
2.	CLASS OF LOCO	WAG 7H
3.	TYPE OF BOGIE	HIGH ADHFSION FABRICATED UNIDIRECTIONAL BOGIE
4.	TRACK GAUGE	1676 mm
5.	LENGTH OF BUFFERS	20394 mm
6.	WHEEL BASE	3800 mm
7.	TOTEL H.P. OF LOCO (CONT.RATED)	5000
8.	MAX.TRACTIVE EFFORT AT CONT.SPEED OF 44Kmph	91 TONNE
9.	MAX.STARTING TRACTIVE EFFORT	45 TONNE
10.	MAX.UPLRATING SPEED	100 Kmph (DESIGNED)
11.	BRAKE SYSTEM	AIR BRAKE/HAND BRAKE
12.	MAX.AXLE LOAD	22 TONNE ±2%
13.	TOTAL WIDTH OF LOCO	9179 mm
14.	PANTO HEIGHT IN LOCKED DOWN CONDITION	4155 mm
15.	TOTAL WEIGHT OF LOCO	132 TONNE ±1%
16.	TRACTION MOTOR	HITACHI TYPE HS 15250-G
17.	NO. OF MOTORS	6
18.	CONT. RATING	150 V, 900 AMP
19.	WHEEL DIA	1092NEW (1055 HALF WORN)
20.	OHE VOLTAGE	25 KV AC 50 HZ
21.	TRANSFORMER	5400 KVA
22.	GEAR RATIO	10.65
23.	MAX.NO.OF LOCOS IN MULTIPLE	4 NOs.

DT	
D	
C	
T	



TRACTION MOTOR	– HS 15250A
No. OF MOTOR	– 6
CONT. RATING	– 750V, 900A
GEAR RATIO	– 65:16
WHEEL DIA	– 1055 mm
WEIGHT OF LOCO	– 132 t
LINE VOLTAGE	– 22.5 Kv
TRANSFORMER	– 5400 KVA

REF:–	SCALE:– N.T.S.	APPROVED BY:– SD. FOR D.G.

PERFORMANCE CURVES OF WAG7 (UPRATED) LOCOMOTIVE

RDSO.ELEC.DTE. GEL–1042

Dt.	20.3.98
D	
T	
C	

WAG 7H

HAULAGE CAPACITY OF WAG 7 (UPRATED) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1.4.06 (16:65) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →											ABOVE 6000
		1/500	← ABOVE 6000 →				5930	4835	3380					-DO-
		1/200	4350	4350	4350	4040	3210	2665	1885					4350
		1/150	3710	3710	3705	3245	2545	2115	1500					3710
		1/100	2655	2620	2580	2195	1780	1485	1045					2855
		1/50	1330	1320	1310	1110	895	745	510					1660
	BOGIC WAGONS (BOXN)	LEVEL	← ABOVE 6000 →											ABOVE 6000
		1/500	← ABOVE 6000 →					5005	3465					-DO-
		1/200	4835	4835	4835	4085	3285	2715	1915					4835
		1/150	3960	3880	3795	3210	2590	2150	1515					4135
		1/100	2705	2665	2625	2225	1805	1500	1055					3060
		1/50	1345	1335	1320	1120	905	750	515					1730

Dt	28.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAM 1

CONT. RAIL P.S. 2870
BO-BO TYPE WAM1 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAM 1

Bo–Bo TYPE WAM1 CLASS ELECTRIC LOCOMOTIVE
1676 mm Gauge

Hundred locos of this type have been supplied by European Group and put into service in 1960. The locomotives are designed for mixed traffic operation. The continuous rail horse power is 2870 p.s. at 52 kmph.

The locomotive is powered by four fully suspended, forced ventilation pulsating current type traction motors. The motors are coupled to the axles through 'Jaquemin' drive. Superstructure is connected to the bogies through pendular suspension and low traction bars. The motors are permanently connected in parallel and speed control is obtained through HT tapchanger. Rectifiers are water cooled Ignitron type.

These constructional features help to give better adhesion.

Compressed air brake for the locomotive and vacuum brake for the train have been provided.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
R/2031/495/57	8.7.58	GROUP	1960	20200–20299	R.D.S.O. EL–AC2	WAM –1	100	

CLASS	TYPE	CONTRACT NUMBER	CONTRACT DATE	BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
WAM1	Bo–Bo	R/2031/459/57	08.07.58	GROUP	1960	20200–20299	R.D.S.O. EL–AC–2	WAM1	100

MAIN PARTICULARS OF LOCO

WAM1

GENERAL

SYSTEM OF CURRENT – A.C.
LINE VOLTAGE – 25000
WEIGHT IN W.O. – 74.00t
ADHESIVE WEIGHT – 74.00t
MAX. AXLE LOAD – 18.64t
MIN. AXLE LOAD – 18.27t
1 HR. RATING :–
P.S. – 3010
T.E. – 15900 Kg
SPEED – 51.00 kmph
CONTINUOUS RATING –
P.S. – 2870
T.E. – 14900 Kg
SPEED – 52 kmph
MAX. T.E. – 25000kg(33.3% Ad)
MAX. SPEED – 112.6 kmph
WHEEL DIA – NEW 1140mm
HALF WORN 1120 mm
FULL WORM 1064 mm

BOGIE

DRIVE ARGT – JOQUEMIN DRIVE THROUGH GEAR PINION
DESIGN–2 AXLE,FABRICATED & CAST PENDULAR SUSPENSION WITH EQUALISER BEAMS.

BRAKES

LOCO – AIR, HAND
TRAIN – VACCUM

SANDING

NO. OF BOXES – 8
CAPACITY EACH – 50 L

CONTROLS –

31 SINGLE UNIT
69 MULTIPLE OF TWO

PANTOGRAPH –

NO – 2
MAKE – FAIVELEY
TYPE – AM 12

TRONSFORMER

MAKE – JEUMONT
TYPE – BOT 3000
NUMBER – ONE
WT. COMPLETE – 10880 kg
COOLING – OIL
KVA – 3150 H.T, 4250 L.T.
TYPE ON H.T. 20

VOLTS :–	H.T.	L.T.
	22500	1631
AMPS :–	H.T.	L.T.
	141	1300

INSULATION –

IGNITRON

MAKE –
TYPE – SGT
NUMBER – 4
RATING :–
CONTINUOUS– 575KW, 1250V
1HR–
INTERMITTANT– 660KW, 1250V
1 MIN. 1125KW, 1250V

TRACTION MOTOR

MAKE– SIEMENS, ACEC, ALSTHOM AEC
TYPE – M.G. 710A
NUMBER – 4
INSULATION – ARM(B), FIELD(B)
SUSPENSION–FULLY SUSPENDED
VENTILATION FORCED
WT. COMPLETE 2750 kg
1 HR. RATING F.F.
740HP, 1250V, 480A, 1000RPM
CONTINIUOUS RATING F.F.
710HP, 1250V, 460A,1020 RPM

TEMP. RISE :–	ARM	FIELD
(By Resistance)	100°C	110°C

COIL RESISTANCE–

ARMATURE	–	0.042 ohm
MAIN POLE	–	0.029 ohm
INTER POLE	–	0.018 ohm

AIR GAP –

MAIN POLE	–	6.5 mm
INTER POLE	– 6.8 –	7.0 mm

BRUSH :–
NO OF HOLDER– 4
BRUSH PER HOLDER– 3
SIZE(LXWXH)– 36X16X50
MIN. HEIGHT– 20 mm
MOTOR GROUPING(P)– 1,2,3,4
GEAR RATIO– 1:4.06(16:65)

AUXILIARIES

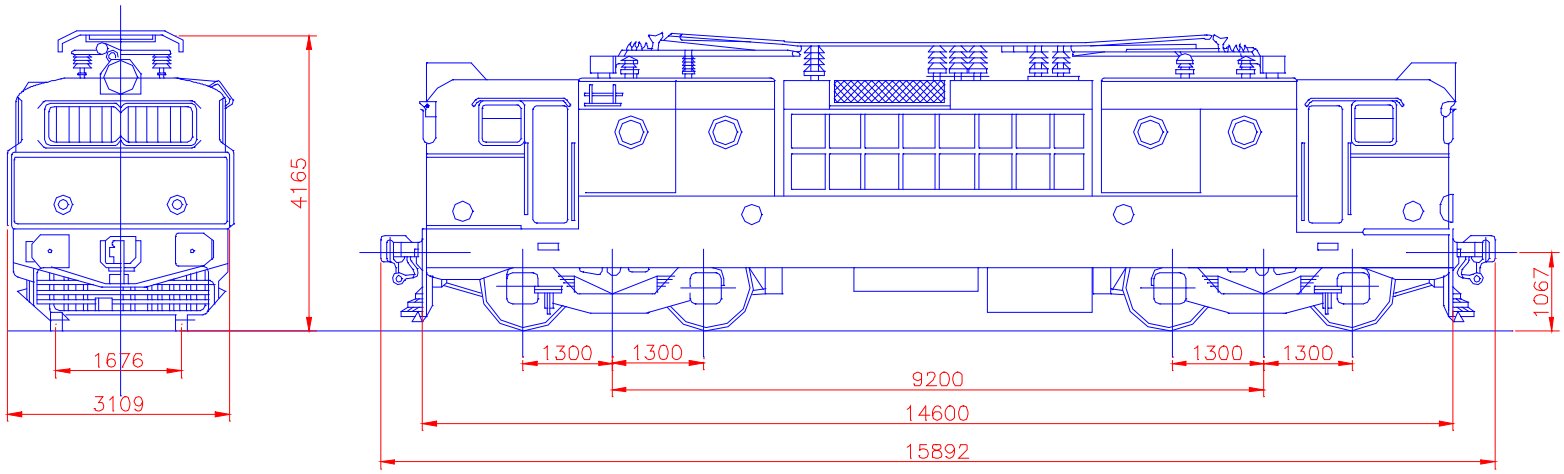
HEAD LIGHT– 2NOS,500W,110V
BATTERY– NI–CD, 72 CELLS
110V,60AH(10 HR. RATE)
AUX. GEN.– 1 NOS.
2.86 KW,110V,26A,2700 RPM
ARNO CONVERTER– 1 NOS.
120 KVA, 1500 RPM
1 PHASE
290/380/460V, 500/420/450A
3 PHASE
290/380/460V, 240/185/150A
COMPRESSOR (1)
MAKE OERLIKON
TYPE 2A – 115
CAPACITY 1000 L/min.

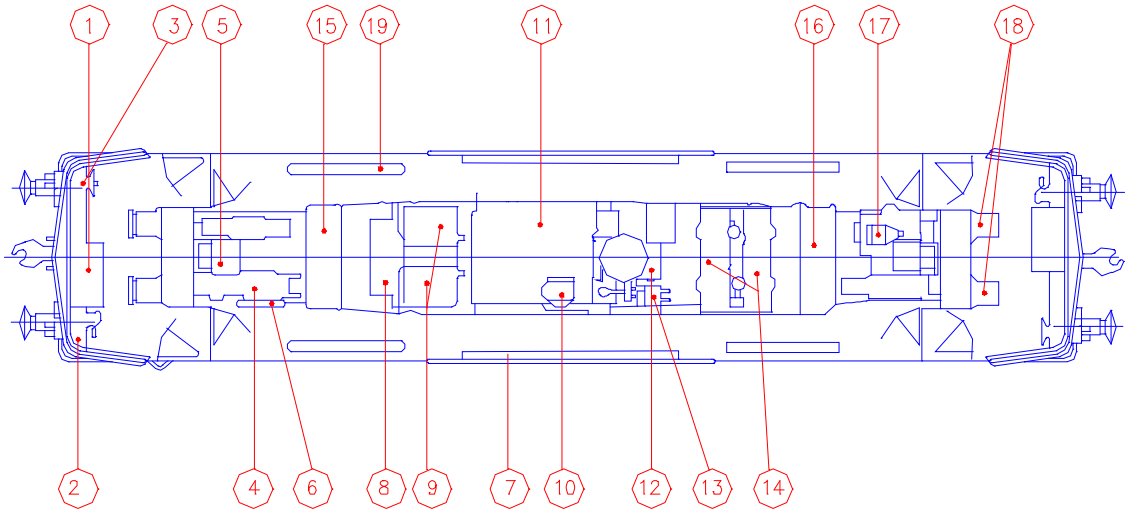
EXHAUSTERS:– (2)
MAKE OERLIKON
TYPE 1A – 480P
CAPACITY 5350 l/m,2675 l/m
MOTORS : 2Nos. 5/10 HP.
10/15.5A,380V,1465/2910 RPM
BLOWER :– (2)
CAPACITY 200 m^3/min.
MOTORS: 2 NOS.
30HP, 380V,44A,2870 RPM
TRANSFORMER OIL PUMP MOTOR:–
1NO,3.8HP,380V,5.7A,2865 RPM
IGNITRON CURCULATING W/p MOTOR:–
D.C.–1No,0.5HP,110V,4.9A,1500 RPM
A.C.–1No,2HP,380V,3.1A,2875 RPM
TRANSFORMEE OIL COOLER B/M :–
1No,19KW,380V,36A,1460 RPM
SMOOTHING REACTOR:–
1NNO,6mh,920A,0.013 ohm
SMOOTHING REACTOR B/M– 1 NO.
1.6 HP,380V,2.5A,2850 RPM

PROTECTIVE DEVICES

DEAD MAN CONTROL	NO
SLIP CONTROL	NO
MAIN O/L RELAY	YES
MOTOR O/L RELAY	YES
O/V RELAY	YES
NO CURRENT RELAY–NO VOLT RELAY	
EARTH FAULT RELAY	YES
OVER SPEED TRIP	NO
LOW PR. GOV.	YES
VAC. CON. GOV.	YES

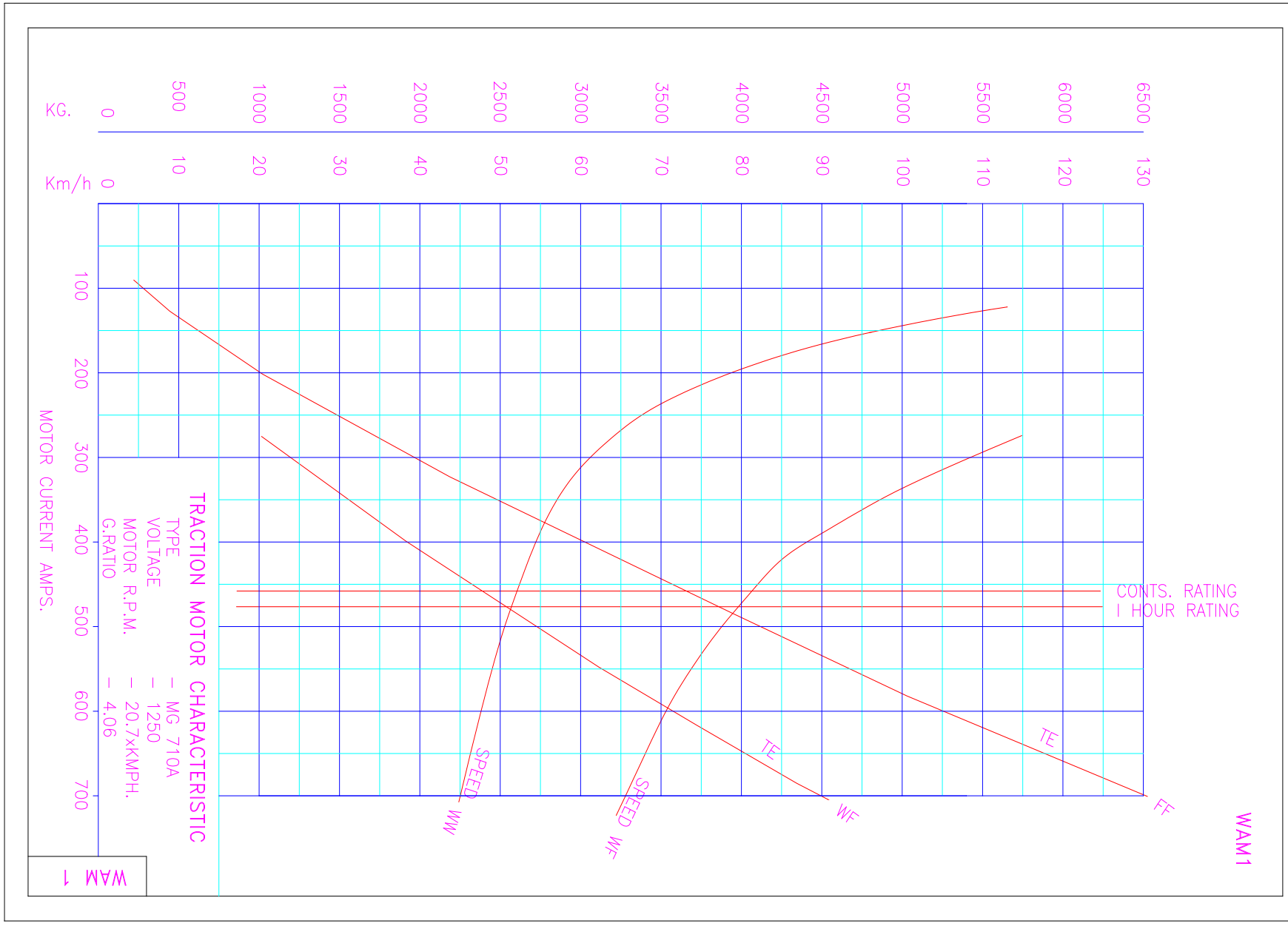
WAM 1





1. MASTER CONTROLLER PANEL
2. BRAKE EQUIPMENTS
3. HAND BRAKE
4. COMPRESSOR
5. TRACTION MOTOR BLOWERS WITH MOTORS
6. BATTERY BOARD
7. RADIATORS
8. IGNITRON WATER CIRCUIT
9. IGNITRON UNITS
10. BLOWER FOR R.G.R
11. MAIN TRANSFORMER
12. GRADUATOR
13. C.G.R. CONTACTOR
14. EXHAUSTERS
15. CONTROL EQUIP UNIT NO
16. CONTROL EQUIP UNIT NO
17. ARNO CONVERTOR & G.E
18. DRIVERS SEATS
19. BATTERY SETS

DT	
D	
C	
T	R.C.S.


KG.
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
6500
Km/h
0
10
20
30
40
50
60
70
80
90
100
110
120
130
MOTOR CURRENT AMPS.
100
200
300
400
500
600
700
TRACTION MOTOR CHARACTERISTIC
TYPE — MG 710A
VOLTAGE — 1250
MOTOR R.P.M. — 20.7×KMPH.
G.RATIO — 4.06
CONTS. RATING
1 HOUR RATING
SPEED WW
SPEED WF
TE
TE
WF
FF
WAM1
WAM 1

TRACTIVE EFFORT – SPEED CURVE
WAM1
WAM 1
Kg
KMPH
0
20
40
60
80
100
120
140
160
5000
10,000
15,000
20,000
25000
CONT.T.E.
F.F.
W.F.
CONST P.S.
F=0.24

WAM 1

HAULAGE CAPACITY OF WAM 1 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:4.06 (16:65) T.M. MG 710 A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				4880	3665	2550					ABOVE 6000
		1/500	3810	3810	3600	3360	2745	2150	1600					3810
		1/200	2010	2010	2010	1940	1630	1310	1000					2010
		1/150	1540	1540	1540	1540	1325	1075	825					1540
		1/100	1200	1180	1150	1120	955	755	600					1230
		1/50	610	605	595	585	500							780
	BOGIE WAGONS (BOX)	LEVEL	4960	4960	4960	4960	4960	4960	4225					4960
		1/500	3520	3520	3520	3520	3425	2625	2115					3520
		1/200	2390	2300	2240	2180	1855	1515	1185					2420
		1/150	1830	1790	1745	1710	1470	1200	945					2060
		1/100	1255	1240	1225	1200	1035	845	655					1580
		1/50	625	620	615	605	525							900
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1445			ABOVE 1500
		1/500	← ABOVE 1500 →							1255	925			–DO–
		1/200	← ABOVE 1500 →					1355	1050	770	560			–DO–
		1/150	← ABOVE 1500 →				1360	1100	850	630	460			–DO–
		1/100	1250	1215	1185	1150	970	785	610	450	330			–DO–
		1/50	620	610	600	590	500	405	310	225	155			960

Dt	17.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAM2/3

CONT. RAIL P.S. 2790
BO-BO TYPE WAM2/3 SS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Bo–Bo TYPE WAM2 CLASS ELECTRIC LOCOMOTIVE
1676 mm Gauge

Ten locomotives of this type have been supplied by Mitsubishi (Japan) and put into service in 1961. These are designed for mixed traffic operation. The continuous rail horse power is 2790 p.s. and 52 km/h.

The locomotive is powered by four fully suspended, forced ventilated pulsating current type traction motors. The motor is coupled to the axle through a flexible WN gear drive. The motors are permanently connected in parallel and the speed control is obtained by means of an HT tap changer.
The rectiviers are water cooled and oignitron type.

Repeat order of 28 Nos. of locomotives was placed on the same firm for meeting the requirment of push–pull operation for suburan trains. Minor changes to suit the new requirment have been made. Two locomotives of this order wil be provided with silicon rectifiers.

For ten locomotives compressed air brake for the locomotive and vacuum brake for the train are provided. The rest have been provided with air brakes at present.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
57/450/7/RS(F)184	17.1.58	MITSUBISHI	1961	20300–20309	R.D.S.O. EL–AC–4	WAM2	10	
RE/RS/34/2	28.12.61	–do–	1964	20310–20335	EL–105A–61	–do–	26	Remote control arrangement.
RE/RS/34/2	28.12.61	MITSUBISHI	1964	20336 & 20337	EL–105A–61	WAM3	2 silicon	

CLASS	TYPE	CONTRACT NUMBER	CONTRACT DATE	BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
WAM2	Bo–Bo	57/459/7/RS(F)184	17–1–58	MITSUBISHI	1961	20300–20309	R.D.S.O. EL–AC–4	WAM2	10

MAIN PARTICULARS OF LOCO

WAM2

GENERAL

SYSTEM OF CURRENT –	A.C.
LINE VOLTAGE –	25000
WEIGHT IN W.O. –	76.03t
ADHESIVE WEIGHT –	76.03t
MAX. AXLE LOAD	19.17t
MIN. AXLE LOAD –	18.80t
1 HR. RATING:–	
P.S. –	2910
T.E.–	15400kg
SPEED –	51.0kmph
CONTINUOUS RATING –	
P.S. –	2190*
T.E. –	14500kg
SPEED –	52.0kmph
MAX. T.E. –	25242kg(33.2% Ad)
MAX. SPEED –	112.6kmph
WHEEL DIA –	NEW 1092 mm
	HALF WORN 1055 mm
	FULL WORN 1016 mm

BOGIE

DRIVE ARGT –	GEAR PINION
DESIGN –	2 AXLE, FABRICATED WITH SWING BOLSTER

BRAKES

LOCO –	AIR, HAND,
TRAIN –	VACUUM

SANDING

NO. OF BOXES –	8
CAPACITY EACH –	40 L

CONTROLS – SINGLE UNIT

PANTOGRAPH –

NOS –	2
MAKE –	FAIVELEY
TYPE –	AM12

TRANSFORMER

MAKE –	MITSUBISHI
TYPE –	SUB
NUMBER –	1
WT.COMPLETE–	7650kg
COOLING–	OIL
KVA–	3000HT,4240LT.
TAPS ON H.T.–	20
VOLTS:–	H.T. 22500 / L.T. 960(DC)
AMPS:–	H.T. 133 / L.T. 2210(DC)
INSULATION:–	

IGNITRON

MAKE –	MITSUBISHI
TYPE –	GU 31
NUMBERS –	8.
RATING:–	
CONTINUOUS–	725V,283KW,390A
1 HR.–	725V,303KW,418A
INTERMITTENT– 1 MIN.–	

TRACTION MOTORS

MAKE–	MITSUBISHI
TYPE–	MB–3045–A
NUMBER–	4
INSULATION– ARM	(F) FIELD (F)
SUSPENSION–	FULLY SUSPENDED
VENTILATION–	FORCED
WT. COMPLETE–	2200kg
1 HR RATING F.F.–	745HP,725V,815A,1000RPM
CONTINUOUS RATING F.F.–	703HP,725V,780A,1020RPM

TEMP. RISE – (By Resistance)	ARM 120°C	FIELD 130°C
COIL RESISTANCE:–(75°C)		
ARMATURE –	0.0115 Ω	
MAIN POLE –	0.0122 Ω	
INTERPOLE –	0.0098 Ω	
AIR GAP:–		
MAIN POLE	6 mm	
INTERPOLE	6.5 mm	
BRUSHES :–		
NO. OF HOLDERS –	6	
BRUSH PER HOLDER –	3	
SIZE (LxWxH) –	45x16x50	
MIN. HEIGHT–	20mm	
MOTOR GROUPING(P):–	1,2,3,4,	
GEAR RATIO –	1:3.88(17:66)	

AUXILIARIES

HEAD LIGHT –	2NOS,500W,125V
BATTERY –	ALKALINE, 72 CELLS, 110V, 60AH, (5HR. RATE)
AUX.GEN.–	1NO,4KW,110V,36.4A,1495RPM
ARNO CONVERTER:–	1NO,150KVA,1495RPM
1PHASE–	400V,450A
3PHASE–	400V,215A
COMPRESSOR (1):–	
MAKE –	OERLIKON
TYPE –	2A–115
CAPACITY–	1000 1/min 9kg/cm
MOTOR –	1NO,11HP, 380V,15.5A,2860RPM

EXHAUSTER (2) :–	
MAKE –	OERLIKON
TYPE –	1A–480P
CAPACITY –	5350l/m,2675l/m
MOTOR –	2NOS,5/11HP, 10/15.5A,380V,1410/2830RPM
BLOWER (2):–	
CAPACITY –	1.33M/S 220RPM
MOTOR –	2NOS,50HP,400V 70A,1455RPM.
TRANSFORMER OIL PUMP MOTOR:–	1NO,10HP,400V,13.2A,1470RPM
IGNITRON CIRCULATING W/P MOTOR:–	D.C.–1NO,1.7HP,110V,16A,1250RPM A.C.–1NO,3HP,400V,4.8A,1450RPM
TRANSFORMER OIL COOLING:–	FROM T.M.BLOWER
SMOOTHING REACTOR:–	1NO,4mh,780A
SMOOTHING REACTOR COOLING:–	FROM T.M.BLOWER

PROTECTIVE DEVICES

DEAD MAN CONTROL–	NO
SLIP CONTROL–	NO
MAIN O/L RELAY–	YES
MOTOR O/L RELAY–	YES
O/V RELAY –	YES
NO CURRENT RELAY–	NO
EARTH FAULT RELAY –	YES
OVER SPEED TRIP–	NO
LOW PR.GOV.–	YES
VAC.CON.GOV.–	YES
BRAKE CYL C/O VALVE –	
E.A.V. –	NO

X CORRECTED ON 6.4.74 APRIL 69

MAIN PARTICULARS OF WAM3 LOCO

GENERAL

SYSTEM OF CURRENT	A.C
LINE VOLTAGE	25000
WEIGHT IN W.O.	76 t
ADHESIVE WEIGHT	76 t
MAX. AXLE LOAD	19 t
MIN. AXLE LOAD	18.80 t
1 HR.RATING	
P.S.	2910
T.E.	15400 Kg
SPEED	51 Km/h

CONTINUOUS RATING

P.S.	2790*
T.E.	14500 Kg
SPEED	52 Km/h
MAX. T.E.	25242 Kg
MAX. SPEED	112.6 Km/h
WHEEL DIA.NEW	1092 mm
HALF WORN	1055 mm
FULL WORN	1016 mm

BOGIE

DRIVE ARGT.	GEAR PINION
DESIGN	2 AXLE FABRICATED WITH SWING BOLSTER

BRAKES

LOCO	AIR,HAND,RHEOSTATIC
TRAIN	VACUUM

SANDING

NO. OF BOXES	8
CAPACITY	40 L
CONTROLS	MULTIPLE

PANTOGRAPH

NOs.	2
MAKE	FAIVELEY
TYPE	AM 12

TRANSFORMER

MAKE	MITSUBISHI
TYPE	SUB
NO.	1
WT. COMPLETE	7650 Kg
COOLING	OIL
KVA	3000 HT,4240 LT (DESIGNED)
TAPS ON H.T.	20

VOLTS	H.T.	L.T.
	22500	960 (DC)
AMPS	H.T.	L.T.
	133	2210(DC)
INSULATION		CLASS A

SILICON RECTIFIER

NUMBER	2
TYPE & FORM	SF-OC20R
CAPACITY	2260 KW
	725 V
	3120 A
CONNECTION	PUSH PULL
NO.OF CELLS	S P A
	9 20 2
WEIGHT (WITH AUX.)	2400 Kg
SILICON RECTIFIER CELL	SR200F

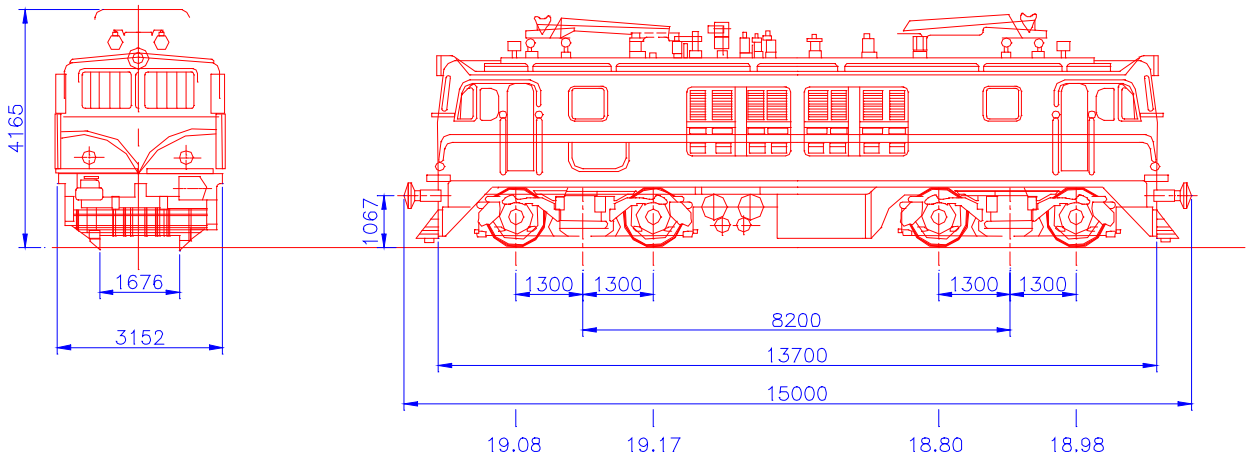
TRACTION MOTORS

MAKE		MITSUBISHI
TYPE		MB-3045-A
NUMBER		4
INSULATION		ARM(F),FIELD(H)
SUSPENSION		FULLY SUSPENDED
VENTILATION		FORCED
WT.COMPLETE		2200 Kg
1 HR.RATING F.F.		745 HP,725 V, 815 A,1000 RPM
COUNTINUOUS RATING F.F.		725 V,780 Amp., 1020 RPM.
TEMP.RISE	ARM	COMM. FIELD
(BY Resistance)	120°C	85°C 160°C
COIL RESISTANCE (110°C)		
ARMATURE		0.0115 ohm
MAIN POLE		0.0122 ohm
INTER POLE		0.0098 ohm
AIR GAP		
MAIN POLE		6 mm
INTER POLE		6.5 mm
BRUSHES		
GRADE		MS-5 (TOKYO CARBON CO)
NO. OF HOLDERS		6
BRUSHES PER HOLDER		3
SIZE (L X W X H)		45x16x50
MIN.HEIGHT		24 mm
MOTER GROUPING		PARALLEL
GEAR RATIO		1:3.88

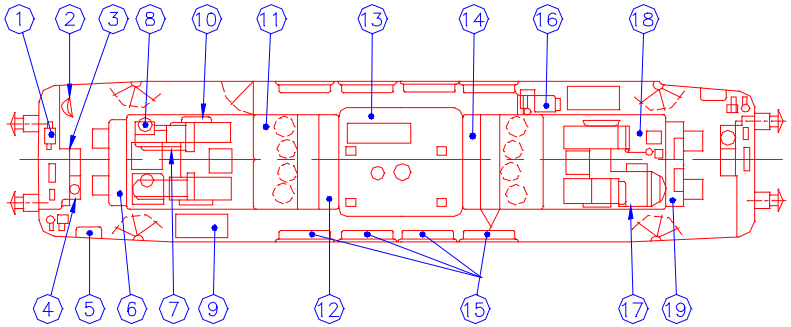
AUXILIARIES

AERO CONVERTOR SET	
NUMBER	1
RATING	150 KVA,1495 RPM
1 phase	400V, 450A.
3 phase	400V, 215A.
AUX.GEN.	1 No.4 KW,110V, 36.4A, 1495 RPM
HEADLIGHTS	
NUMBER	2
RATING	32V, 250W
BATTERY	
TYPE	JH-4B-9 Alkaline
CAPACITY	60 AH
(5 HR.RATE),110V.	72 CELLS
MAIN COMPRESSOR	
NUMBER	1
MOTER TYPE	51d2 OERLINKON
RATING	320V,3Phase 2860 RPM, 11 HP
COMPRESSOR	
TYPE	2A115 OERLIKON
CAPACITY	100001/min
PRESSURE	9 Kg/cm ^{2} 1200 RPM
AUX.COMPRESSOR	
NUMBER	1
MOTER	DC 110V,460W, 1 HR.RATING
COMPRESSORE	
CAPACITY	86.6 l/min
PRESSURE	6 Kg/cm ^{2}
EXHAUSTER	
NUMBER	2
MAKE	OERLIKON
TYPE	1A-480P
CAPACITY	5350 l/min, 2675 l/min.
MOTOR	2 Nos, 11/5 HP 15.5/10A, 380V, 2830/1410 RPM
TRACTION MOTOR BLOWER SET	
NUMBER	2
MOTOR	50 HP 3 PHASE DOUBLE SQUIREL CAGE 400V 1450 RPM
BLOWER	
TYPE	RMF64 RMF60
CAPACITY	180m /min 230m /min
	RPM 1455 1455
PRESSURE	250mm Aq,180mm Aq
BRAKING RESISTANCE BLOWER SET	
NUMBER	2
MOTER	6 KW,3 PHASE 400V 11A, 1450 RPM
BLOWERS	
TYPE	FPD-65
CAPACITY	230m /min
PRESSURE	75 mm Aq
OIL PUMP SET	
NUMBER	1
MOTOR	5.5.HP,400V,3PHASE 8A,1000 Kg,1470 RPM
PUMP	
HEAD	13mWG
FLOW QUANTITY	1.2 m /min.
WEIGHT(MOTOR & PUMP)	142 Kg
SILICON RECTIFIER BLOWER SET	
NUMBER	4
MOTOR	1.1 KW 400V,3 PHASE
BLOWER	1
AIR VOLUME	45m /min
STATIC PRESSURE	45 mm

WAM2

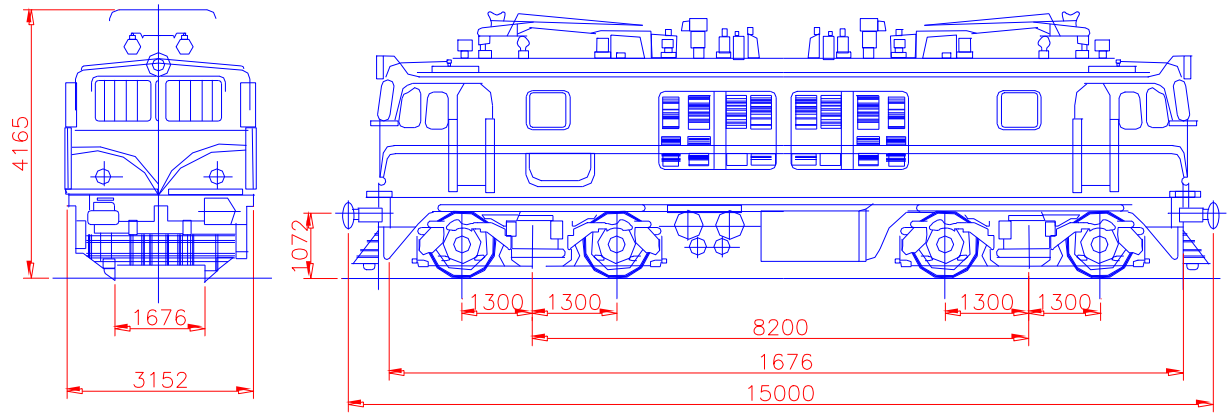


1. PANTO COMPRESSOR
2. HAND BRAKE
3. DRIVER'S DESK
4. MASTER CONTROLER
5. CAB HOLDER
6. NO.1 CONTROL CABINET
7. EXHAUSTERS
8. WATER PUMP MOTOR RESISTOR
9. BATTERY BOX
10. BLOWER (MVMT)
11. IGNITRON CONTROL CABINETS
12. NO.1 CONTROL BLOCK
13. MAIN TRANSFORMER
14. NO.2 CONTROL BLOCK
15. RE-COOLER
16. WATER PUMP
17. CONVERTOR
18. AIR COMPRESSOR
19. NO.2 CONTROL CABINET

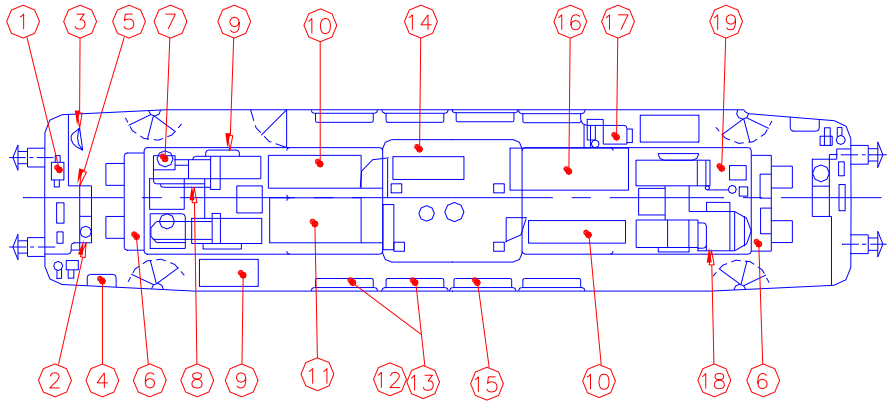


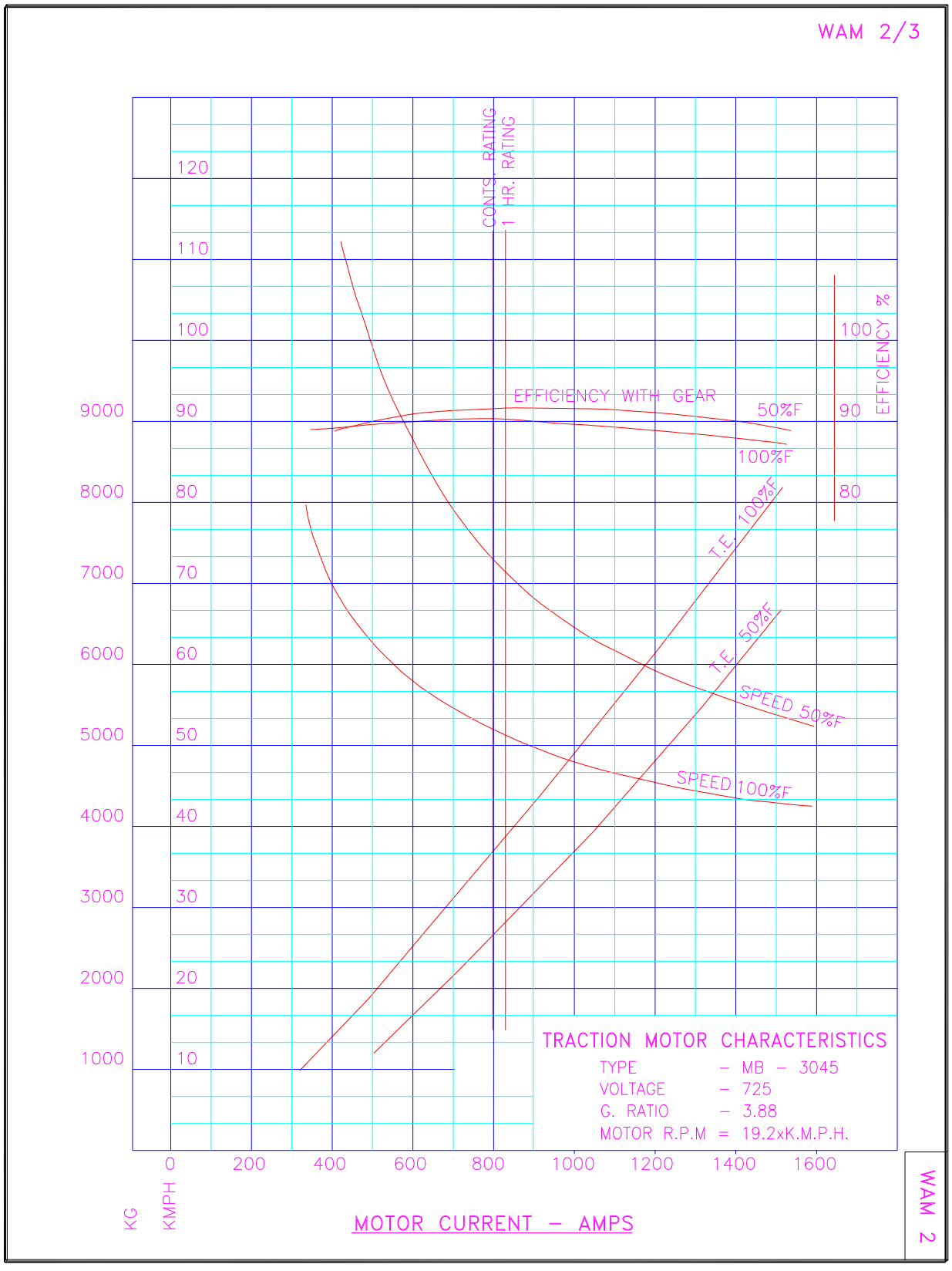
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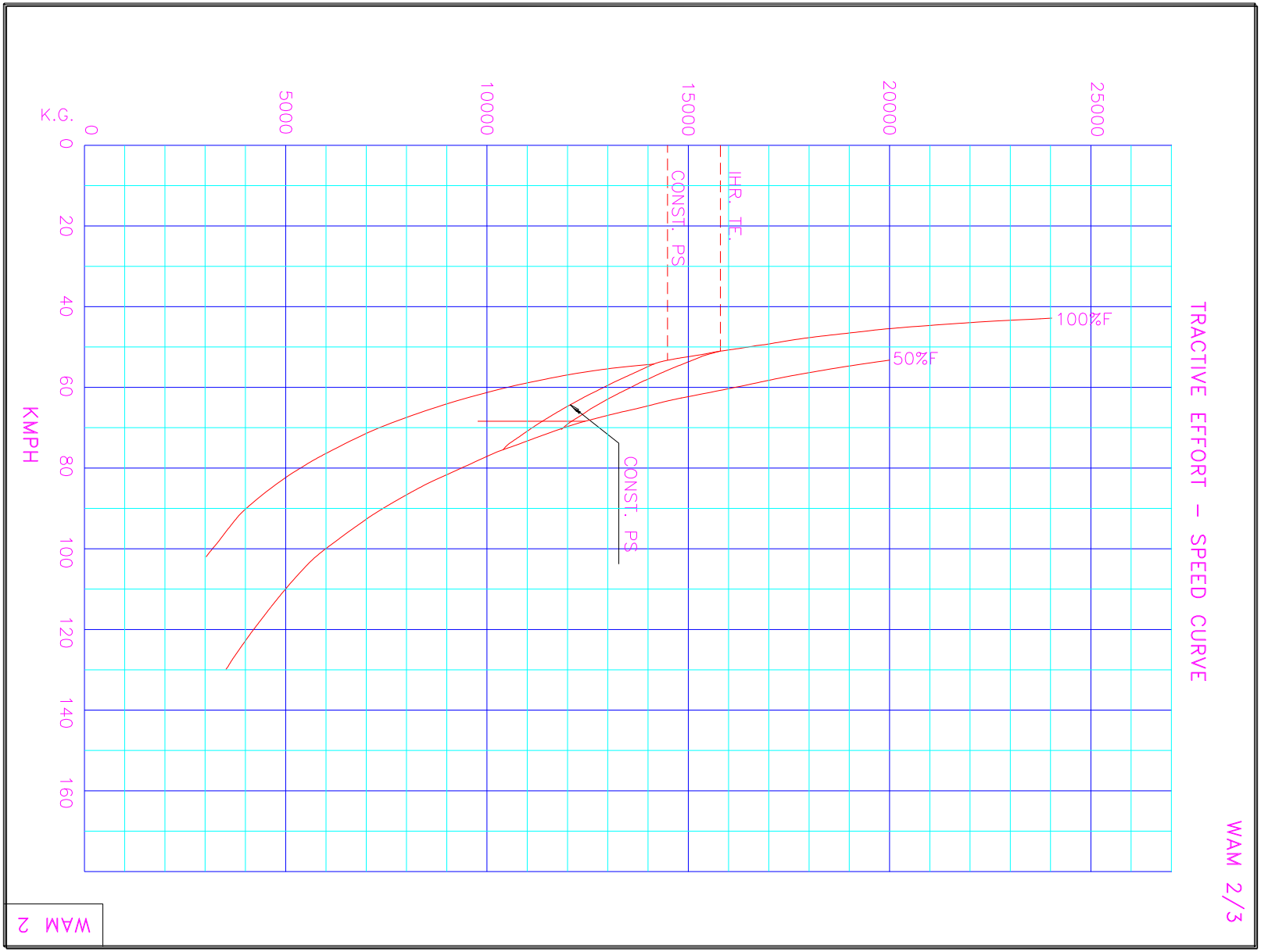
WAM 3

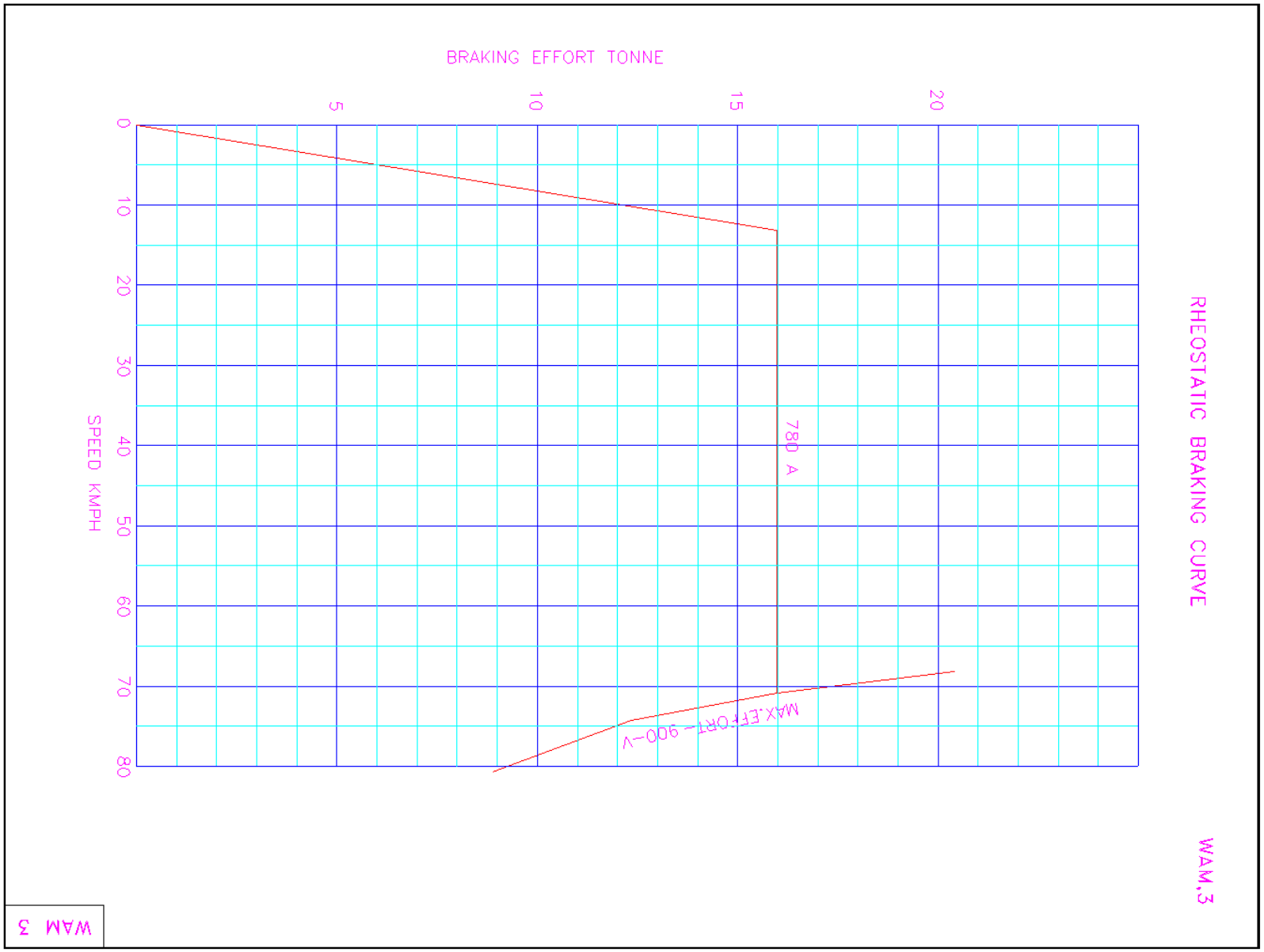


1. PANTO COMPRESSOR
2. MASTER CONTROLLER
3. HAND BRAKE
4. CAB HEATER
5. DRIVERS DESK
6. CONTROL CABINET
7. WATER PUMP MOTOPR RESISTOR
8. EXHAUSTER SET
9. BLOWER SET
10. SILIIDON RECTIFIER BLOCK
11. RHEDSTATIC BRAKE RESISTOR BLOCK
12. CONTRACTOR BOX FOR RHEOS BRAKE
13. RE-COOLER
14. MAIN TRANSFORMER
15. BATTERY BOX
16 CONTROL BLOCK
17. WATER PUMP
18. CONVERTOR
19. AIR COMPRESSOR




WAM 2/3
CONTS. RATING
1 HR. RATING
EFFICIENCY WITH GEAR
50%F
100%F
EFFICIENCY %
100
90
80
T.E. 100%F
T.E. 50%F
SPEED 50%F
SPEED 100%F
120
110
100
90
80
70
60
50
40
30
20
10
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
200
400
600
800
1000
1200
1400
1600
KG
KMPH
MOTOR CURRENT – AMPS
TRACTION MOTOR CHARACTERISTICS
TYPE – MB – 3045
VOLTAGE – 725
G. RATIO – 3.88
MOTOR R.P.M = 19.2xK.M.P.H.
WAM 2


TRACTIVE EFFORT – SPEED CURVE
WAM 2/3
WAM 2
K.G.
0
5000
10000
15000
20000
25000
KMPH
0
20
40
60
80
100
120
140
160
CONST. PS
IHR. TE.
CONST. PS
100%F
50%F


BRAKING EFFORT TONNE
5
10
15
20
0
10
20
30
40
50
60
70
80
SPEED KMPH
780 A
MAX.EFFORT- 900-V
RHEOSTATIC BRAKING CURVE
WAM,3
WAM 3

WAM 2&3

HAULAGE CAPACITY OF WAM 2&3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.88 (17:66) T.M. MB-3045-A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				4650	3480	2330					ABOVE 6000
		1/500	3820	3820	3820	3260	2600	2040	1450					3820
		1/200	2020	2020	1980	1885	1540	1240	905					2020
		1/150	1550	1550	1550	1520	1250	1010	745					1550
		1/100	1170	1140	1120	1100	900	730	540					1240
		1/50	590	585	575	565								790
	BOGIE WAGONS (BOX)	LEVEL	5000	5000	5000	5000	5000	5000	3850					5000
		1/500	3530	3530	3530	3530	3230	2600	1925					3530
		1/200	2300	2225	2170	2120	1750	1430	1080					2430
		1/150	1780	1740	1700	1665	1385	1135	860					2070
		1/100	1220	1200	1180	1160	1140	800	600					1590
		1/50	605	600	595	588								920
PASSENGER SERVICE	ICF COACH	LEVEL									1360			ABOVE 1500
		1/500								1180	850			-DO-
		1/200	← ABOVE 1500 →					1315	985	720	525			-DO-
		1/150	← ABOVE 1500 →				1280	1065	800	590	430			-DO-
		1/100	1220	1190	1155	1120	910	760	570	420	305			-DO-
		1/50	605	595	585	575	465	390	290	205	140			965

Dt	17.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

11

WAM 2&3

HAULAGE CAPACITY OF WAM 2&3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.88 (17:66) T.M. MB-3045-A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →					5965	4185					ABOVE 6000
		1/500	4105	4105	4105	4105	3330	2730	2030					4105
		1/200	2370	2310	2240	2180	1770	1480	1120					2710
		1/150	1830	1790	1750	1710	1390	1170	890					2275
		1/100	1250	1230	1205	1180	970	820	620					1715
		1/50	615	605	600	590	480	400	300					970

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

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WAM 4

CONT. RAIL P.S. 3640
CO-CO TYPE WAM4 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAM–4

CO–CO TYPE WAM–4 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

One hundred and eight locomotives of this type were ordered on Chittaranjan Locomotive Works to the design of R.D.S.O. First prototype locomotive was put in service in March, 1971. The continuous rail hourse–power of the locomotive is 3640 PS at 56 km/h.

The locomotive is powered by six axle hung, nose suspended forced ventilated type do traction motors. Speed control is achieved by grouping the motors in three different combinations and by field weakening the motors.

These locomotives, utilise silicon rectifier for conversion of ac power into dc.

This can be used for a multiple operation to a maximum of four locomotives.

Compressed air brake for the locomotive and vacuum brake for the train are provided. In addition these locomotives have been provided with Rheostatic braking.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED		REMARKS
NUMBER	DATE								
66/RSF/495/1	4.12.69	RDSO/CLW	1971	20400–20483	R.D.S.O. C–WAM–004	WAG4	84		
70/RSF/459/2	7.07.70	–do–		20484–20507	–do–	–do–	24	141	
70/RSF/459/2	6.05.71	–do–			–do–	–do–	33		

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WAM4	Co–Co			RDSO/CLW	1971	20400–20507	RDSO C–WAM–004	WAM4	84+24 =108

MAIN PARTICULARS OF LOCO

WAM4

GENERAL

SYSTEM OF CURRENT –	a.c.
LINE VOLTAGE –	25000V
WEIGHT IN W.O. –	112.8 t
ADHESIVE WEIGHT –	112.8 t
MAX. AXLE LOAD	
MIN. AXLE LOAD –	
CONTINUOUS RATING	
P.S. –	3640
T.E.–	17600kg
SPEED –	56.0 kmph
MAX. T.E.	30.0 t @
MAX. SPEED	120 kmph
WHEEL DIA –	NEW 1092mm
	HALF WORN 1055 mm
	FULL WORN 1016 mm

BOGIE

DRIVE ARGT –	GEAR PINION
DESIGN –	3AXLE, TRIMOUNT CAST FRAME, WITH SWING BOLSTER

BRAKES

LOCO –	AIR, HAND, RHEOS
TRAIN –	VACCUM

SANDING

NO. OF BOXES –	16
CAPACITY EACH –	

@ Limited to 30 t due to the bridges.

PANTOGRAPH

NUMBERS	2
MAKE	FAIVELEY
TYPE	AM 12
WEIGHT(including 4 insulators)	285 kg

TRANSFORMER

MAKE –	HEIL
TYPE –	BOT 3460 A
NUMBER –	1
WT. COMPLETE –	11500 kg
COOLING –	FORCED OIL
INSULATION –	A
TAPSON H.T. –	32
RATING –	
PRIMARY –	3460 KVA
	22.5 kv, 162 A
SECONDARY –	3460 KVA
	1270V (dc)
TERTIARY –	180 KVA, 380V

SILICON RECTIFIER

NUMBER –	2
CONT. TATING –	1000A(EACH CUBICLE), 1270V
MAX. STARTIGN –	
CURRENT –	1650 A
COOLING –	FORCED AIR
TYPE OF CELL –	D400/2000
CONNECTION –	Bridge
NO. OF CELLS –	48 PER BRIDGE S.P.A. 3 4 4

TRACTION MOTORS

MAKE –	Alsthom/CLW
TYPE –	TAO 659A1
NUMBER –	6
INSULATION –	ARM. H, FIELD H
SUSPENSION –	AXLE HUNG NOSE SUSPENDED
VENTILATION –	FORCED
WEIGHT COMPLETE –	2800 KG
TEMP. RISE –	ARM. 140°C, FIELD 160°C
(BY RESISTRANCE)	110°C
COIL RESISTANCE AT –	
ARMATURE –	0.0151 ohm
MAIN POLE –	0.0145 ohm
INTER POLE –	0.0078 ohm
RATING	
CONTINUOUS	– 770 HP, 750 V 840A, 1095 r.p.m.
1HR –	798 HP 750V, 870A 1070 r.p.m.
AIR–GAP –	
MAIN POLE –	5.5 mm
INTER POLE –	6.0 mm
BRUSHES –	
GRADE –	EG367
NO OF HOLDERS –	6
BRUSH PER HOLDER –	3
SIZE(WxL) –	2x(8x43)
MIN HEIGHT –	NEW – 52
	WORN – 27

MOTOR GROUPING –

S	1–4, 2–5, 3–6
SP	1–4–2 3–6–5
P	1–4 2–5 3–6
GEAR RATED –	1:4.13(62:15)
PERMANENT SHUNT –	5%

AUXILIARIES

Head Light –	2Nos. 350W 32V
BATTERY –	LEAD ACID, 50 CELLS 110V, 75 AH (5HR.RATE)
TRANSFORMER –	380/32, 24V 50C/S, 500VA
ARNOO CONVERTER	1 No., 1420 r.p.m.
1 HPASE –	150KVA, 380V 395A
3 PHASE –	120KVA,380V,190A

COMPRESSOR

No. –	1
MAKE –	WESTING HOUSE KIRLOSKAR
TYPE –	2EC–38B
CAPACITY –	792 1/m at 7Kg/cm^2
MOTOR –	1No., 7.5KW, 380V 15A, 1390 r.p.m.

EXHAUSTER

NO –	2
MAKE –	NORTHEY
TYPE –	250RE
CAPACITY –	4500 1/m

MOTOR–
2NOS, 7.5/11KW, 16/22A
385V, 970/1460 r.p.m.

TRACTION MOTOR BLOWER –

NO –	2
MAKE –	S.F. INDIA LTD.
TYPE –	MLBR–42,5–1–44

MOTOR –

NO. –	2
MAKE –	SIEMENS
RATING –	22KW, 385V,14A, 3000 r.p.m.

SMOOTHING REACTOR BLOWER–

NO. –	1
MAKE –	S.F. INDIA LTD.
TYPE –	PFTA–50,ARR6
CAPACITY –	4200 m^3/hr. 85 mmwg

MOTOR –
1 NO,2.2HP,380V,2860 r.p.m.

BRAKING RESISTOR BLOWER

NO. –	2
TYPE –	VN 50Z
CAPACITY –	3.15 m^3/hr

MOTOR –
2NOS,15KW,13A,95V,5000r.p.m.

SILICON TRCTIFIER BLOWER

NO. –	2
MAKE –	S.F. INDIA LTD.
TYPE –	PHMX–40–6

CAPACITY –3400 m^3/hr,56mmwg
MOTOR –
2NOS, 2KW, 380V, 4.4A, 2860 r.p.m.

OIL COOLER BLOWER

NO. –	1
MAKE –	S.F. INDIA LTD.
TYPE –	MLBR–60–1–H2
CAPACITY –	22,200m^3/hr,170mmwg

MOTOR –
1NOS, 22KW, 380V, 43A, 1450 r.p.m.

OIL PUMP FOR TRANSFORMER

NO. –	1
MAKE –	BEST & CO.PR.LTD.
CAPACITY –	750 1/m at 1 mmwg
MOTOR –	1NOS,3.3KW,380V 6.6A,2865 r.p.m.

SMOOTHING REACTOR FOR TRACTION–MOTOR

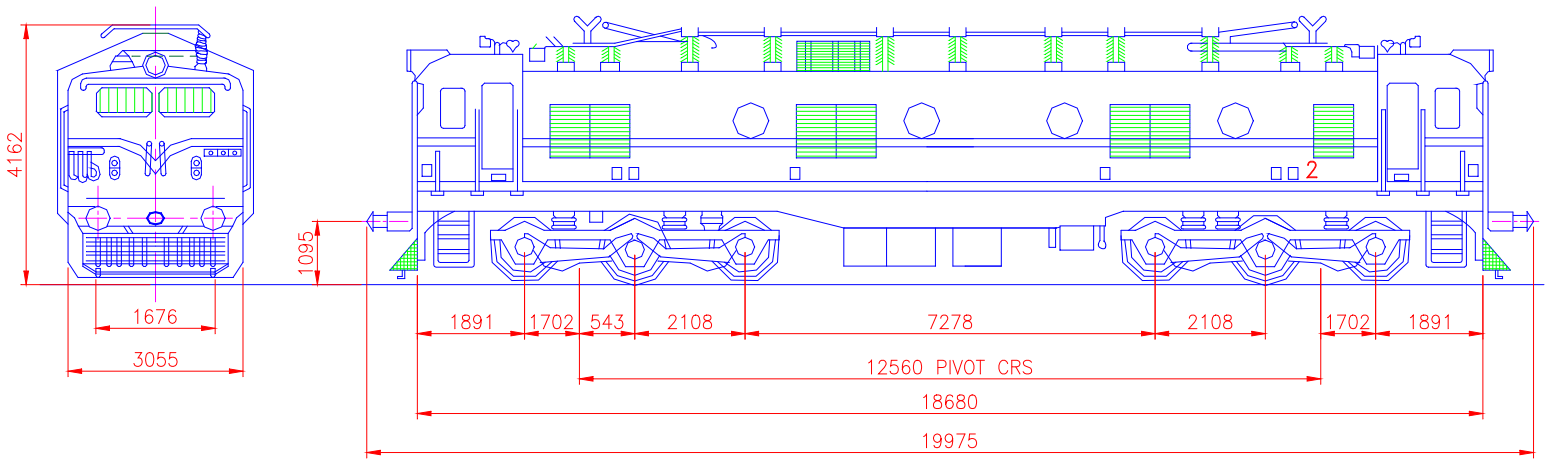
TYPE –	SL42
RATING –	1250V,950A
REACTANCE –	5.37mH

RESISTANCE AT 110°C–0.00718 ohm

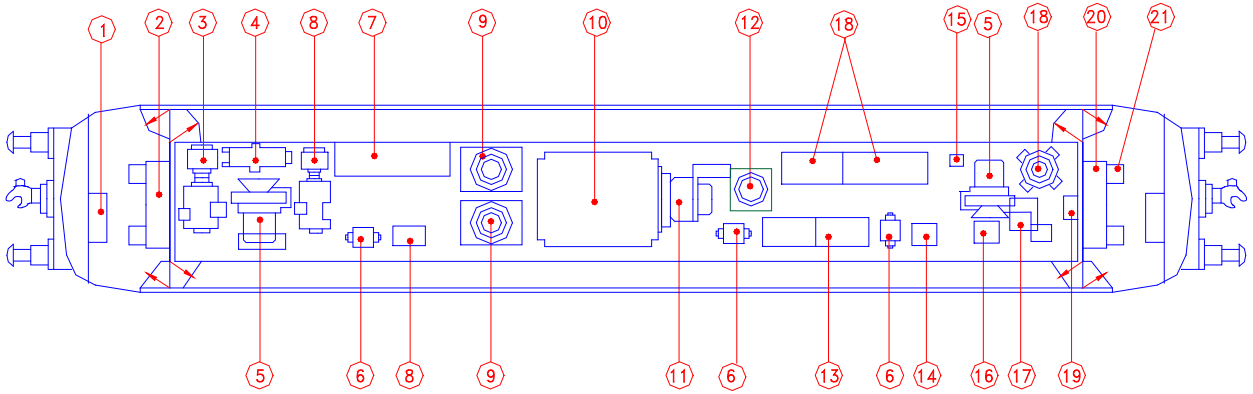
PROTECTIVE DECIVES

DEAD MAN CONTROL –	NO
SLIP CONTROL –	YES
MAIN O/L RELAY –	YES
MOTOR O/L REKAY –	YES
OVER–VALTAGERELAY –	YES
NO VOLTA RELAY –	YES
EARTH FAULT RELAY –	YES
LOW VOLTAGE RELAY –	YES
LOW PR.GOV. –	YES
VAC.CON.GOV. –	YES
BRAKE CYL C/O VALVE –	YES

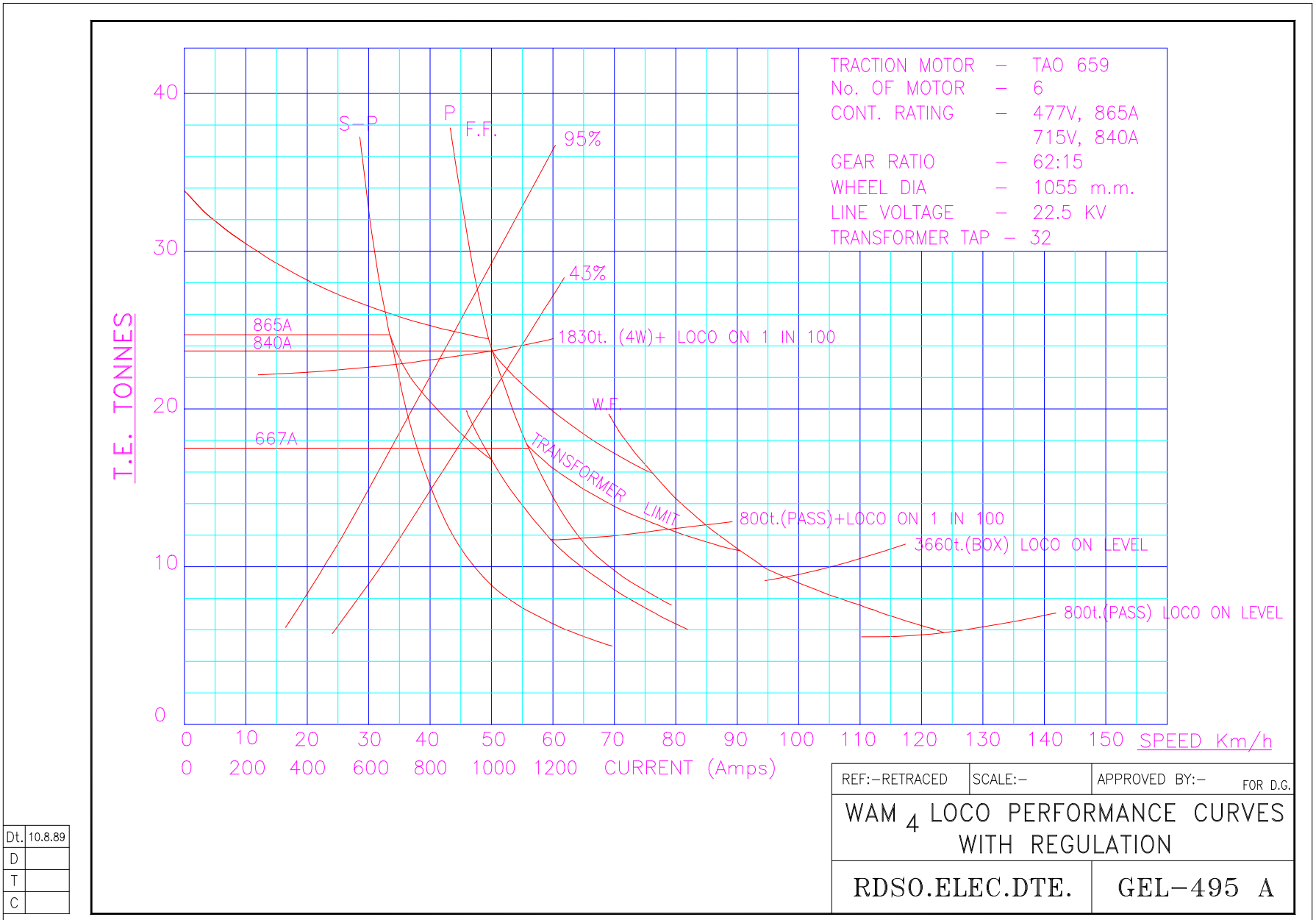
WAM4

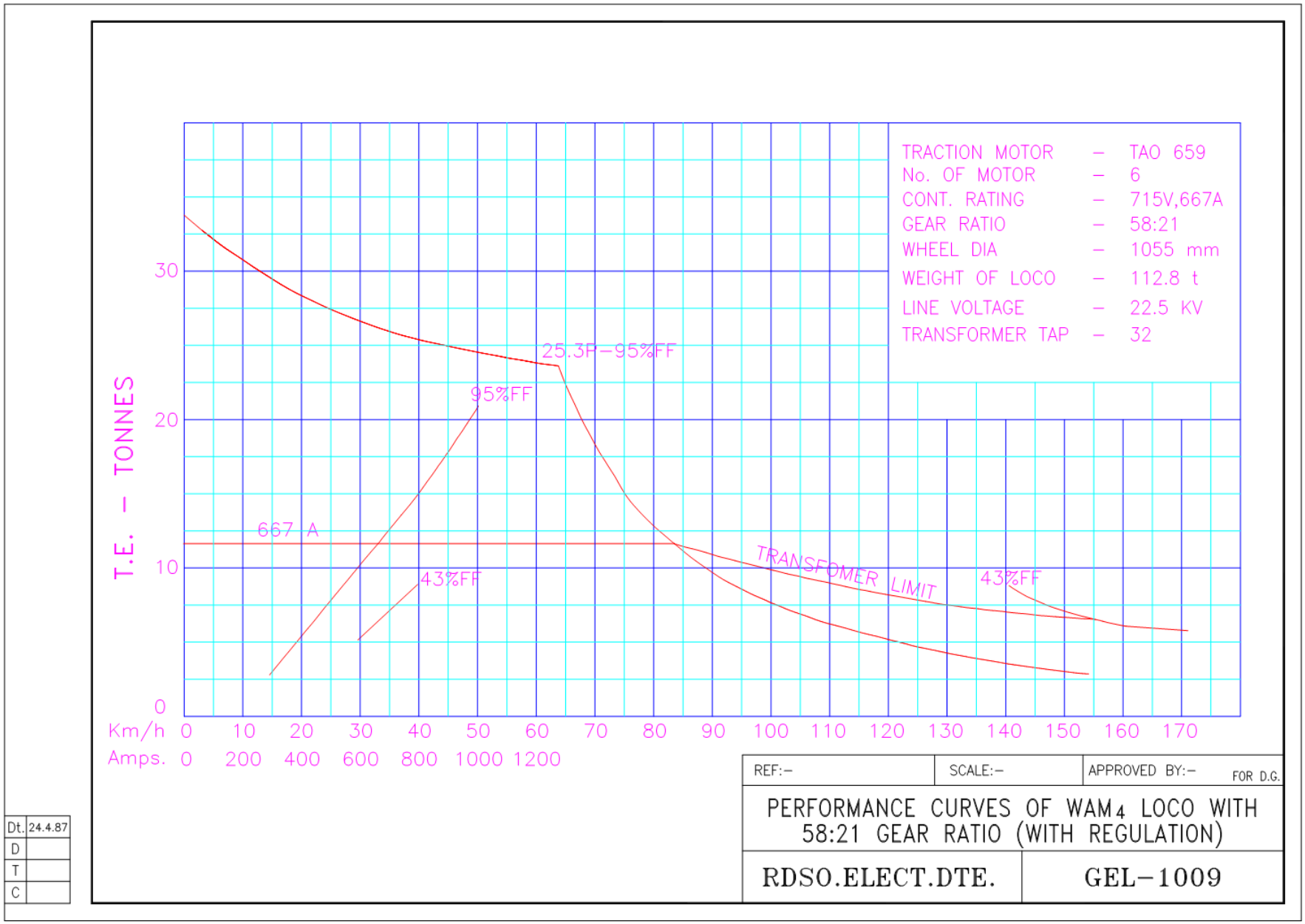


1. DRIVER'S DESK
2. PNEUMATIC CABINAT
3. EXHAUSTER SET
4. COMPRESSOR SET
5. T.M. BLOWER SET
6. INDUCTIVE SHUNT
7. H.T. PANNEL
8. EXCITATION TRANSFORMER
9. BRAKE RESISTER
10. TRANSFORMER ASSEMBLY
11. TAP CHANGER
12. SMOOTHING REACTOR
13. RECTIFIERS
14. R.C. NETWORK
15. HEAD LIGHT TRANSFORMER
16. BATTERY CHARGER
17. ARNO STARTING RESISTER
18. ARNO
19. CONTROL PANNEL TK-2
20. CONTROL CABINATE
21. DRIVER'S SEAT



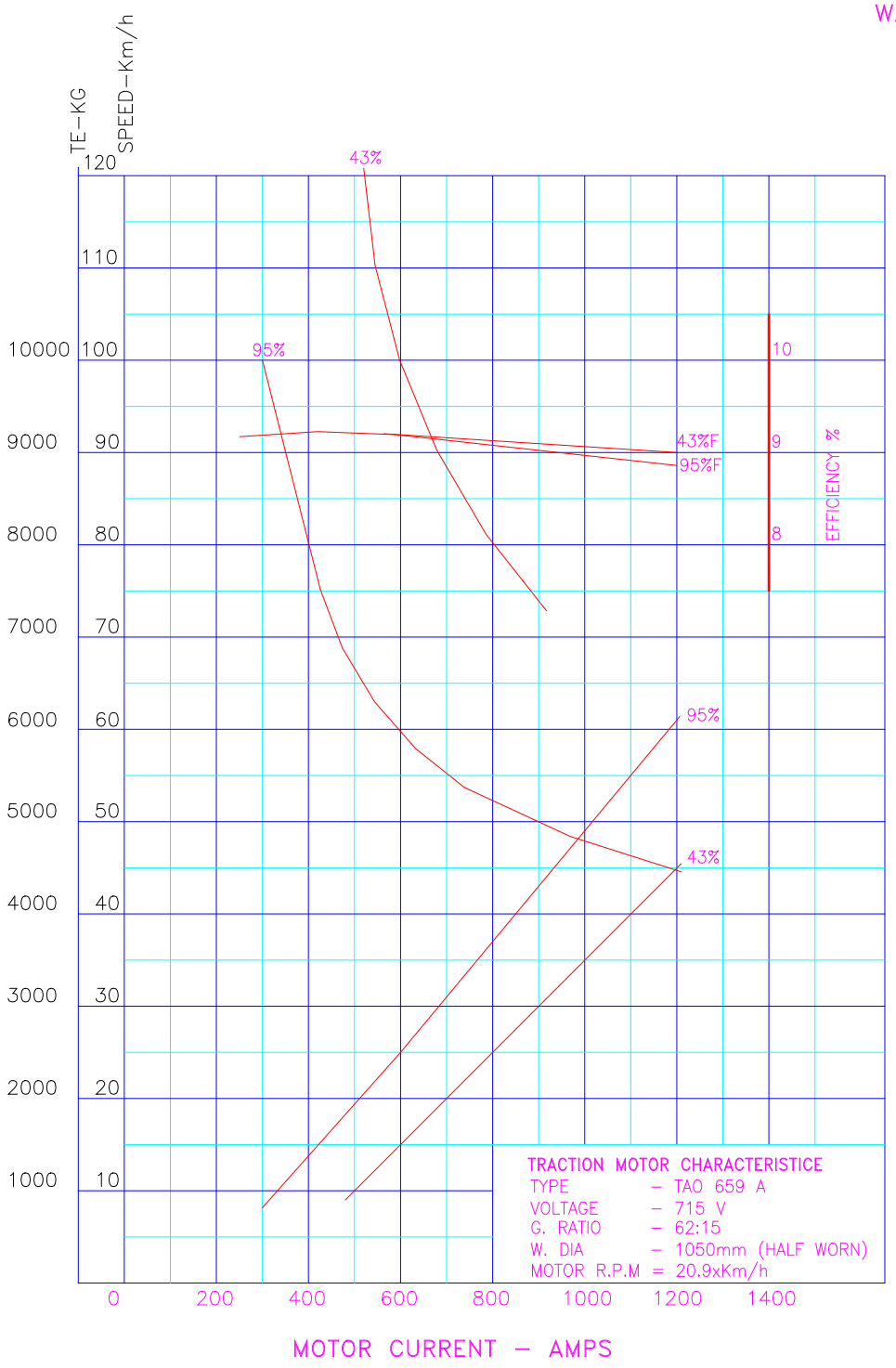
Dt.	---
D	---
T	R.C.S
C	----


TRACTION MOTOR – TAO 659
No. OF MOTOR – 6
CONT. RATING – 477V, 865A
715V, 840A
GEAR RATIO – 62:15
WHEEL DIA – 1055 m.m.
LINE VOLTAGE – 22.5 KV
TRANSFORMER TAP – 32
T.E. TONNES
SPEED Km/h
CURRENT (Amps)
S–P
P F.F.
95%
43%
865A
840A
667A
1830t. (4W)+ LOCO ON 1 IN 100
W.F.
TRANSFORMER LIMIT
800t.(PASS)+LOCO ON 1 IN 100
3660t.(BOX) LOCO ON LEVEL
800t.(PASS) LOCO ON LEVEL
REF:–RETRACED
SCALE:–
APPROVED BY:–
FOR D.G.
WAM 4 LOCO PERFORMANCE CURVES WITH REGULATION
RDSO.ELEC.DTE.
GEL–495 A
Dt. 10.8.89
D
T
C

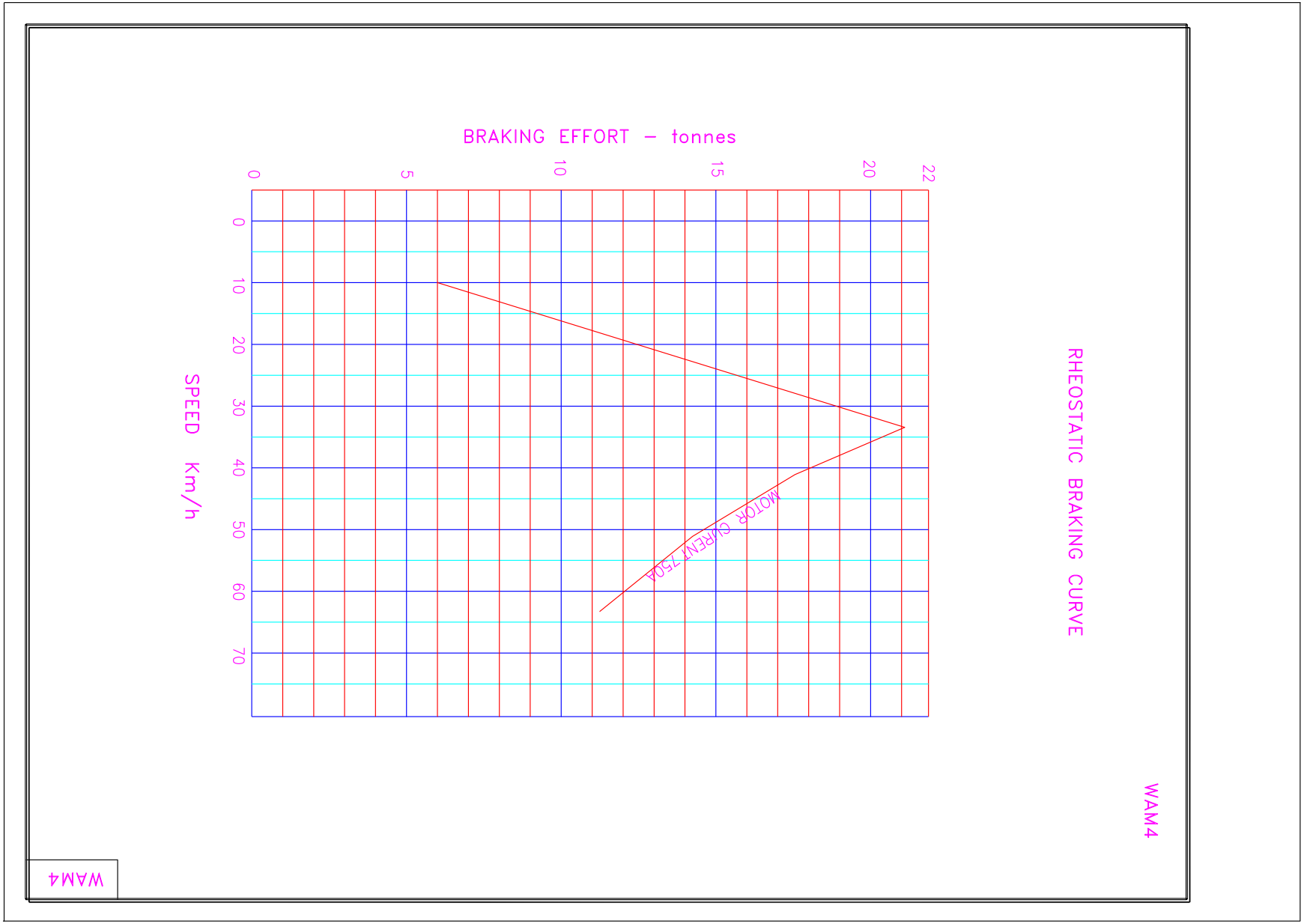

TRACTION MOTOR – TAO 659
No. OF MOTOR – 6
CONT. RATING – 715V,667A
GEAR RATIO – 58:21
WHEEL DIA – 1055 mm
WEIGHT OF LOCO – 112.8 t
LINE VOLTAGE – 22.5 KV
TRANSFORMER TAP – 32
T.E. – TONNES
0
10
20
30
667 A
25.3P–95%FF
95%FF
43%FF
TRANSFORMER LIMIT
43%FF
Km/h 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170
Amps. 0 200 400 600 800 1000 1200
REF:–
SCALE:–
APPROVED BY:–
FOR D.G.
PERFORMANCE CURVES OF WAM4 LOCO WITH 58:21 GEAR RATIO (WITH REGULATION)
RDSO.ELECT.DTE.
GEL–1009
Dt. 24.4.87
D
T
C

C	T	D	DT
	R.C.S		

WAM 4



WAM 4


BRAKING EFFORT – tonnes
0
5
10
15
20
22
SPEED Km/h
0
10
20
30
40
50
60
70
MOTOR CURRENT 750A
RHEOSTATIC BRAKING CURVE
WAM4
WAM4

WAM 4

HAULAGE CAPACITY OF WAM 4 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:4.13 (15:62) T.M. TAO-659A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →					4530	3430					ABOVE 6000
		1/500	← ABOVE 6000 →		4970	3970	3410	2675	2110					ABOVE 6000
		1/200	3300	3300	2800	2290	2025	1630	1330					3330
		1/150	2600	2600	2230	1845	1640	1330	1090					2600
		1/100	1790	1790	1580	1320	1175	970	790					1790
		1/50	1030	1025	810	670	610							1070
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						5750					ABOVE 6000
		1/500	4720	4720	4720	4720	4720	3460	2860					4720
		1/200	3280	3280	3070	2555	2300	1900	1595					3280
		1/150	2800	2800	2410	2010	1820	1505	1270					2800
		1/100	2120	2080	1670	1400	1270	1050	885					2140
		1/50	1055	1050	835	695	635							1240
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →										1250	ABOVE 1500
		1/500	← ABOVE 1500 →								1445	1100	830	-DO-
		1/200	← ABOVE 1500 →						1430	1200	905	695	525	-DO-
		1/150	← ABOVE 1500 →					1375	1160	980	740	570	430	-DO-
		1/100	1460	1425	1385	1330	1220	980	835	705	530	405	305	-DO-
		1/50	715	705	695	680	620	495	420	350	255	190	130	1285

Dt	17.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAM 4
(3S-2P)

HAULAGE CAPACITY OF WAM 4 (3S-2P) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:4.13 (15:62) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				4340	2730	1450					ABOVE 6000
		1/500	← ABOVE 6000 →		4960	3805	2410	1590	875					ABOVE 6000
		1/200	3300	3300	2785	2190	1415	950	525					3330
		1/150	2600	2600	2230	1765	1145	770	420					2600
		1/100	1790	1790	1580	1255	810	540	285					1790
		1/50	1030	1020	810	640	400	255	115					1070
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →					4430	2855					ABOVE 6000
		1/500	4650	4650	4650	4630	3020	2060	1175					4650
		1/200	3220	3220	3100	2460	1615	1125	765					3220
		1/150	2750	2750	2435	1940	1270	880	600					2750
		1/100	2110	2085	1685	1345	875	600	400					2110
		1/50	1055	1050	385	665	420	270	120					1220
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →					4700	2560					ABOVE 6000
		1/500	5430	5430	5430	4870	3150	2125	1205					5430
		1/200	3580	3580	3160	2515	1650	1130	635					3580
		1/150	3005	3005	2470	1970	1295	885	490					3005
		1/100	2155	2125	1695	1355	885	600	320					2660
		1/50	1070	1060	840	665	420	270	125					1270

Dt	17.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAM 4P

HAULAGE CAPACITY OF WAM 4P LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:2.76 (21:58) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICF COACH	LEVEL	ABOVE 1500											ABOVE 1500
		1/500	ABOVE 1500									1300	1070	-DO-
		1/200	ABOVE 1500				1460	1390	1320	1170	970	830	700	-DO-
		1/150	1370	1320	1270	1220	1170	1120	1070	950	800	680	570	-DO-
		1/100	920	900	870	850	820	790	760	680	570	490	410	1500
		1/50	430	420	420	410	400	390	380	340	280	240	200	850

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WAP 1/3

CONT. RAIL P.S. 3800
CO-CO TYPE WAP 1/3 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAP1

Co–Co Type WAP1 Class Electric locomotive
1676 mm Gauge

Five Proto Type locomotives of this type were ordered on Chittaranjan Locomotive Works to the design of RDSO. First Prototype locomotive was put in service in 1981. The continuous rail horse power of the locomotive is 3800 PS at 73.5KW/h.

THE locomotive is powered by six axle hung, nose suspended forced ventilated type dc traction motors. Speed Control is achieved by grouping in 2S–3P combination and by field weakening the motor.

These locomotives, utilise silicon rectifier for conversion of ac power line into dc.
These locos are being converted to make them suitable for multiple operation.

Compressed air brake for the locomotive and vacuum brake for the train are provided. Brakes system is being modified to make them suitable for dual brakes.

Procurement Particular

Contract		Builder	Year put in line	I. R. Loco Numbers	Particular Spec. No.	As made drawing set	Total No. Ordered.	Remark
Number	Date							
		RDSO/CLW	1981	22000–22004	E–17/P–1 WAM4R	WAP1	5	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WAP1	Co–Co			RDSO/CLW	1981	2200–22004	RDSOE–17/P–1 WAM4R	WAP1	5(Prototype)

MAIN PARTICULARS OF LOCO

WAP1

GENERAL

SYSTEM OF CURRENT	—	ac
LINE VOLTAGE	—	25000V
WEIGHT IN W.O.	—	108.3
ADHESIVE WEIGHT	—	108.3
MAX. AXLE LOAD	—	18.05 t
MIN. AXLE LOAD		

CONTINUOUS RATING

P.S.	—	3800
T.E.	—	13.8
SPEED	—	73.5 KMPH
MAX. T.E.	—	22.4 t
MAX. SPEED	—	130 KMPH
WHEEL DIA Half worn	—	1055 mm
Full worn	—	1016 mm
NEW	—	1092 mm

BOGIE

DRIVE ARGT	—	GEAR PINION
DESIGN	—	3 AXLE Flexicoil Bogie (Mark I)

BRAKES

LOCO	—	AIR, HAND
TRAIN	—	DUAL BRAKE

SANDING

NO. OF BOXES	—	8
CAPACITY	—	

CONTROLS

— Being corrected to make it suitable for multiple operation.

PANTOGRAPH

No.	—	2
MAKE	—	FAIVELEY
TYPE	—	AM 12
WEIGHT (including 4 insulators)	—	285 kg

TRANSFORMER

MAKE	—	BHEL
TYPE	—	HETT 3900
NUMBER	—	1
WT.COMPLETE	—	11730 kg
COOLING	—	FORCED OIL
INSULATION	—	A
TAPSON H.T.	—	32
RATING	—	32
PRIMARY	—	3900 KVA 22.5 KV 182A
SECONDARY	—	3900 KVA 865V (AC)
TERTIARY	—	180 KVA/250 KVA, 380V.

SILICON RECTIFIER

NUMBER	—	2
CONT.RATING	—	2700A(EACH CUBICLE) 1050V (RMS)
MAX.STARTING CURRENT	—	3300A
COOLING	—	FORCED AIR
TYPE OF CELL	—	S18FN35(Hind Rect.)
CONNECTION	—	BRIDGE
NO.OF CELLS	—	64 PER BRIDGE

S P A
2 8 4

TRACTION MOTORS

MAKE	—	Alsthom/CLW
TYPE	—	TAO 659
NUMBER	—	6
INSULATION	—	ARM H FIELD H
SUSPENSION	—	AXLE HUNG NOSE SUSPENDED
VENTILATION	—	FORCED
WEIGHT COMPLETE	—	2800 KG
TEMP. RISE (BY RESISTANCE)	—	ARM 140°C FIELD 160°C
COIL RESISTANCE	—	110°C
ARMATURE	—	0.012 ohms
MAIN POLE	—	0.01117 ohms
INTERPOLE	—	0.008 ohms
RATING	—	110°C
CONTINUOUS	—	770 HP,750V,840A, 1095 RPM
1 Hr.	—	750V,855A,1070RPM
AIR GAP		
MAIN POLE	—	5.5 mm
INTERPOLE	—	6.0
BRUSHES		
GRADE	—	EG 367
NO. OF HOLDERS	—	6
BRUSH PER HOLDER	—	3
SIZE (LxWxH)	—	2x(8x43)
MIN. HEIGHT	—	NEW 52 WORN 57

MOTOR GROUPING –
P 1 – 2
3 – 4
5 – 6

GEAR RATIO 58:21
PERMANENT SHUNT 5%

AUXILIARIES

HEAD LIGHT — 2 Nos.,250W
— 32V.
BATTERY — LEAD ACID,
— 50 CELLS 110V,75AH (5 Hr.RATE)
TRANSFORMER — 380/32,24V,16V 50C/S,500 VA
ARNO CONVERTOR — 1 NO,1420 RPM
1 PHASE — 150 KVA, 380V, 395A.
3 PHASE — 120KVA,380V,190A

COMPRESSOR

No. — 2
MAKE — ELGI
TYPE —
CAPACITY — 1000 l/m at 7.5kg/cm^2
MOTOR — 2 No.12.5HP,380V

EXHAUSTER

NO. — 2
MAKE — NORTHEY
TYPE — 250 RE
CAPACITY — 4500 l/m
MOTOR — 2 NOS,7.5/11KW, 16/22A,285V,970/ 1460 RPM.

TRACTION MOTOR BLOWER

NO. — 2
MAKE — SF INDIA LTD
TYPE — MLBR–42,5–1.44
MOTOR
No. — 2
MAKE — SIEMENS
RATING — 22 KW,380V, 41A,3000 RPM

SMOOTHING REACTOR BLOWER

No. — 2
MAKE — S.F.INDIA LTD
TYPE — PFTA–50, ARR6
CAPACITY — 4200 m^3/hr 85 mmWg.
MOTOR
2 NO, 2.2 HP, 380V, 2860 RPM

SILICON RECTIFIER BLOWER

NUMBER — 2
MAKE — S.F.INDIA LTD
TYPE — AXIAL
CAPACITY — 56 mmWg
MOTOR 3100 to 3200m^3/hr, 45 to 47 mmWg.
MOTOR — 2NOS,2KW,380V,4.4A, 2860 RPM
TOTAL WT. — 60 kg (Approx.)

OIL COOLER BLOWER

NUMBER — 1
MAKE — S.F.INDIA LTD.
TYPE — MLBR–60–1–H2
CAPACITY — 22,200 m^3/hr,170 mmWg
MOTOR — 1 NO,30 HP,380V, 43A,1450 RPM

OIL PUMP FOR TRANSFORMER

NUMBER — 1
MAKE — BEST & CO.PR.LTD
CAPACITY — 750 l/m at 11 mmwg
MOTOR — 1 NO,3.3 KW, 380V 6.6A, 2865 RPM

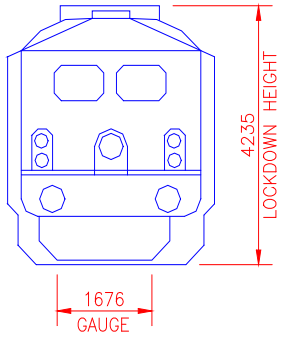
SMOOTHING REACTOR FOR TRACTION MOTOR

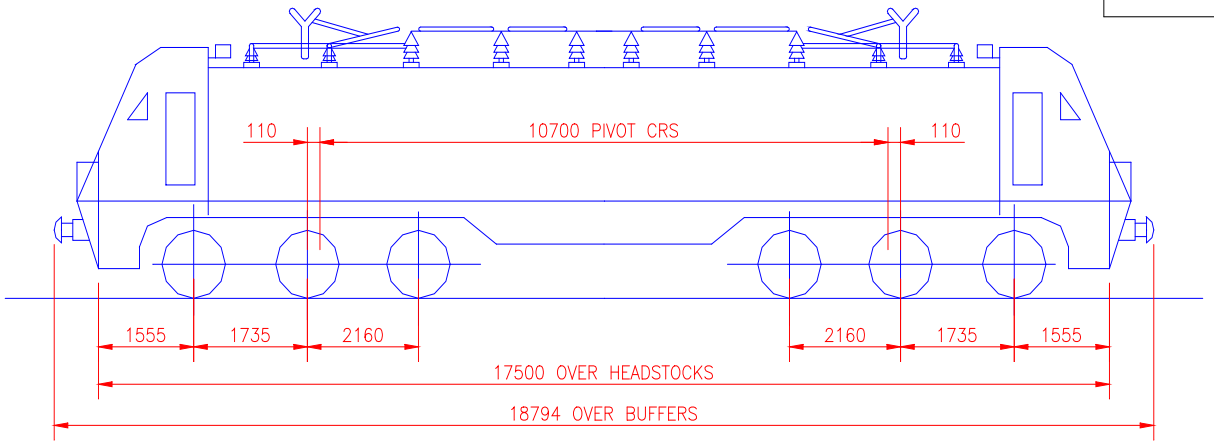
TYPE — SL42
RATING — 1250V,950A
REACTANCE — 5.37 mH
RESISTANCE AT 110°C–0.00718 Ohm.

PROTECTIVE DEVICES.

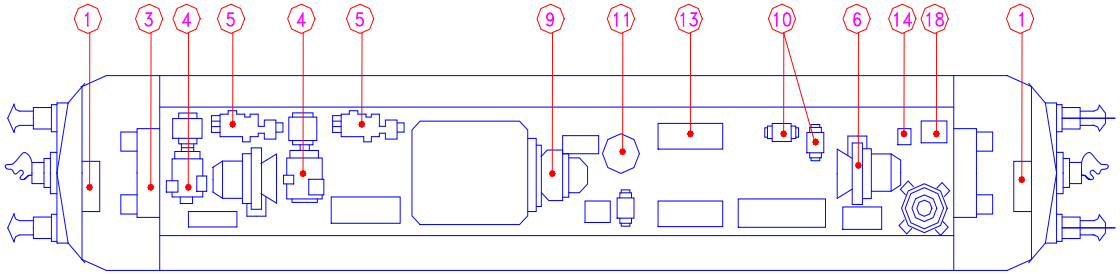
DEAD MAN CONTROL — NO
SLIP CONTROL — YES
MAIN O/L RELAY — YES
OVER VOLTAGE RELAY — YES
NO VOLT RELAY — YES
EARTH VOLT RELAY — YES
LOW PR.GOV. — YES
VAC.CON.GOV. — YES
BRAKE CYC.C/O VALVE — YES

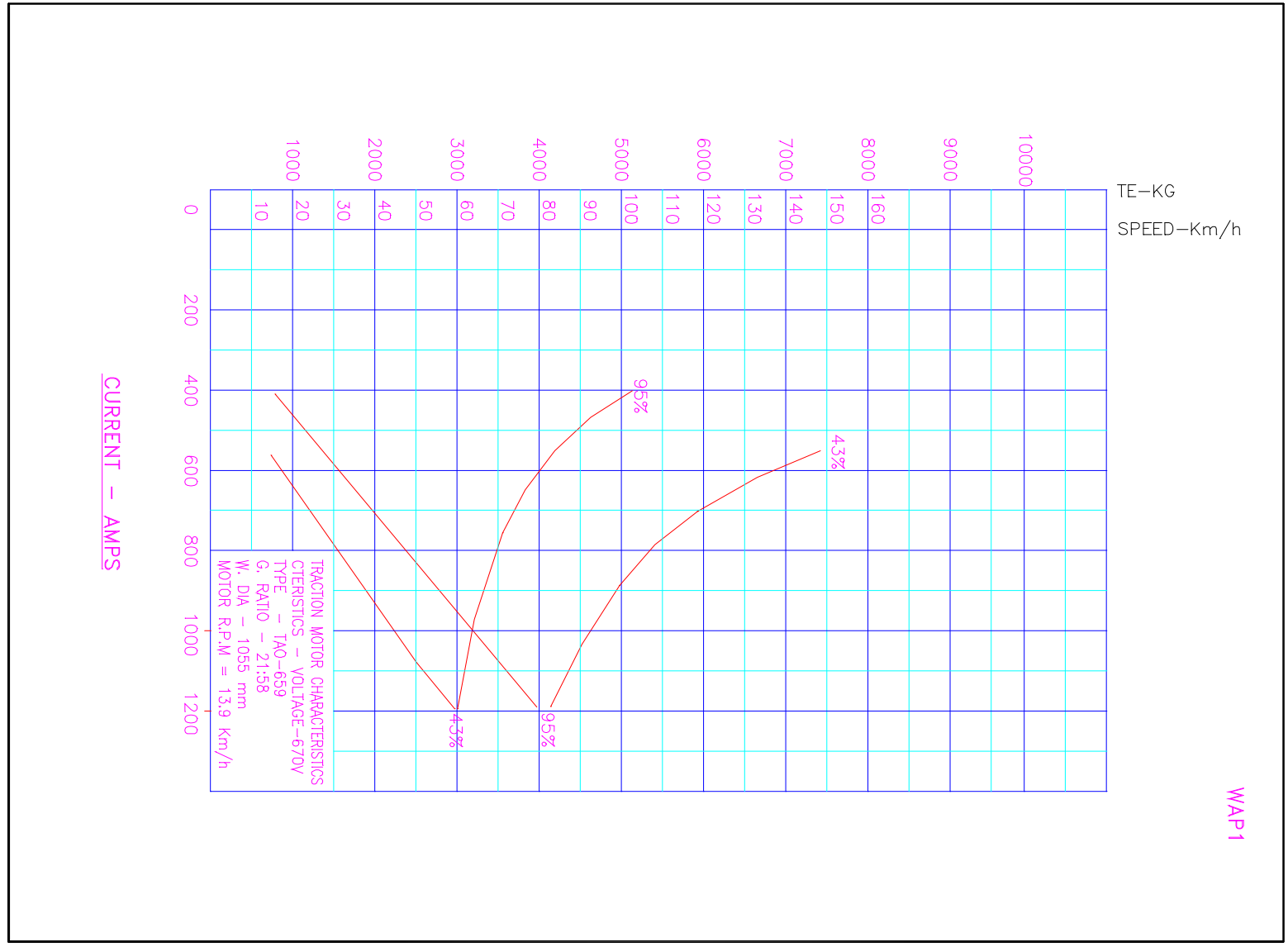
WAP1

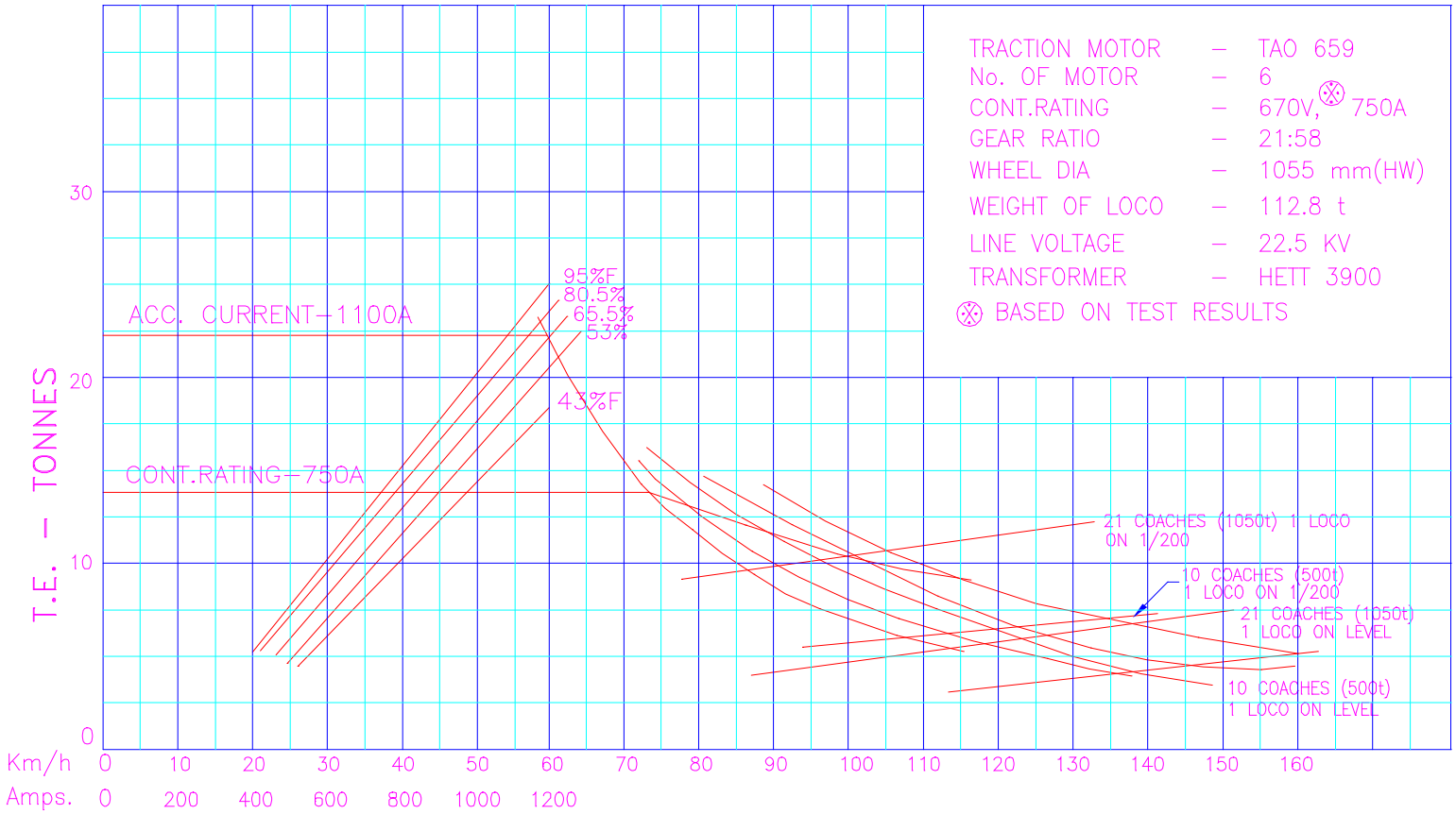




1. MASTER CONTROLLER
2. DRIVER'S SEAT
3. AC–1 CUBICLE
4. EXHAUSTER.
5. COMPRASSOR.
6. T–M BLOWER.
7. Ba PANNEL–1.
8. MAIN TRANSFORMER.
9. TAP CHANGER.
10. INDUCTIVE SHUNT.
11. SMOOTHING REACTOR WITH BLOWER.
12. DAMPING NETWORK.
13. SILICON RECTIFIRE WITH BLOWER.
14. HEAD TRANSFORMER.
15. Ba PANNEL – 2.
16. ARNO STARTING REACTOR.
17. ARNO.
18. BATTERY CHARGER.
19. AC–2 CUBICLE.
20. EXHAUSTER BLOCK.




TE–KG
SPEED–Km/h
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
0
200
400
600
800
1000
1200
CURRENT – AMPS
95%
43%
43%
95%
TRACTION MOTOR CHARACTERISTICS
CTERISTICS – VOLTAGE–670V
TYPE – TAO–659
G. RATIO – 21:58
W. DIA – 1055 mm
MOTOR R.P.M = 13.9 Km/h
WAP1



Dt.	25.6.86
D	
T	
C	

REF:– RETRACED	SCALE:– 1:1	APPROVED BY:– SD. FOR D.G.

PERFORMANCE CURVES OF WAM$_4$R (WAP1/3) LOCOMOTIVE WITH ACTUAL REGULATION.

RDSO.ELEC.DTE.	GEL–949

WAP 1

HAULAGE CAPACITY OF WAP 1 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:2.76 (21:58) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)													START
			20	40	60	70	80	90	100	110	120	130	140	150	160	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
	BOGIE WAGONS (BOX)	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
PASSENGER SERVICE	ICF COACH	LEVEL	4340	4340	4340	4340	4340	4340	4340	4340	4340	1280	985	720	520	4340
		1/500	3070	3070	3070	3070	3070	3070	3070	1350	1100	870	685	505	365	3070
		1/200	2115	2115	2115	2115	1460	1215	1010	860	715	570	450	330	235	2115
		1/150	1795	1795	1415	1360	1185	990	830	710	590	470	370	270	190	1795
		1/100	1120	1060	1000	965	850	715	600	515	425	340	265	190	130	1370
		1/50	540	520	500	490	430					155	115	70	35	775

Dt	29.9.94
D	L.K.MISRA
T	
C	P.N.SETH

WAP 3

HAULAGE CAPACITY OF WAP 3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:2.52 (23:58) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)													START
			20	40	60	70	80	90	100	110	120	130	140	150	160	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
	BOGIE WAGONS (BOX)	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →									1200	870	600	360	ABOVE 1500
		1/500	← ABOVE 1500 →							1335	1105	810	600	415	245	-DO-
		1/200	← ABOVE 1500 →				1470	1225	1020	850	715	530	390	265	145	-DO-
		1/150	← ABOVE 1500 →			1430	1195	1000	835	700	590	435	320	215	115	-DO-
		1/100	1225	1165	1095	1020	855	720	605	505	425	310	225	145	65	-DO-
		1/50	590	575	550	515	430	360	300	245	205	140	90	45		1145

Dt	3.9.94
D	L.K.MISRA
T	
C	P.N.SETH

WAP 4

CONT. RAIL P.S. 5050
CO-CO TYPE WAP 4 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAP 4

WAP–4 CLASS 5000 h p ELECTRIC LOCOMOTIVE FOR PASSENGER OPERATION 1676 MM GAGUE

ONE PROTOTYPE OF THIS TYPE HAS BEEN ORDERED ON CHITTARANJAN LOCOMOTIVE WORKS TO THE DESIGN OF R.D.S.O. FRIST LOCOMOTIVE PUT ON LINE IN SEPTEMBER 1994. THE CONTINUOUS RAIL HORSE POWER OF THE LOCOMOTIVE IS 5050h p AT 72 kmph.

THE LOCOMOTIVE IS POWERED BY SIX AXLE HUNG. NOSE SUSPENDED FORCED VENTILATED TYPE dc TRACTION MOTORS. SPEED CONTROL IS ACHIEVED BY GROUPING IN G.P. COMBINATION AND BY FIELD WEAKENING THE MOTORS.

THE LOCOMOTIVE,UTILISES HIGH CAPACITY SILICON RECTIFIER FOR CONVERSION OF ac POWER OF dc

THESE LOCOMOTIVES CAN BE USED FOR RMM TABLE OPERATION COMPRESSED AIR FOR LOCOMOTIVE AND AIR BRAKE FOR THE TRAIN ARE PROVIDED.THE LOCO IS HIGHER UNDERFRAME OF 300 I BUFFING LOAD.CAST BOGIE MARK–1 FLEXICOIL SUITABLE FOR 149kmph SERVICE SPEED. THE LOCO HAS BEEN PROVIDED WITH ALLUMINIUM CHEQUERED PLATES. REDUCED NUMBER OF SANDERS HIGH UNDERFRAME ETC.SO AS TO KEEP WEIGHT OF LOCO 112.8 TONNE MAX.

PROCUREMENT PARTICULAR

CONTRACT		BUILDER	YEAR PUT IN LINE	I. R. LOCO NO.SPECN.	PARTICULAR No.DRG SET	AS MADE ORDERED	TOTAL No.	REMARKS
NUMBER	DATE							
		RDSO/CLW	1994		EL/RS–101	WAP–4	01	

MAIN PARTICULARS OF LOCO

WAP4

GENERAL

SYSTEM CURRENT	—	AC
LINE VOLTAGE	—	25000V
WEIGHT IN W.O.	—	112.8t
ADHESIVE WEIGHT	—	112.8t
MAX. AXLE LOAD	—	18.8t
MIN. AXLE LOAD		

CONTINUOUS RATING

P.S.	—	5050HP
T.E.	—	18800 kg
SPEED	—	72 KMPH
MAX. T.E.	—	30.8t
MAX. SPEED	—	169.5KMPH
WHEEL DIA		
Half WORN	—	1055 mm
Full worn	—	1016 mm
NEW	—	1092 mm

BOGIE

DRIVE ARGT	—	GEAR PINION
DESIGN	—	3 AXLE Flexicoil Mark–1 CASTBOGIE

BRAKES

LOCO	—	AIR/HANDBRAKE
TRAIN	—	AIRBRAKE

SANDING

NO. OF BOXES	—	4

PANTOGRAPH

No.	—	2
MAKE	—	STONEINDIA CALCUTTA
TYPE	—	AM 12
WEIGHT	—	285 kg
(INCLUDING/4INSULATORS)		

TRANSFORMER

MAKE	—	
TYPE	—	
WT.COMPLETE	—	
COOLING	—	FORCED OIL
INSULATION	—	A
TAPSON H.T.	—	32
RATING		
PRIMARY	—	5000A 22.5KV,5000A
SECONDARY	—	5100 KVA 1000V,5400A

SILICON RECTIFIER

No.	—	2
CONT.RATING	—	2700A (EACH CUBICAL) 1050V
MAX.STARTING CURRENT	—	3300A RMS
COOLING	—	FORCED AIR
TYPE OF CELL	—	
NO.OF COILS	—	

TRACTION MOTORS

MAKE	—	CLW
TYPE	—	HS–15250A
NUMBER	—	6
CLASS OF INSULATED		
ARMATURE	—	C
FIELD	—	C
SUSPENSION	—	AXLE HUNG NOSE SUSPENDED
VENTILATION	—	FORCED 80m^3/mt. ON OUTERM/L
WEIGHT COMPLETE	—	3650 KG
TEMPRATURE RISE		
ARMATURE	—	90DEG.CEN
FIELD	—	70DEG.CEN
COMMOTATOR	—	85DEG.CEN
COIL RESISTANCE AT 110 DEG.CEN		
ARMATURE	—	0.0126 ohms
FIELD	—	0.0117 ohms
COMMOTATOR	—	0.0089 ohms
RATING CONT.	—	630KW, 750V 900A,895 RPM
RATING ONE HOUR	—	870 HP,750V,960A, 990A 877 RPM
	—	750V,855A,1070RPM
AIR GAP MAIN PLACE		6.35 mm
AIR GAP INTERPOLE		10 mm
BRUSHES		
GRADE	—	EG 1055/BG 1165 (Morganite)
TYPE	—	2 SPILIT
NO. OF HOLDER	—	6Br.per holder
SIZE	—	200X40X64 mm
BR WEAR LIST	—	25MM.
MOTOR GROUPING	–	6P
GEAR RATIO	—	23:58
PERMANENT SHUNT	—	5%

AUXILIARIES

HEAD LIGHT	—	2 Nos.,250W, 32V
BATTERY	—	LEAD ACID,50CELLS
TRANSFORMER	—	380/32,24V,16V 50C/S,500 VA
ARNO CONVERTOR	—	1 NO,1420 RPM
1 PHASE	—	150 KVA, 380V, 395A.
3 PHASE	—	120KVA, 380V,

COMPRESSOR

No.	—	2
MAKE	—	ELGI
TYPE	—	
CAPACITY	—	1000l/m AT 7.5 kg/cm sq
MOTOR	—	2 No.12.5HP,380V

TRACTION MOTOR BLOWER

NO.	—	2
MAKE	—	SF INDIA LTD
TYPE	—	MLBR–42,5–1.44
AIR DELIVERY	—	276 CUBC/M AT 300 MM OF
MOTOR		
No.	—	2
MAKE	—	SIEMENS
RATING	—	22 KW,415V, 50A,2820 RPM

SMOOTHING REACTOR BLOWER

No.	—	2
MAKE	—	S.F.INDIA LTD
TYPE	—	PFTA–50, ARR6
CAPACITY	—	4200 m^3/hr 85 mmWg.

Silicon Rectifier Blower

NUMBER	—	2
MAKE	—	S.F.INDIA LTD
TYPE	—	AXIAL
CAPACITY	—	3100 to 3200m/hr, 45 to 47 mmWg.
MOTOR	—	2NOS,22KW,415V,8A,2860RPM
TOTAL WEIGHT	—	60 kg (Approx.)

OIL COOLER BLOWER

NUMBER	—	1
MAKE	—	S.F.INDIA LTD.
TYPE	—	MLBR–60–1–H2
CAPACITY	—	22,200 m^3/hr, 190 MMWG
MOTOR	—	1NO, 30HP, 380V, 43A,1450 RPM

OIL PUMP FOR TRANSFORMER

NUMBER	—	1
MAKE	—	BEST & CO.PR.LTD
CAPACITY	—	750 L/M at 11 MMWG
MOTOR	—	1 NO,3.3 KW, 415V 6.6A, 2865 rpm

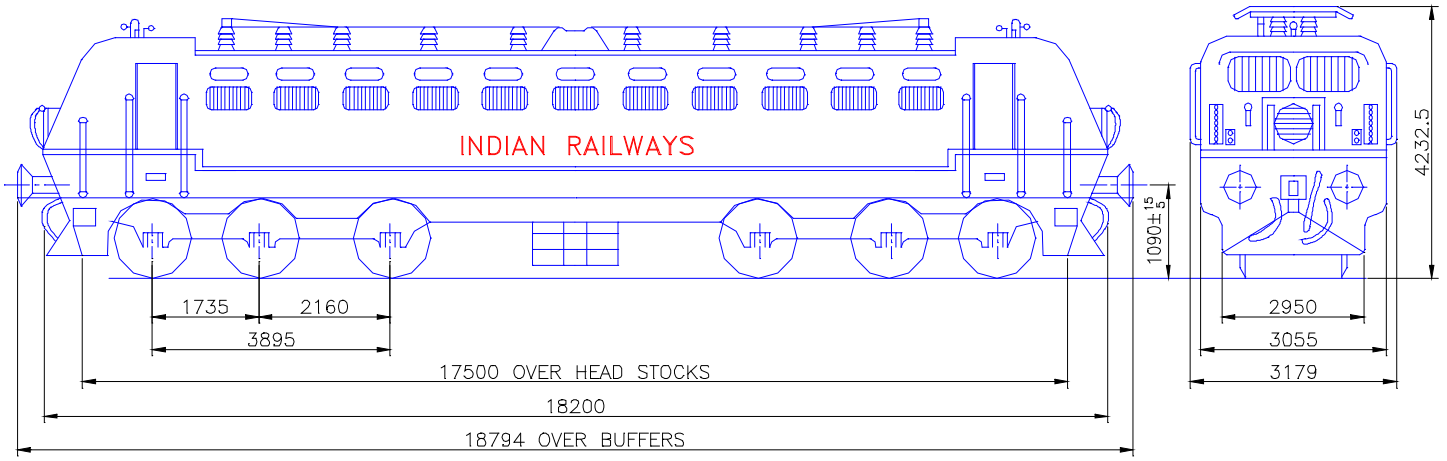
Smoothing Reactor For Traction Motor

TYPE	—	SL–30
RATING	—	1250V,1350A
REACTANCE	—	260 mt
RESISTANCE AT 110°C–0.00718 Ohm.		

PROTECTIVE DEVICES.

DEAD MAN CONTROL	—	NO
SLIP CONTROL	—	YES
MAIN O/L RELAY	—	YES
OVER VOLTAGE RELAY	—	YES
NO VOLT RELAY	—	YES
EARTH VOLT RELAY	—	YES
LOW PR.GOV.	—	YES
VAC.CON.GOV.	—	YES
BRAKE CYC.C/O VALVE	—	YES

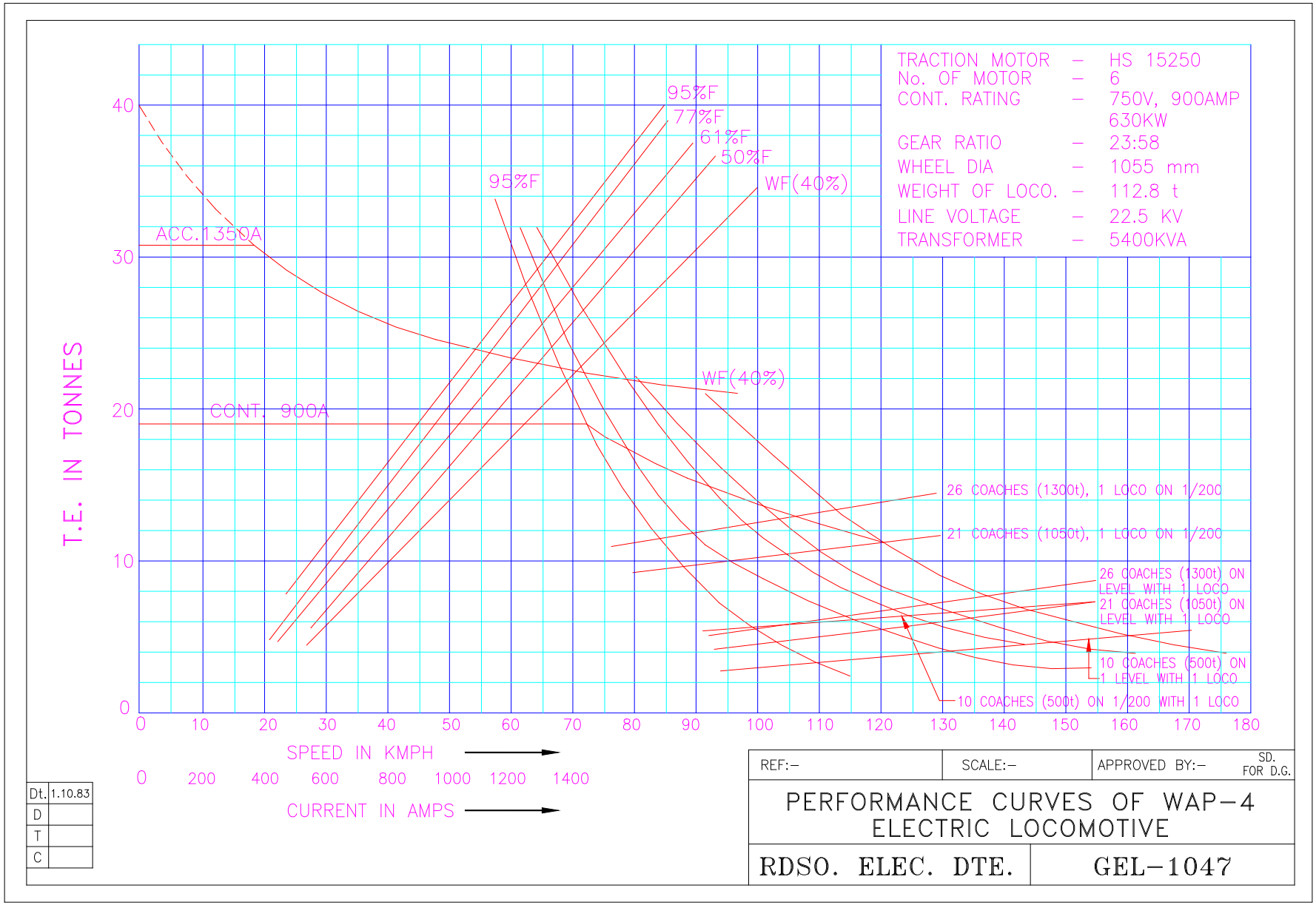
WAP4



SALIENT DATA OF WAP 4 – 5000 H.P.

1.	TYPE OF SERVICE	HIGH SPEED PASSENGER
2.	CLASS OF LOCO	WAP 4 – 5000 H.P.
3.	TYPE OF BOGIE	FLEXICOIL (CO–CO) MARK I
4.	TRACK GAUGE	1676 mm
5.	LENGTH OF BUFFERS	18794 mm
6.	WHEEL BASE	3895 mm
7.	TOTEL H.P. OF LOCO (CONT.RATED)	5060
8.	MAX.TRACTIVE EFFORT AT CONT.SPEED OF 72Kmph	19 TONNE
9.	MAX.STARTING TRACTIVE EFFORT	30.8 TONNE
10.	MAX.UPRATING SPEED	140 Kmph
11.	BRAKE SYSTEM	AIR BRAKE/HAND BRAKE
12.	MAX.AXLE LOAD	18.8 TONNE ±2%
13.	TOTAL WIDTH OF LOCO	3179 mm
14.	PANTO HEIGHT IN LOCKED DOWN CONDITION	4232.5 mm
15.	TOTAL WEIGHT OF LOCO	112.3 TONNE ±1%
16.	TRACTION MOTOR	HITACHI TYPE HS 15250–A
17.	NO. OF MOTORS	6
18.	CONT. RATING	750 V, 900 AMP
19.	WHEEL DIA	1092NEW (1055 HALF WORN)
20.	OHE VOLTAGE	25 KV AC 50 HZ
21.	TRANSFORMER	5400 KVA

DT	19.8.91
D	
C	
T	


TRACTION MOTOR – HS 15250
No. OF MOTOR – 6
CONT. RATING – 750V, 900AMP
630KW
GEAR RATIO – 23:58
WHEEL DIA – 1055 mm
WEIGHT OF LOCO. – 112.8 t
LINE VOLTAGE – 22.5 KV
TRANSFORMER – 5400KVA
T.E. IN TONNES
SPEED IN KMPH
CURRENT IN AMPS
ACC.1350A
CONT. 900A
95%F
77%F
61%F
50%F
95%F
WF(40%)
WF(40%)
26 COACHES (1300t), 1 LOCO ON 1/200
21 COACHES (1050t), 1 LOCO ON 1/200
26 COACHES (1300t) ON LEVEL WITH 1 LOCO
21 COACHES (1050t) ON LEVEL WITH 1 LOCO
10 COACHES (500t) ON 1 LEVEL WITH 1 LOCO
10 COACHES (500t) ON 1/200 WITH 1 LOCO
Dt. 1.10.83
D
T
C
REF:–
SCALE:–
APPROVED BY:–
SD. FOR D.G.
PERFORMANCE CURVES OF WAP–4 ELECTRIC LOCOMOTIVE
RDSO. ELEC. DTE.
GEL–1047

WAP 4

HAULAGE CAPACITY OF WAP 4 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 2.52 (23:58) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)													START
			20	40	60	70	80	90	100	110	120	130	140	150	160	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
	BOGIE WAGONS (BOX)	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →										1155	805	570	ABOVE 1500
		1/500	← ABOVE 1500 →									1105	805	565	400	-DO-
		1/200	← ABOVE 1500 →						1320	1230	1035	730	535	375	260	-DO-
		1/150	← ABOVE 1500 →					1405	1090	1020	860	610	445	310	215	-DO-
		1/100	1570	1490	1405	1365	1195	1020	795	750	635	445	320	220	145	-DO-
		1/50	770	750	720	710	625	530	410	390	325	220	150	90	45	1160

NOTE : AVERAGE WEIGHT OF ICF COACH IS 55 TONNE.

Dt	22.8.94
D	L.K.MISRA
T	
C	P.N.SETH

WAP 6

CONT. RAIL P.S. 5060
CO-CO TYPE WAP 6 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WAP 6

WAP–6 CLASS 5000 h p ELECTRIC LOCOMOTIVE FOR PASSENGER OPERATION 1676 MM GAGUE

ONE PROTOTYPE OF THIS TYPE HAS BEEN ORDERED BY "CHITTARANJAN LOCOMOTIVE WORKS" TO THE DESIGN OF R.D.S.O. FRIST LOCOMOTIVE PUT ON LINE IN APRIL 1996. THE CONTINUOUS RAIL HORSE POWER OF THE LOCOMOTIVE IS 5060h p AT 72 kmph.

THE LOCOMOTIVE IS POWERED BY SIX AXLE HUNG NOSE SUSPENDED FORCED VENTILATED TYPE dc TRACTION MOTORS. SPEED CONTROL IS ACHIEVED BY GROUPING IN G.P. COMBINATION AND BY FIELD WEAKENING THE MOTORS.

THE LOCOMOTIVE,UTILISES HIGH CAPACITY SILICON RECTIFIER FOR CONVERSION OF ac POWER TO dc

THESE LOCOMOTIVES CAN BE USED FOR MULTIPLE OPERATION COMPRESSED AIR FOR LOCOMOTIVE AND AIR BRAKE FOR THE TRAIN ARE PROVIDED.THE LOCO IS HIGHER UNDERFRAME OF 300 I BUFFING LOAD.FABRICATED BOGIE MARK–IV FLEXICOIL SUITABLE FOR 160kmph SERVICE SPEED. THE LOCO HAS BEEN PROVIDED WITH ALLUMINIUM CHEQUERED PLATES. REDUCED NUMBER OF SANDERS LIGHTER UNDERFRAME ALUMINIUM WOUND TRANSFORMERS ETC.SO AS TO KEEP WEIGHT OF LOCO 113.2 TONNE.

PROCUREMENT PARTICULAR

CONTRACT NUMBER	DATE	BUILDER IN LINE.	YEAR PUT NO.SPECN.	I. R. LOCO NO.DRG.SET	PARTICULAR	AS MADE ORDERED	TOTAL No.	REMARKS
94/Elect/TRS /440/22	10.07.95	RDSO/CLW	1996	22401	SKEL–4360	WAP–6	01	

MAIN PARTICULARS OF LOCO(WAP-6)

GENERAL

SYSTEM CURRENT	—	SINGLE-PHASE
LINE VOLTAGE	—	25000V
WEIGHT IN W.O.	—	113.2t
ADHESIVE WEIGHT	—	113.2t
MAX. AXLE LOAD	—	19t
MIN. AXLE LOAD	—	19t

CONTINUOUS RATING

P.S.	—	5060HP(3675kw)
T.E.	—	19.00t
SPEED	—	72 KMPH
MAX. T.E.	—	30.8t
MAX. SPEED	—	160.0KMPH
WHEEL DIA		
Half WORN	—	1055 mm
Full worn	—	1016 mm
NEW	—	1092 mm

BOGIE

DRIVE ARGT	—	Co-Co
GEAR RATIO	—	23:58
DESIGN	—	3 AXLE

FLEXICOIL MARK-IV FABRICATED BOGIE

BRAKES

LOCO	—	AIR/HANDBRAKE
TRAIN	—	AIRBRAKE

SANDING

NO. OF BOXES	—	4

PANTOGRAPH

No.	—	2
MAKE	—	STONEINDIA CALCUTTA
TYPE	—	AN 12
WEIGHT	—	270 kg

(INCLUDING/4 INSULATORS)

TRANSFORMER

MAKE	—	CGL
TYPE	—	Aluminium coil round
WT.COMPLETE	—	11.78t
COOLING	—	FORCED OIL
INSULATION	—	A
TAPSON H.T.	—	32
RATING		
PRIMARY	—	5640A 22.5KV,5400A
SECONDARY	—	5400 KVA 1000V,5400A

SILICON RECTIFIER

No.	—	2(CuticlesLoco)
CONT.RATING	—	2700A (EACH CUBICAL) 1050V
MAX.STARTING CURRENT	—	3300A RMS
COOLING	—	FORCED AIR
TYPE OF CELL	—	
NO.OF COILS	—	

TRACTION MOTORS

MAKE	—	CLW
TYPE	—	HS-15250A
NUMBER	—	6
CLASS OF INSULATED		
ARMATURE	—	C
FIELD	—	C
SUSPENSION	—	AXLE HUNG NOSE SUSPENDED
VENTILATION	—	FORCED 90CUBI CM./MIN
WEIGHT COMPLETE	—	3485KG
TEMPRATURE RISE		
ARMATURE	—	90 DEG.CENT
FIELD	—	70 DEG.CENT
COMMOTATOR	—	85 DEG.CENT
COIL RESISTANCE AT 115 DEG.CENT		
ARMATURE	—	0.01284 ohms+10%
FIELD	—	0.01184 ohms+10%
COMMOTATOR	—	0.00907 ohms+10%
RATING CONT.	—	630KW,750V 900A,895 RPM
RATING ONE HOUR	—	630KW,750V 900A 895RPM
AIR GAP MAIN POLE	—	6.35 KVA
AIR GAP INTERPOLE	—	10 MM
BRUSHES		
GRADE	—	EG 105 S/EG 116S (MAGANITE)
TYPE	—	2 SPILIT
NO. OF HOLDER	—	6BR./HOLDER
SIZE	—	20x40x64MM.
BR WEAR LIST	—	25MM.
MOTOR GROUPING-GP		PARALLEL
GEAR RATIO	—	23:58
PERMANENT SHUNT	—	285MILIOHMS

AUXILIARIES

HEAD LIGHT	—	2 Nos.,250W, 32V
BATTERY	—	LEAD ACID,50CELLS 110V,75AH(5Hr.RATE)
TRANSFORMER	—	380/32,24V,16V 50C/S,500 VA

ARNO CONVERTOR

1 PHASE	—	216 KVA
		150 KVA
3 PHASE	—	

COMPRESSOR

No.	—	2/3
MAKE	—	ELGI
TYPE	—	TRC2000/TRC 1000MIN
CAPACITY	—	1000 L/M AT/1000Litre 7.54/SQ.CM
MOTOR	—	27.5HP./14 HP

TRACTION MOTOR BLOWER

NO.	—	2
MAKE	—	ACCEL/FLAKT/MLBRX
TYPE	—	42,5–1–H4
AIR DELIVERY	—	276 CUBC/M AT 300 MM OF W.G

MOTOR

No.	—	2
MAKE	—	SIEMENS
RATING	—	35HP,415V 50A,2920 RPM

SMOOTHING REACTOR BLOWER

No.	—	2
MAKE	—	FLAKT
TYPE	—	PHMX–40
CAPACITY	—	4200 SQ M/MIN

SILICON RECTIFIER BLOWER

NUMBER	—	2
MAKE	—	ACCEL/FLAKT
TYPE	—	MLBRR–60–1–H2
CAPACITY	—	270 CUBIC M./MIN AT 230V
MOTOR	—	31HP.
TOTAL WEIGHT	—	60 kg (Approx.)

OIL COOLER BLOWER

NUMBER	—	1
MAKE	—	S.F.INDIA LTD.
TYPE	—	MLBR–60–1–H2
CAPACITY	—	22,000 CUBIC M/HR, 190 MMWG
MOTOR	—	1NO, 30HP, 380V,22KW 45A,1450 RPM

OIL PUMP FOR TRANSFORMER

NUMBER	—	1
MAKE	—	BEST & CROMPTON/CROMPTON
CAPACITY	—	750 L/M at 11 MMWG
MOTOR	—	1 NO,4.3 HP

SMOOTHING REACTOR FOR TRACTION MOTOR

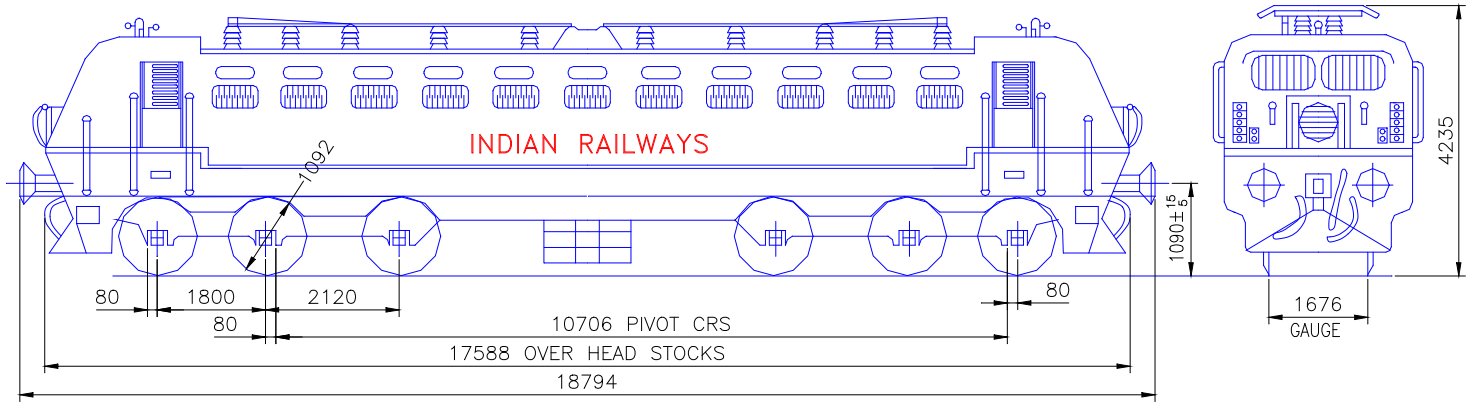
TYPE	—	SL–30
RATING	—	1350A/1270V
REACTANCE	—	3.6mH.FOR EACH COL
RESISTANCE AT 110DEG.CENT	—	0.00535 OHMS
NO OF COIL	—	2

PROTECTIVE DEVICES.

DEAD MAN CONTROL	—	NO
SLIP CONTROL	—	YES
MAIN O/L RELAY	—	YES
OVER VOLTAGE RELAY	—	YES
NO VOLT RELAY	—	YES
EARTH VOLT RELAY	—	YES
LOW CON. GOV.	—	YES
VAC. CON. GOV.	—	YES

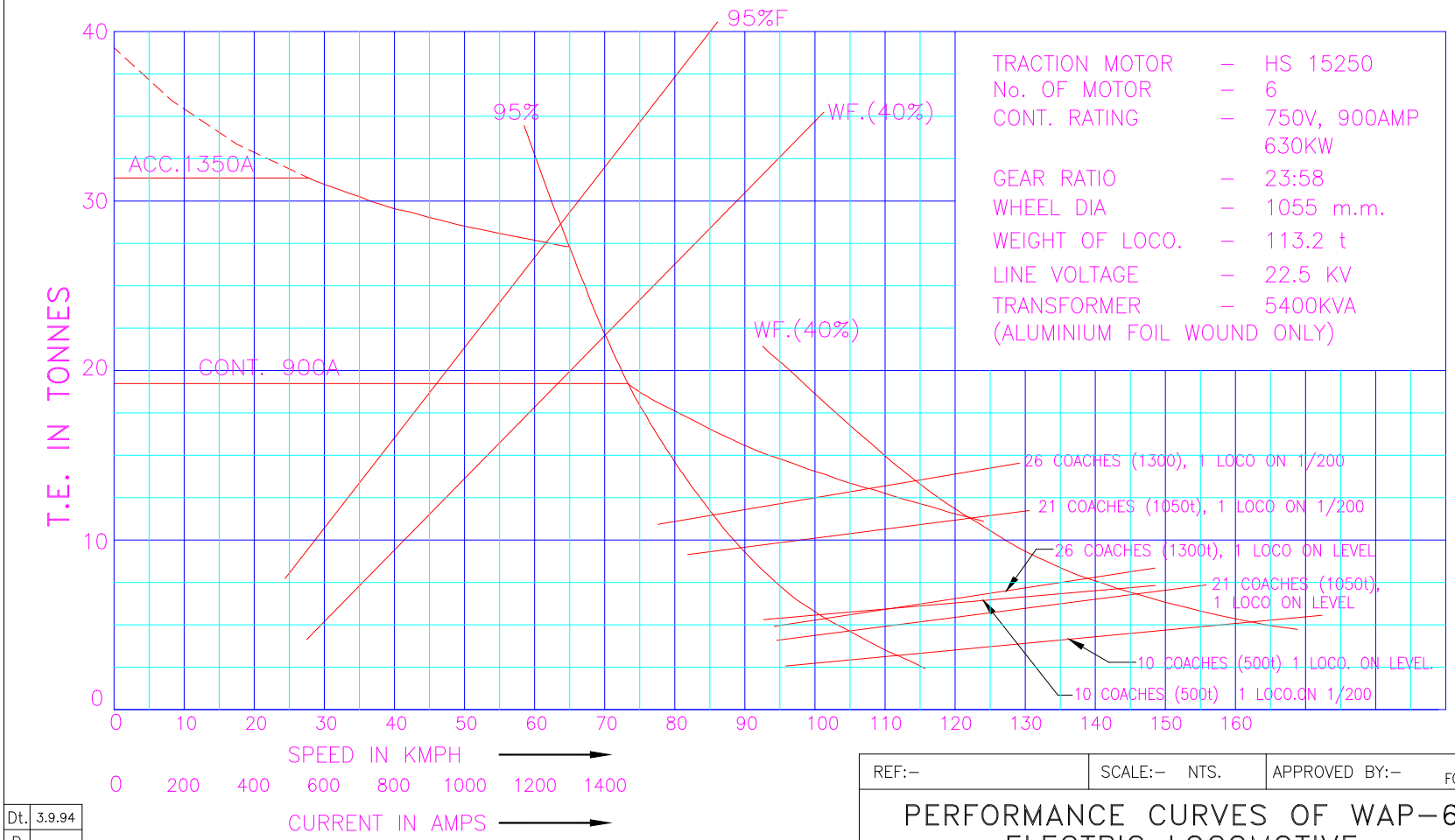
WAP6

MAX.MOVING DIMENSION OF 1929
AS PER SCHEDULE OF 9.6 MOVING
DIMENSION (1973 REPRINT)



MAX. AXLE LOAD = 19t.+2%

DT	
D	
C	
T	



Dt.	3.9.94
D	
T	
C	

REF:–	SCALE:– NTS.	APPROVED BY:– SD. FOR D.G.

PERFORMANCE CURVES OF WAP–6 ELECTRIC LOCOMOTIVE

RDSO. ELEC. DTE.	GEL–1059

WAP 6

HAULAGE CAPACITY OF WAP 6 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:2.52 (23:58) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)													START
			20	40	60	70	80	90	100	110	120	130	140	150	160	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
	BOGIE WAGONS (BOX)	LEVEL														
		1/500														
		1/200														
		1/150														
		1/100														
		1/50														
PASSENGER SERVICE	ICF COACH	LEVEL	ABOVE 1500										1155	805	570	ABOVE 1500
		1/500	ABOVE 1500									1105	805	565	400	-DO-
		1/200	ABOVE 1500						1320	1230	1035	730	535	375	260	-DO-
		1/150	ABOVE 1500					1405	1090	1020	860	610	445	310	215	-DO-
		1/100	1570	1490	1405	1365	1195	1020	795	750	635	445	320	220	145	-DO-
		1/50	770	750	720	710	625	530	410	390	325	220	150	90	45	1160

NOTE : AVERAGE WEIGHT OF ICF COACH IF 55 TONNE.

Dt	22.8.94
D	L.K.MISRA
T	
C	P.N.SETH

25 KV / 1500 V AC/DC
ELECTRIC LOCOMOTIVES (B.G.)



WCAM 1

CONT. RAIL P.S. 3640 (AC) / 2930 (DC)
CO-CO TYPE WCAM 1 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co–Co TYPE WCAM–1 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Thirty–four dual voltage locomotives of this type were ordered on Chittaranjan Locomomotive Works to the design of RDSO. The locomotive is designed for operation on 25 KV ac and 1500 V dc overhead traction system for Western Railway. First Prototype locomotive is expected on line in March 1973. The continuous rail horse–power of the locomotive is 3640 PS at 60 Km/h during ac operation and 2930 PS at 35 Km/h during dc operation.

The locomotive is powered by six axle hung, nose suspended forced ventilated type do series traction motors. Speed control is achieved by grouping the motors in different combinations and by Field weakening of the motors. The voltage control is obtained by tap changer in ac operation and by resistance notching in dc operation. Silicon Rectifiers are utilised for conversion of ac power into dc.

Compressed air brake for the locomotive and vacuum brake for the train are provided.

Procurement Particulars

CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBER	PARTICULAR SPEC.NO.	AS MADE DRG.SET	TOTEL NO. ORDERED	REMARKS
NUMBER	DATE							
66/RSF/459/1	6.5.1968	RDSO/CLW	1975	21800–52	RDSO C–WCAM–001	WCAM1	34 + 19	

September 1971

MAIN PARTICULARS OF LOCO

WCAM–1

GENERAL

SYSTEM OF CURRENT	– ac/dc
LINE VOLTAGE	– 25000V/1500V
WEIGHT IN W.O.	– 112.8 t
ADHESIVE WEIGHT	– 112.8 t
MAX. AXLE LOAD	– 18.8 t

CONTINUOUS RATING – ac/dc

P.S.	– 3640/2930
T.E.	– 16000 Kg/22600Kg
SPEED	– 60 Kmph/35 Kmph
MAX. T.E. ac	– 33.84 t (30% Ad.)
dc	– 28.2 t (25% Ad.)
MAX. SPEED	– 120 Kmph
WHEEL DIA (HALF–WORN)	– 1055 mm
FULL WORN	– 1016 mm
NEW	– 1092 mm

BOGIE

DRIVE ARGT.	– GEAR PINION
DESIGN	– 3 AXle, Trimount cast Frame with swing bolster.

BRAKES

LOCO	– AIR, HAND,
TRAIN	– VACUUM

SANDING

NO. OF BOXES	– 16
CAPACITY	–

PANTOGRAPH

NO.	– 2
MAKE	– FAIVELEY
TYPE	– AM 12/AM 18B

TRANSFORMER

MAKE	– BHEL
TYPE	– BOT 34600
NUMBER	– 1
WT. COMPLETE	– 11500kg
COOLING	– FORGED OIL
INSULATION	– A
TAPS ON H.T.	– 32
RATING	
PRIMARY	– 3646 KVA, 22.5kv,162A
SECONDARY	– 3460 KVA 1730V (dc), 2x1000A (dc)
TERTIARY	– 274 KVA, 1470V, 186A

SILICON RECTIFIER

NUMBER	– 2
CONT. RATING	– 1000A (each cubicle),
MAX. STARTING	– 1270V 1HR
CURRENT	– 1650A
COOLING	– Forced air
TYPE OF CELL	– 321 UFR200
CONNECTION	– Bridge
NO.OF CELLS	– 48 Per bridge

S P A
3 4 4

AUXILIARY RECTIFIER

NUMBER	– 1
RATING	
– WITH 2 BRIDGES IN PARALLEL	– CONT. 180A – 5SEC. 1000A,
– WITH 1 BRIDGE	– CONT. 90A OR 140A 30MIN. 900A 2 SECS.
COOLING	– NATURAL AIR
TYPE OF CELL	– 321 UFR200
CONNECTION	– BRIDGE S P A 3 2 4
NO. OF CELLS	– 24

TRACTION MOTORS

MAKE	– ALSTHOM/CLW
TYPE	– TAO 659A1
NUMBER	– 6
INSULATION	– ARM. H FIELD H
SUSPENSION	– AXLE HUNG NOSE SUSPENDED
VINTILATION	– FORCED
WEIGHT	
COMPLETE	– 2800 Kg.
TEMP. RISE	– ARM. FIELD
(BY RESISTANCE)	– 140°C 160°C
COIL RESISTANCE AT 110 °C –	
ARMATURE	– 0.0151
MAIN POLE	– 0.0145
INTERPOLE	– 0.0078

RATING CONTINUOUS – 770HP, 750V, 840A, 1095 R.P.M.

1 HR	– 798HP, 750V, 870A, 1070 R.P.M.

AIR–GAP

MAIN POLE	– 5.5 mm
INTERPOLE	– 6.0 mm
BRUSHES	
GRADE	– EG 367
NO.OF HOLDERS	– 6
BRUSH PER HOLDER	– 3
SIZE (WXL)	– 2X (8x43)
MIN.HEIGHT	– NEW 52 WORN 27

Sheet No.1/2

MOTOR GROUPING

S	– 1,4,2–5, 3–6 dc operation	
SP	– 1–2–4 3.5.6	ac operation
P	– 1–4 2–5 6–3	ac operation
GEAR RATIO	– 1:3.8	

AUXILIARIES

HEAD LIGHT	– 2 Nos., 350W, 32V.
BATTERY	– LEAD ACID, 50CELLS 110V, 75AH (5 HR. RATE)
TRANSFORMER	– 380/110, 32, 24 & 16V 50 C/S, 500 VA

MOTOR–ALTERNATOR SET

ALTERNATOR

MAKE	– KIRLOSKAR
TYPE	– SOA 749
RATING	– 180 KVA, 400V, 270A 1500 r.p.m.,50 c/s 3 PHASE.

MOTOR

MAKE	– AEI–UK
TYPE	– AY 100 AZ
RATING	– 2106HP, 1500 r.p.m. 1400V, 136A, CONT. 1100V, 176A } 1 HR. 1400V, 142 } 1 HR.

COMPRESSOR

NO.	– 1
MAKE	– Kirlosker
TYPE	– 2EC38B
CAPACITY	– 792 1/m at 7 kg/cm^2
MOTOR	– 1 No., 7.5KW, 38V, 15A, 1390 r.p.m.

EXHAUSTER

NO.	– 2
MAKE	– GRESHAM & CRAVEN
TYPE	– NORTHEY 250RE
CAPACITY	– 7000 1/M, – 4500 1/M
MOTOR	– 2 NOs., 7.5/11KW, 16/22A,385V, 970/1460 r.p.m.

TRACTION MOTOR BLOWER

NO.	– 2
MAKE	– SF Product
TYPE	– MLBRX–42.5–1–H4
CAPACITY	– 16200 m^3/hr, 85 mmwg

MOTOR

NO.	– 2
MAKE	– Siemens
RATING	– 22KW, 385V, 41A, 3000 r.p.m.

SMOOTHING REACTION BLOWER

NO.	– 1
MAKE	– SF Product
TYPE	– PFTA–50 Arr.6
CAPACITY	– 4200 m^3/hr, 85mmwg
MOTOR	– 1 No., 2.2hp, 380V, 2860 r.p.m.

SILICON RECTIFIER BLOWER

NO.	– 2
MAKE	– SF Product
TYPE	– PHMX–40–6
CAPACITY	– 3400m^3/hr,56mmwg
MOTOR	– 2 NOs., 2KW,380v, 4.4A,2860 r.p.m.

OIL COOLER BLOWER

NO.	– 1
MAKE	– SF Product
TYPE	– MLBR–60–1–H2
CAPACITY	– 22200 m^3/hr, 170 mm wg
MOTOR	– 1No.,22KW,380V, 43A, 1470 r.p.m.

OIL PUMP FOR TRANSFORMER

NO.	– 1
MAKE	– BEST & CO.PVT.LTD.
CAPACITY	– 750 1/m at 11 mmwg
MOTOR	– 1No.,3.3KW,380V, 66A, 2865 r.p.m.

SMOOTHING REACTOR FOR TRACTION MOTOR

TYPE	– SL 42
RATING	– 1250V, 950A
REACTANCE	– 5.37 mH
RESISTANCE AT 110°C	– 0.00718

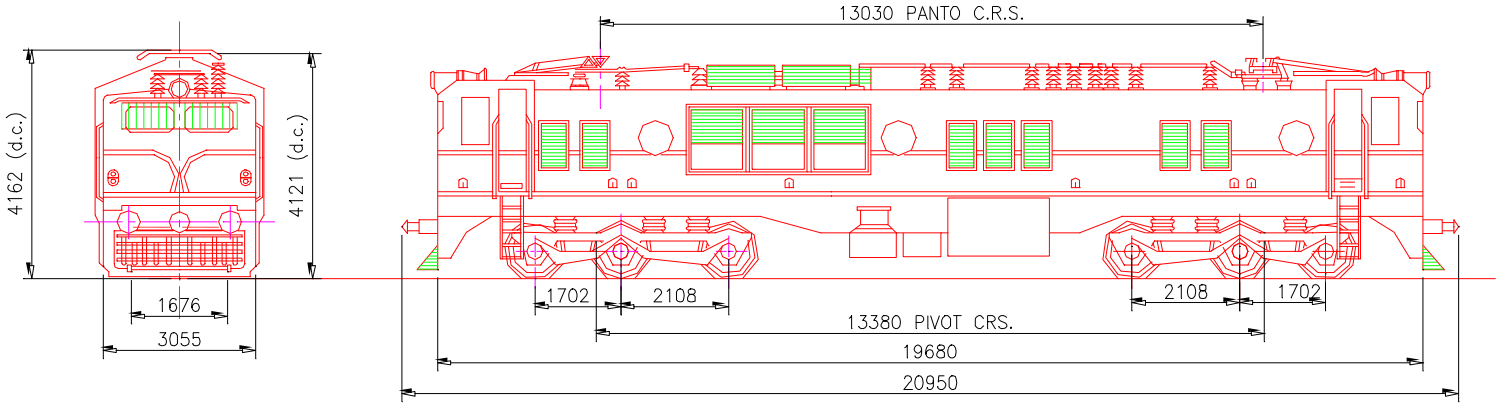
MAIN STARTING RESISTANCE BLOWER

NO.	– 4
MAKE	– SF Product
TYPE	– PETA-60
CAPACITY	– 11400 m^3/hr at 125 mmwg
MOTOR	– 1 No., 9.3 KW, 400v, 18A, 2925 r.p.m.
TYPE	– ILA2-116.2
MAKE	– Siemans

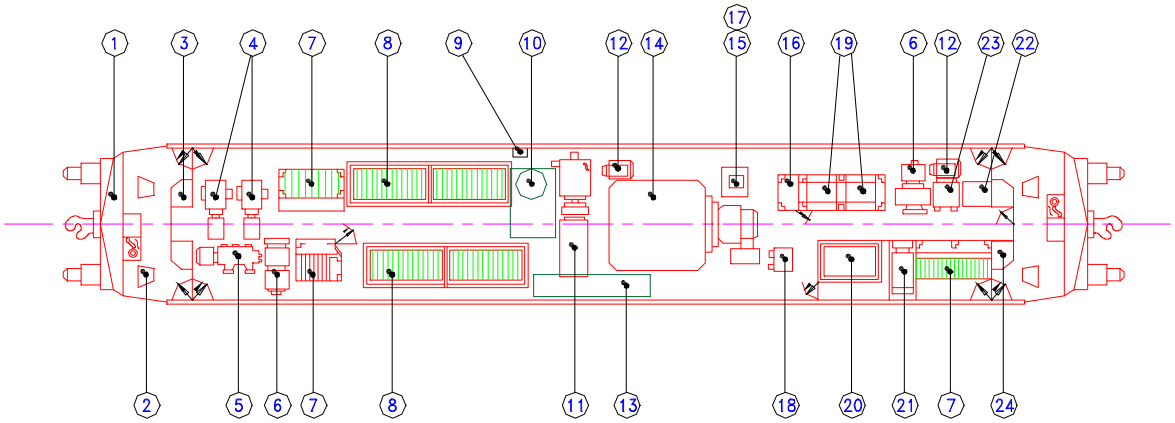
PROTECTIVE DEVICES

DEAD MAN CONTROL	– NO
SLIP CONTROL	– YES
MAIN O/L RELAY	– YES
MOTOR O/L RELAY	– YES
OVER VOLTAGE RELAY	– YES
LOW VOLTAGE RELAY	– NO
EARTH FAULT RELAY	– YES
LOW PR. GOV.	– YES
VOC.CON GOV.	– YES
BRAKE CYL C/O VALVE	– YES

WCAM1

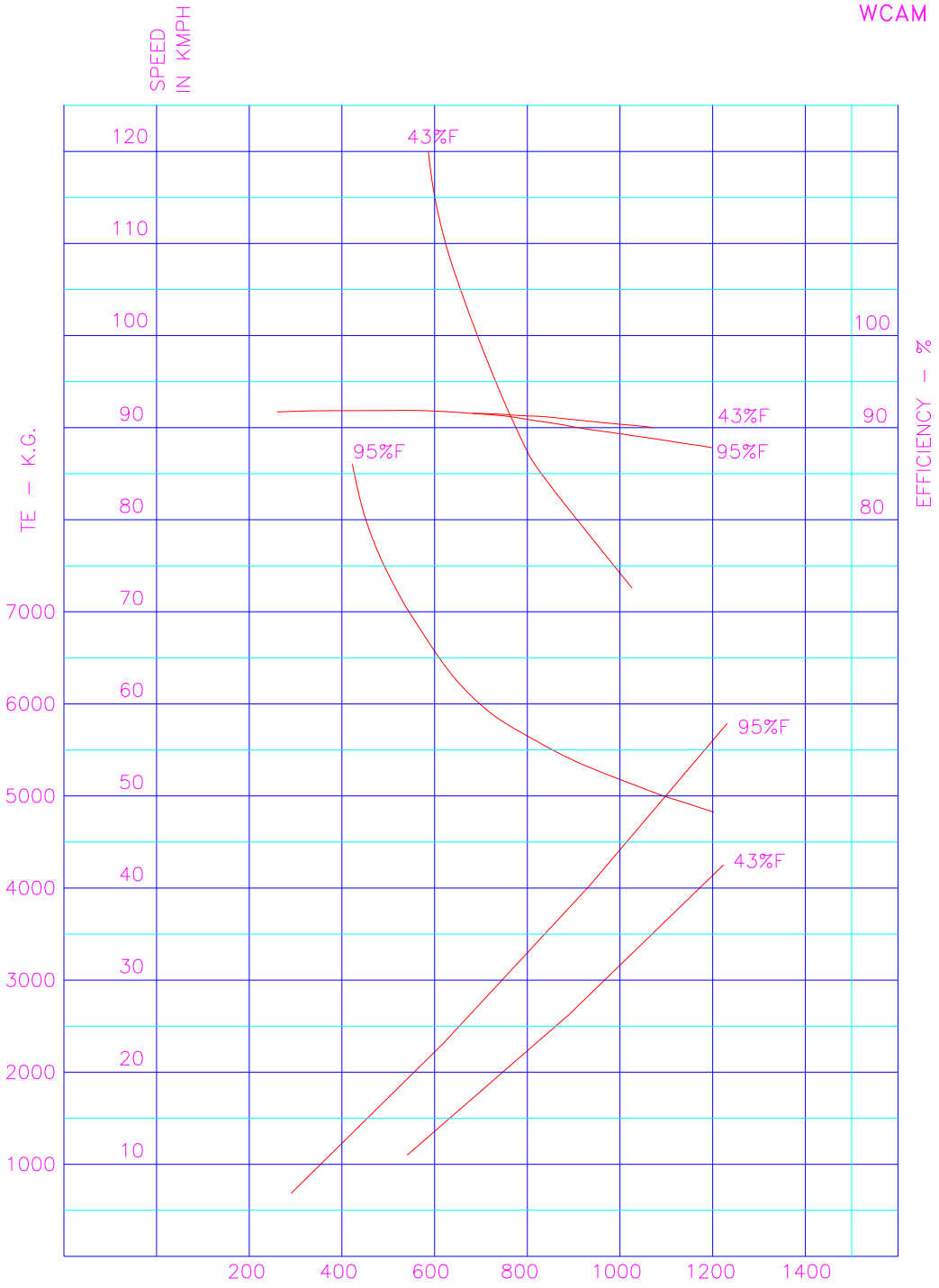


1. DRIVER'S DESK
2. DRIVER'S SEAT
3. PNUEMATIC CUBICLE
4. EXHAUSTER SET
5. COMPRESSOR SET
6. T.M. BLOWER SET
7. H.T. COMPARTMENT
8. MAIN STARTING RESISTOR
9. FREQ. REG. FOR MA SEAT
10. SMOOTHING REACTOR
11. MOTOR ALTERNATOR SET
12. INDUCTIVE SHUNT
13. BATTERY
14. TRANSFORMER
15. AUX. SMOOTHING REACTOR
16. AUX. RECTIFIER
17. VOLTAGE SENSING DEVICE
18. D.C. SERVO CONTROLLER
19. RECTIFIER BLOCK
20. COS & REVERSER PANNEL
21. FIELD SHUNTING RESISTOR
22. AUX. CONTROL CUBICAL
23. STATIC BATTERY CHARGER
24. L.T. RELAY CUBICAL

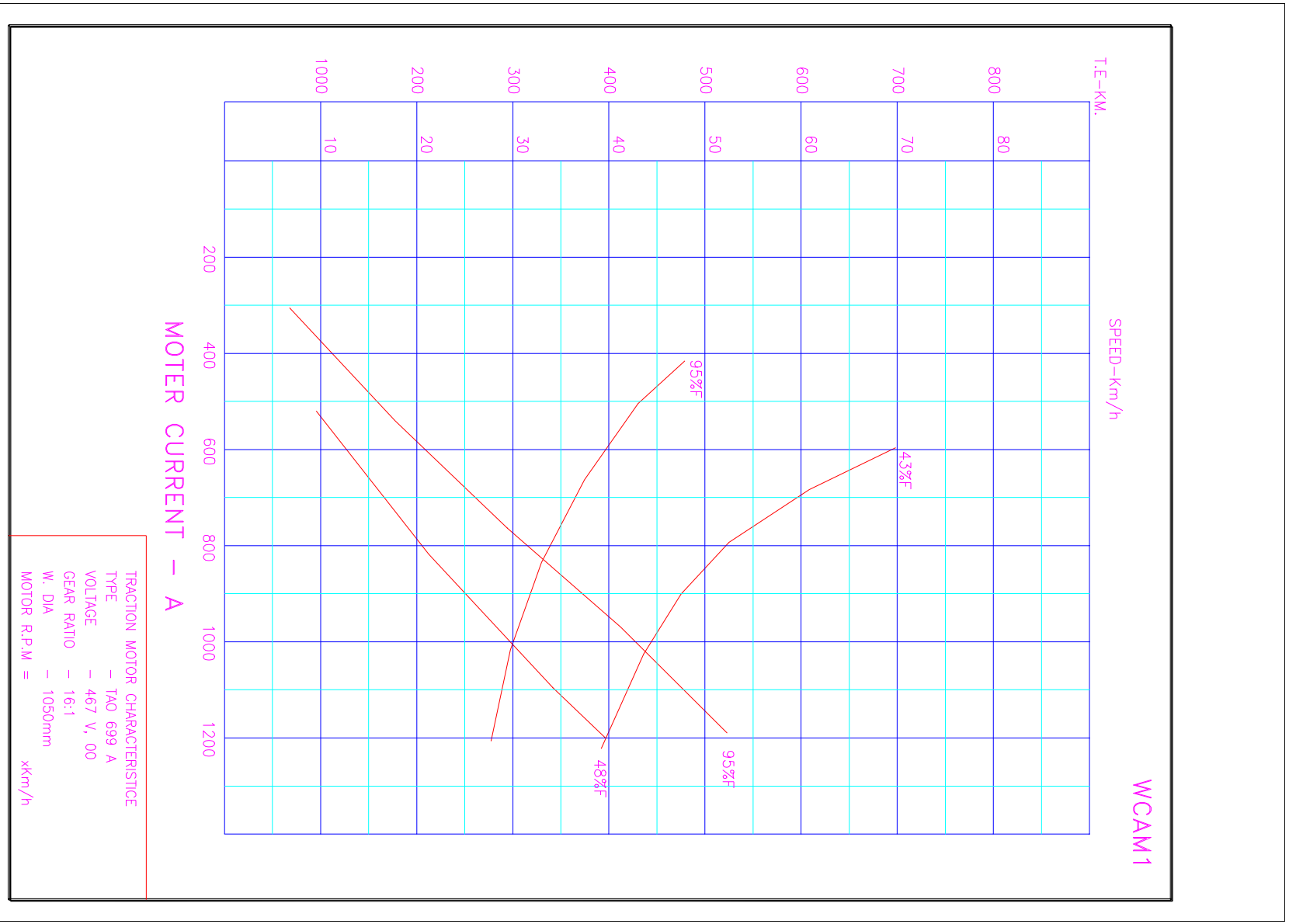


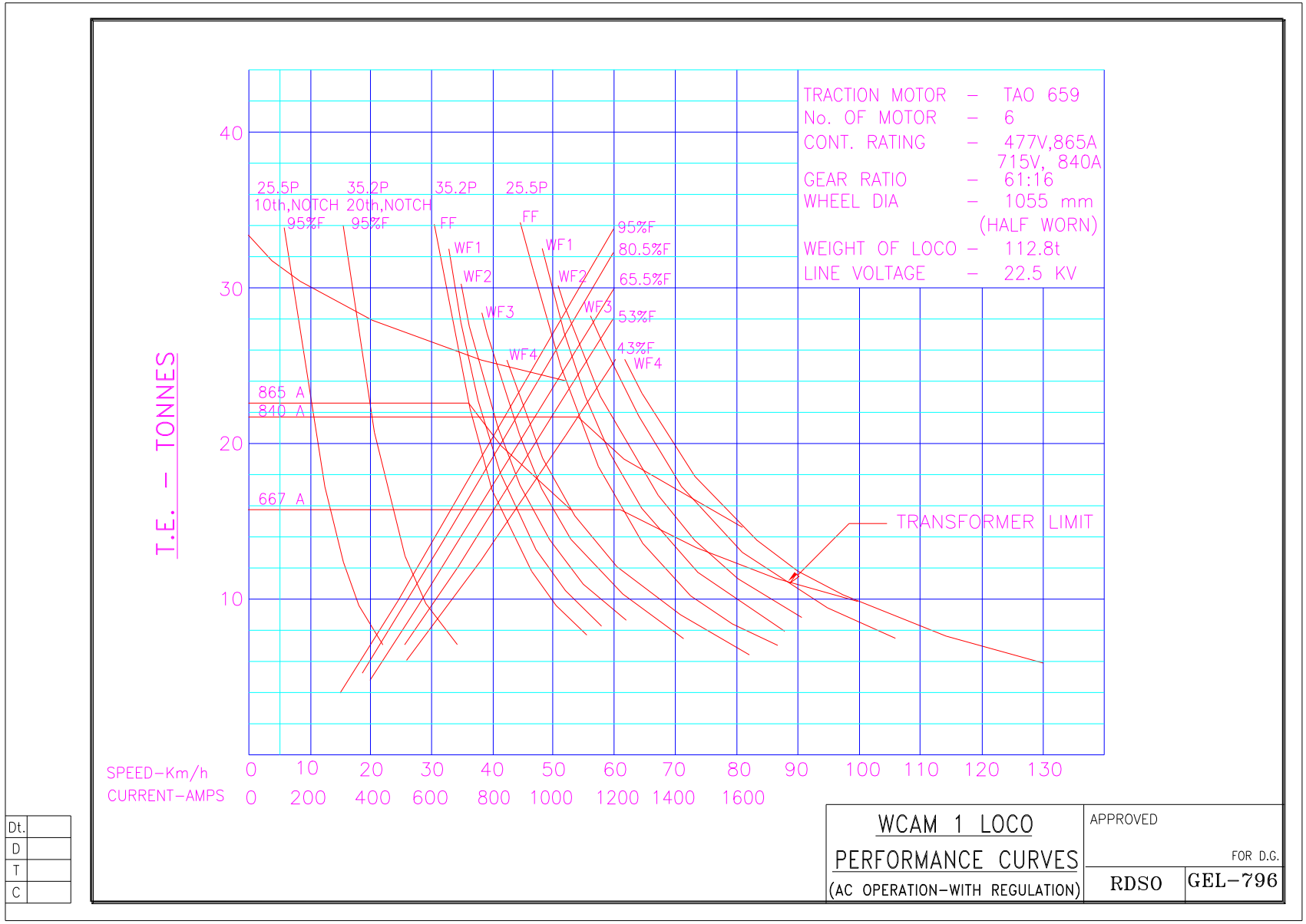
C	T	D	DT
	R.C.S.		

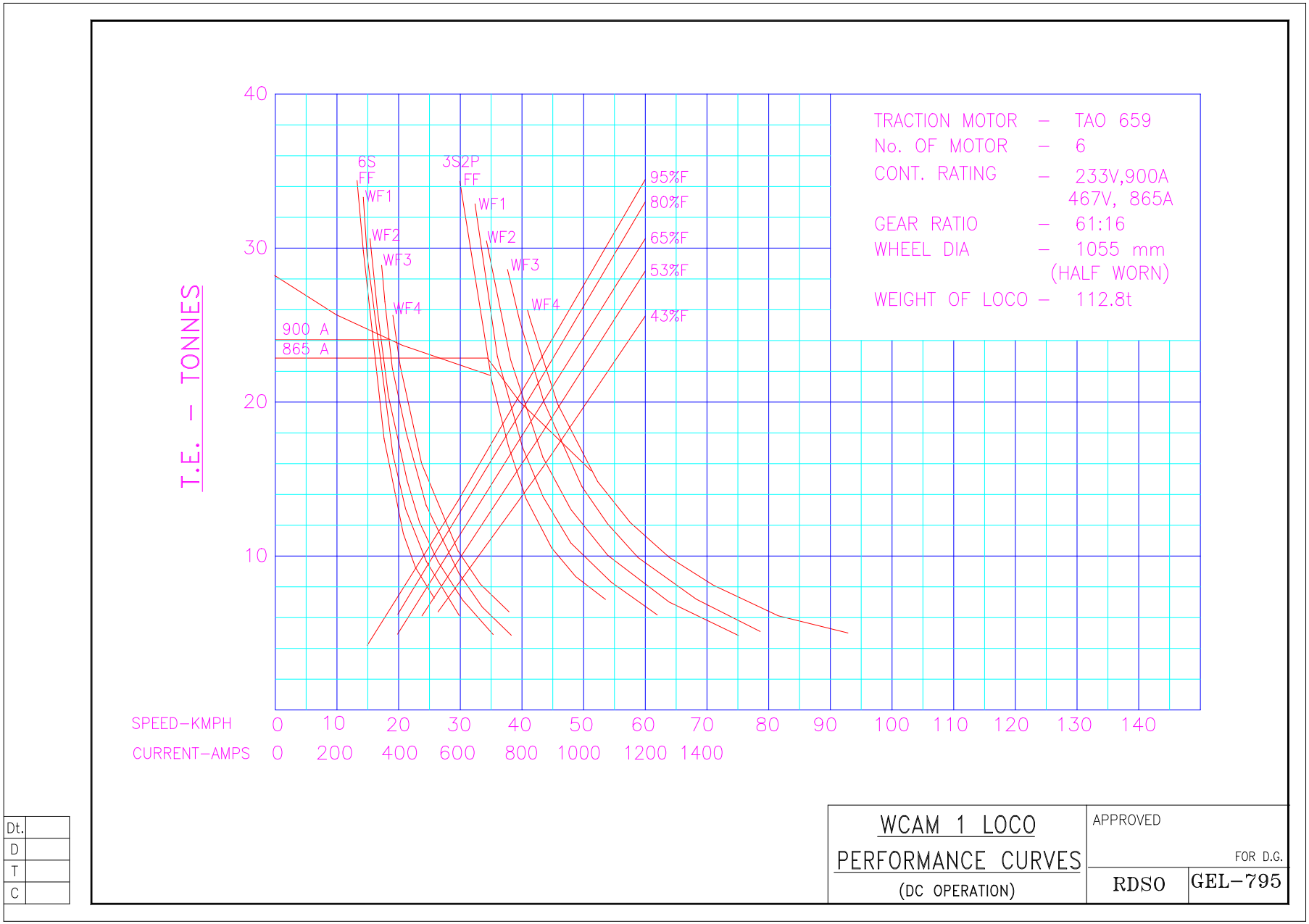
WCAM 1



TRACTION MOTOR CHARACTERISTICS
TYPE – TAO 659 A
VOLTAGE – 715 V PULSATING dc
GEAR RATIO – 3.8:1
W. DIA – 1050mm (HALF WORN)
MOTOR R.P.M = 19.2xKmph


WCAM1
SPEED-Km/h
T.E-KM.
10
20
30
40
50
60
70
80
200
300
400
500
600
700
800
1000
200
400
600
800
1000
1200
MOTER CURRENT - A
95%F
43%F
48%F
95%F
TRACTION MOTOR CHARACTERISTICE
TYPE - TAO 699 A
VOLTAGE - 467 V, 00
GEAR RATIO - 16:1
W. DIA - 1050mm
MOTOR R.P.M = xKm/h


TRACTION MOTOR – TAO 659
No. OF MOTOR – 6
CONT. RATING – 477V,865A
715V, 840A
GEAR RATIO – 61:16
WHEEL DIA – 1055 mm
(HALF WORN)
WEIGHT OF LOCO – 112.8t
LINE VOLTAGE – 22.5 KV
T.E. – TONNES
40
30
20
10
25.5P
10th,NOTCH
95%F
35.2P
20th,NOTCH
95%F
35.2P
FF
WF1
WF2
WF3
WF4
25.5P
FF
WF1
WF2
WF3
WF4
95%F
80.5%F
65.5%F
53%F
43%F
865 A
840 A
667 A
TRANSFORMER LIMIT
SPEED–Km/h
0 10 20 30 40 50 60 70 80 90 100 110 120 130
CURRENT–AMPS
0 200 400 600 800 1000 1200 1400 1600
Dt.
D
T
C
WCAM 1 LOCO
PERFORMANCE CURVES
(AC OPERATION–WITH REGULATION)
APPROVED
FOR D.G.
RDSO
GEL–796


T.E. – TONNES
40
30
20
10
6S
FF
WF1
WF2
WF3
WF4
3S2P
FF
WF1
WF2
WF3
WF4
95%F
80%F
65%F
53%F
43%F
900 A
865 A
TRACTION MOTOR – TAO 659
No. OF MOTOR – 6
CONT. RATING – 233V,900A
467V, 865A
GEAR RATIO – 61:16
WHEEL DIA – 1055 mm
(HALF WORN)
WEIGHT OF LOCO – 112.8t
SPEED–KMPH 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
CURRENT–AMPS 0 200 400 600 800 1000 1200 1400
WCAM 1 LOCO
PERFORMANCE CURVES
(DC OPERATION)
APPROVED
FOR D.G.
RDSO
GEL–795
Dt.
D
T
C

WCAM 1

HAULAGE CAPACITY OF WCAM 1 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) ac WORKING
G.R. 1:3 : 8 (16 : 61) T.M. TAO–659A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5950	4530	3380					ABOVE 6000
		1/500	ABOVE 6000	5850	4880	3640	3325	2675	2100					–DO–
		1/200	2900	2900	2735	2100	1970	1630	1310					2900
		1/150	2250	2250	2185	1690	1595	1330	1080					2250
		1/100	1535	1535	1535	1195	1145	960	780					1535
		1/50	925	915	795	610								965
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						5675					ABOVE 6000
		1/500	4300	4300	4300	4300	4160	3460	2820					4300
		1/200	2975	2975	2975	2340	2245	1900	1570					2975
		1/150	2530	2530	2360	1845	1775	1505	1250					2530
		1/100	1910	1880	1635	1275	1235	1050	870					1945
		1/50	950	940	815	630	615							1120
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 6000 →										1340	ABOVE 1500
		1/500	← ABOVE 6000 →									1200	885	–DO–
		1/200	← ABOVE 6000 →						1445	1175	995	760	565	–DO–
		1/150	← ABOVE 6000 →					1400	1175	960	815	625	465	–DO–
		1/100	← ABOVE 6000 →			1295	1175	995	840	690	590	450	330	–DO–
		1/50	970	955	840	655	595	505	435	345	290	215	145	1165

Dt	11.05.99
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM1

HAULAGE CAPACITY OF WCAM 1 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) ac OPERATON
G.R. 1:3.81 (16 : 61) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →											ABOVE 6000
		1/500	5015	5015	5015	4900	4340	3600	2980					5015
		1/200	3305	3305	3225	2530	2295	1945	1645					3305
		1/150	2770	2770	2515	1980	1805	1535	1300					2770
		1/100	1990	1960	1730	1365	1250	1070	905					2085
		1/50	980	975	860	670	615	525	440					1165

Dt	11.05.99
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 1

HAULAGE CAPACITY OF WCAM 1 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) dc WORKING
G.R. 1:3 : 8 (16 : 61) T.M. TAO-659A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				4300	2800	1815					ABOVE 6000
		1/500	4710	4710	4710	3640	2390	1635	1110					4710
		1/200	2470	2470	2470	2100	1400	980	675					2470
		1/150	1900	1900	1900	1690	1125	790	545					1900
		1/100	1390	1390	1390	1195	800	555						1390
		1/50	875	875	795	610								875
	BOGIE WAGONS (BOX)	LEVEL	5100	5100	5100	5100	5100	4500	3045					5100
		1/500	3950	3950	3950	3950	2980	2115	1490					3950
		1/200	2700	2700	2700	2340	1590	1140	805					2700
		1/150	2310	2310	2310	1845	1255	895	630					2310
		1/100	1770	1770	1635	1275	865	610						1770
		1/50	950	940	815	630								1020
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →							1380	1040			ABOVE 1500
		1/500	← ABOVE 1500 →						1135	810	630			-DO-
		1/200	← ABOVE 1500 →				1450	965	660	475	370			-DO-
		1/150	← ABOVE 1500 →				1040	770	525	375	290			-DO-
		1/100	← ABOVE 6000 →			1215	785	535	360	250	190			-DO-
		1/50	960	930	805	610	380	245	150	95	60			1050

Dt	11.05.99
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 1

HAULAGE CAPACITY OF WCAM 1 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) dc OPERATION
G.R. 1:3.81 (16:61) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →					4540	2970					ABOVE 6000
		1/500	4545	4545	4545	4545	2980	2050	1410					4545
		1/200	2995	2995	2995	2375	1560	1085	750					2995
		1/150	2505	2505	2415	1855	1220	845	585					2505
		1/100	1885	1885	1660	1275	835	575	390					1885
		1/50	970	945	820	625	395	255	160					1080

Dt	28.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 1

HAULAGE CAPACITY OF WCAM 1 (P) LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) ac WORKING
G.R. 1:2.76 (21:58) T.M. TAO–659A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →											ABOVE 1500
		1/500	← ABOVE 1500 →									1300	1070	–DO–
		1/200	← ABOVE 1500 →				1435	1360	1295	1175	985	830	695	–DO–
		1/150	1330	1290	1245	1195	1145	1095	1050	960	805	680	575	–DO–
		1/100	905	880	855	830	800	775	745	690	580	490	410	1470
		1/50	420	415	405	400	390	380	370	345	285	240	195	810

Dt	08.01.96
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 1

HAULAGE CAPACITY OF WCAM 1 (P) LOCOMOTIVE
(WITHOUT 5% ACCELERATION RESERVE) dc WORKING
G.R. 1:2.76 (21:58) T.M. TAO-659A1

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1290			ABOVE 1500
		1/500	← ABOVE 1500 →							1155	790			-DO-
		1/200	← ABOVE 1500 →					1335	990	690	475			-DO-
		1/150	← ABOVE 1500 →				1325	1075	800	555	190			-DO-
		1/100	1350	1315	1285	1180	930	760	560	390	260			1285
		1/50	660	650	640	590	460	370	265	170	100			700

Dt	21.09.94
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 2

CONT. RAIL P.S. 4716 (AC) / 2916 (DC)
CO-CO TYPE WCAM 2 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WCAM–2 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

TWENTY DUAL VOLTAGE LOCOMOTIVES OF THIS TYPE HAVE BEEN ORDERED ON B H E L TO THE DESIGN OF R D S O. THE LOCOMOTIVE IS DESIGNED FOR OPERATION ON 25 k v a c AND 1500 V d c OVERHEAD TRACTION SYSTEM FOR WESTERN RAILWAY. FIRST PROTOTYPE LOCOMOTIVE IS EXPECTED ON LINE IN MARCH 1995. THE CONTINUOUS RAIL HORSE POWER OF THE LOCOMOTIVE 4715 HP AT 70.5 Kmph. DURING A C OPERATION AND 2916 H P AT 42.6 Kmph. DURING dc OPERATION.

THE LOCOMOTIVE IS POWERED BY SIX AXLE HUNG NOSE SUSPENDED FORCED VENTILATED TYPE dc SERIES TRACTION MOTORS. SPEED CONTROL IS ACHIEVED BY GROUPING THE MOTORS IN DIFFERENT COMBINATIONS AND BY FIELD WEAKENING OF THE MOTORS.THE VOLTAGE CONTROL IS OBTAINED BY TAP CHANGER IN a.c. OPERATION AND BY RESISTANCE NOTCHING IN d c OPERATION. SILICON RECTIFIERS ARE UTILISED FOR CONVERSION OF a c POWER INTO d c STATIC CONVERTOR IMPORTED FROM A C E C IS ADOPTED FOR SUPPLYING THE AUXILIARIES 3–PHASE SUPPLY.

COMPRESSED AIR BRAKE FOR THE LOCOMOTIVE AND DUAL BRAKE FOR THE TRAIN ARE PROVIDED.THE LOCOMOTIVE IS SUITABLE FOR MULTIPLE OPERATION (UP TO 4 LOCO) UNDERFRAME SHALL BE OF MONOCOQUE DESIGN AND BOGIES ARE FABRICATED TRIMOUNT CO–CO BOGIE WITH SECONDARY SUSPENSION.

P R O C U R E M E N T P A R T I C U L A R S

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DGR. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
RSP/91/4413	11.02.94	B H E L		21861–21880	RDSO No.E.17/15 (R2)JULY 1991	WCAM–2	20	

—: MAIN PARTICULARS OF LOCO :—

GENERAL :—

SYSTEM OF CURRENT	— AC/DC
LINE VOLTAGE	— 25000V/1500V
WEIGHT IN W.O.	— 112.8 t
ADHESIVE WEIGHT	— 112.8 t
MAX. AXLE LOAD	— 18.8 t

CONTINUOUS RATING :—

P.S.	— 4715/2916 H.P.
T.E.	— 23800 Kg/24600Kg
SPEED	— 53.5 Kmph/32.5 Kmph
MAX. T.E. ac/dc	— 33.4 t/26.0t.
MAX. SPEED	— 120 Kmph
WHEEL DIA	
HALF WORN	— 1016 mm
FULL WORN	— 1092 mm

BOGIE :—

DRIVE ARGT.	— GEAR PINION
DESIGN	— 3 AXLE,FABRICATED TRIMOUNT CO CO BOGIE WITH SECONDARY SUSPENSION

BRAKES :—

LOCO	— AIR, HAND,
TRAIN	— DUAL

SANDING :—

NO. OF BOXES	— 16
CAPACITY	—

PANTOGRAPH :—

NO.	— 2

TRANSFORMER :—

MAKE	— BHEL
TYPE	— 5400 AC/DC OLTC CONTROLLED
NUMBER	— 1
WT. COMPLETE	— 17200kg
COOLING	— FORCED OIL (INHIBITED)
INSULATION	— "A" CLASS
TAPS ON H.T.	— 32
RATING PRIMARY	— 5670 kVA.22.5kV,252A.
SECONDARY	— 5400kVA.2X1000V,2700A.
TERTIARY	— 270kVA,1000V,270A

SILICON RECTIFIER :—

NUMBER (CONNECTED IN SERIES)	— 2
MAX. STARTING	— 1000V
CURRENT	— 3600A (1Mt)
COOLING	— FORCED AIR
TYPE OF CELL	— D1800N44(SIEMENS GERMAN)
CONNECTION	— BRIDGE
NO.OF CELLS	— 16 PER BRIDGE (4 IN PARALLEL PERARMS)

STATIC CONVERTER 3—PHASE :—

NUMBER	— 1
RATING	— 180kVA
INPUT	— 1000 VRMS(ac REGION) 1500Vdc (dc REGION)
OUTPUT	— 415 ± 5%
PHASE	— 3 PHASE WITH NEUTRAL FOR PROTECTION
FREQUENCY	— 50Hz ± 3%
RATED OUTPUT	— 180 kVA
P.F.	— MIN. 0.8 AT FULL LOAD

TRACTION MOTORS :—

MAKE	—
TYPE	— TAO 659 A 1
NUMBER	— 6
INSULATION	— ARM."H",FIELD"H".
SUSPENSION	— AXLE HUNG NOSE SUSPENDED
VENTILATION	— FORCED
WT.COMPLETE	— 2800 Kg.
TEMP. RISE (BY RESISTANCE)	— ARM. 140DEG.C. FIELD 160DEG.C.
COIL RESISTANCE AT 110 DEG.CENT.	—
ARMATURE	— 0.0151 OHMS
MAIN POLE	— 0.0145 OHMS
INTERPOLE	— 0.0078 OHMS

RATING :—

CONTINUOUS	— 770HP, 750V, 840A, 1095 R.P.M.
ONE HOUR	— 798HP, 750V, 870A, 1070 R.P.M.
AIR GAP	
MAIN POLE	— 5.5 mm
INTERPOLE	— 6.0 mm
BRUSH GRADE	— EG 367
No.OF HOLDER	— 6
BRUSH PER HOLDER	— 3
SIZE (W X L)	— 2X (8x43)
MIN.HEIGHT	— NEW—52,WORN—27

MOTOR GROUPING :—

S — 1, 4, 2, 5, 3, 6.

d c SERIES OPERATION

SP — 1. 2. 4 } dc OPERATION
3. 5. 6 }

P — 1. 4 }
2. 5 } ac OPERATION
3. 6 }

GEAR RATIO — 15 : 62 — 4.13.

AUXILIARI :–

HEAD LIGHT	– 2 NoS, 350W, 32V
VOLTAGE STABLIZER	– 380/32, 24 & 16V
RATING	– 500VA
CAB FAN	
TRANSFORMER	– 380/110V.ac. – 220/110V.dc.

BATTERY :–

TYPE	– LEAD ACID
NO.OF CELLS	– 50
RATING	– 110V, 75AH

MAIN STARTING RESISTOR :–

NUMBER	1&2
TYPE	CSN600F
MAKE	SCHNIEWINDT GERMANY
CONT.	400/570/900A
CURRENT	FOR 30SEC.
VOLTAGE	1500VDC
POWER	1026KW
PEAK	
INSULATION	6KV/50HZ
LEVEL	FOR 1 mint.
COOLING	6cu.m/Seec
AIR FLOW	
WEIGHT	645Kg.
MOTOR	
COOLING FAN	4.5cum
OUTPUT	/Sec
POWER RATING	18kw.
SUPPLY	415V,ac
VOLTAGE	3–PHASE 50 Hz
SPEED	2900 rpm
INSULATION	HORF
CLASS	

COMPRESSOR :–

NO.	– 2
MAKE	– ELGI.
CAPACITY	– 1000 L/M,AT 10.5KG/CM.Sq.
TYPE	– TRC 1000MN.
MOTOR	– 415V, 14 HP, 24A.

PROTECTIVE DEVICES :–

DEAD MAN CONTROL	– NO
SLIP CONTROL	– YES
MAIN OVER LOAD RELAY	– YES
MOTOR OVER LOAD RELAY	– YES
OVER VOLTAGE RELAY	– YES
LOW VOLTAGE RELAY	– NO
EARTH FAULT RELAY	– YES
OIL PRESSURE GOVERNOR	– YES
VACCUME CONTROL GOV.	– YES
BRAKE CYL. C/O VALVE	– YES

STATIC CONVERTER 3–PHASE :–

No.	– 2
MAKE	– SF (I) LTD.
TYPE	– MLBR–42–5–1–H4.
AIR DELIVERY	– 276 Cb.m/Mt. AT 308 mm WG.
MOTOR	– 2
RATING	– 415 V,26 kW.,50A., 2920 rpm.

EXHAUSTER :–

NO.	– 2
MAKE	– GRESHAM & CRAVEN
TYPE	– NORTHEY
MOTOR	– 7.5/11 kW 16/22A.,415 V. 970/1460 rpm.

SMOOTHING REACTOR BLOWER :–

NO.	– 2.
MAKE	– SF (I) LTD.
TYPE	– PTF–59
CAPACITY	– 4200 Cb.M/hr.AT 85 mm WG
MOTOR	– 2.2kW,415V.,2860 rpm

SILICON RECTIFIER BLOWER :–

NO.	– 2.
MAKE	– SF (I).
TYPE	– P H M X.–40–6.
CAPACITY	– 3100 Cb.m/hr.45 mm WG
MOTOR	– 2.2kW,415 V,4.8A 2860 r p m.

OIL COOLER BLOWER :–

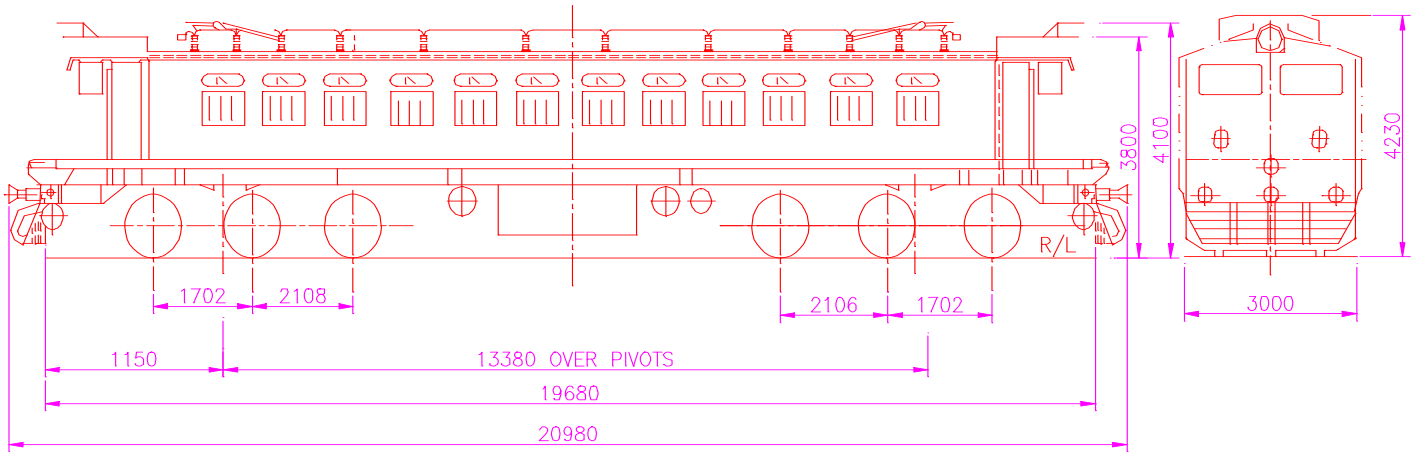
NO.	– 1.
MAKE	– SF (I) LTD.
TYPE	– M L B H – 60 – 1 – HB
CAPACITY	– 22200 Cb.m/hr.,AT190 mm WG
MOTOR	– 22kW,415 V.,45A., 1450 rpm.

OIL PUMP FOR TRANSFORMER :–

NO.	– 1.
MAKE	– BEST & CO. Pvt. Ltd.
CAPACITY	– 740 L/M,AT 11000mm WG
MOTOR	– 3.2 kW.,415V, 2865 rpm.

SMOOTHING REACTOR FOR T.M. :–

TYPE	– SL 30.
RATING	– 1250 V.,1350A.
REACTANCE	– 2.68 mH.
RESISTANCE AT 110 DEG. CENT.	– 0.00544 Ohms.



TYPE OF SERVICE	MIXED
APPLY CURRENT	25 KV A C /1500 V DC
CLASS OF LOCO	WCAM 2
CRACK GAUGE	CO–CO
MAX. OPERATING SPEED	1676 mm (BROAD GAUGE)
TRANSFORMER	120 kph
ACTION MOTOR	5400 KVA
	6 NOS. TYPE IA0 650
BREAK EQPT.	DUAL BRAKE SYSTEM WITH IRAVB–2 WITH TWIN PIPE
MAX. AXLE LOAD	18.8 TONNES
TOTAL WEIGHT OF LOAD.	112.8 TONNES

Dt.	
D	
C	
T	

DATE	ALT.		REV.	DATE	ALT.
	CKD.				CKD.
	APPD.				APPD.

BHARAT HEAVY ELECTRICALS LIMITED
JHANSI

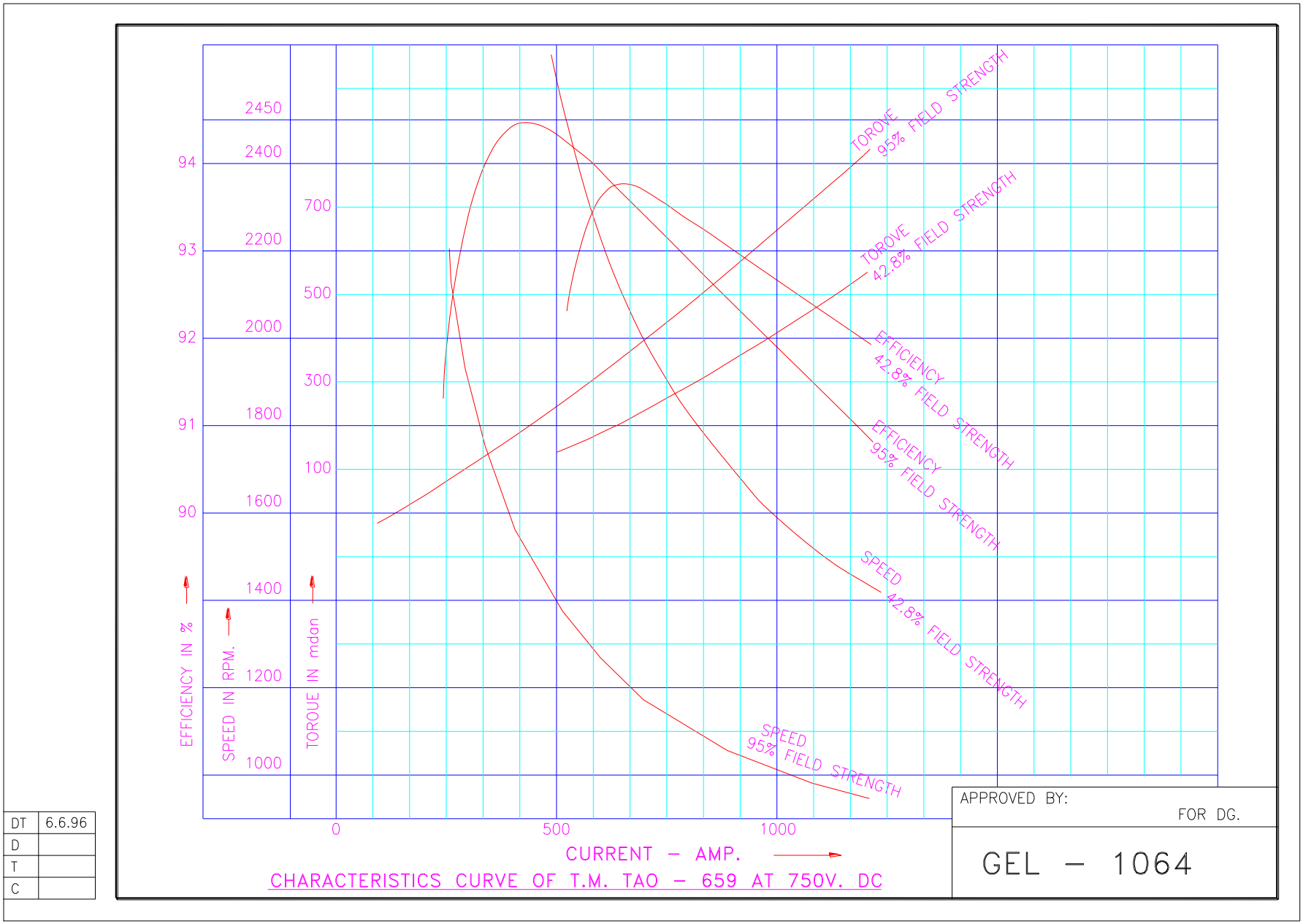
TYPE OF PROJECT (AC/DC LOCO TYPE WCAM2)
OR
NAME OF CUSTOMER RAIWAY BOARD

TITLE
LOCOMOTIVE DIAGRAM
(AC/DC LOCO TYPE WCAM2)

	NAME	SIGN	DATE
DRN	BHAGWAT		6.11.95
CKD	V.SINGH		6.11.95
APPD	VKV		6.11.95

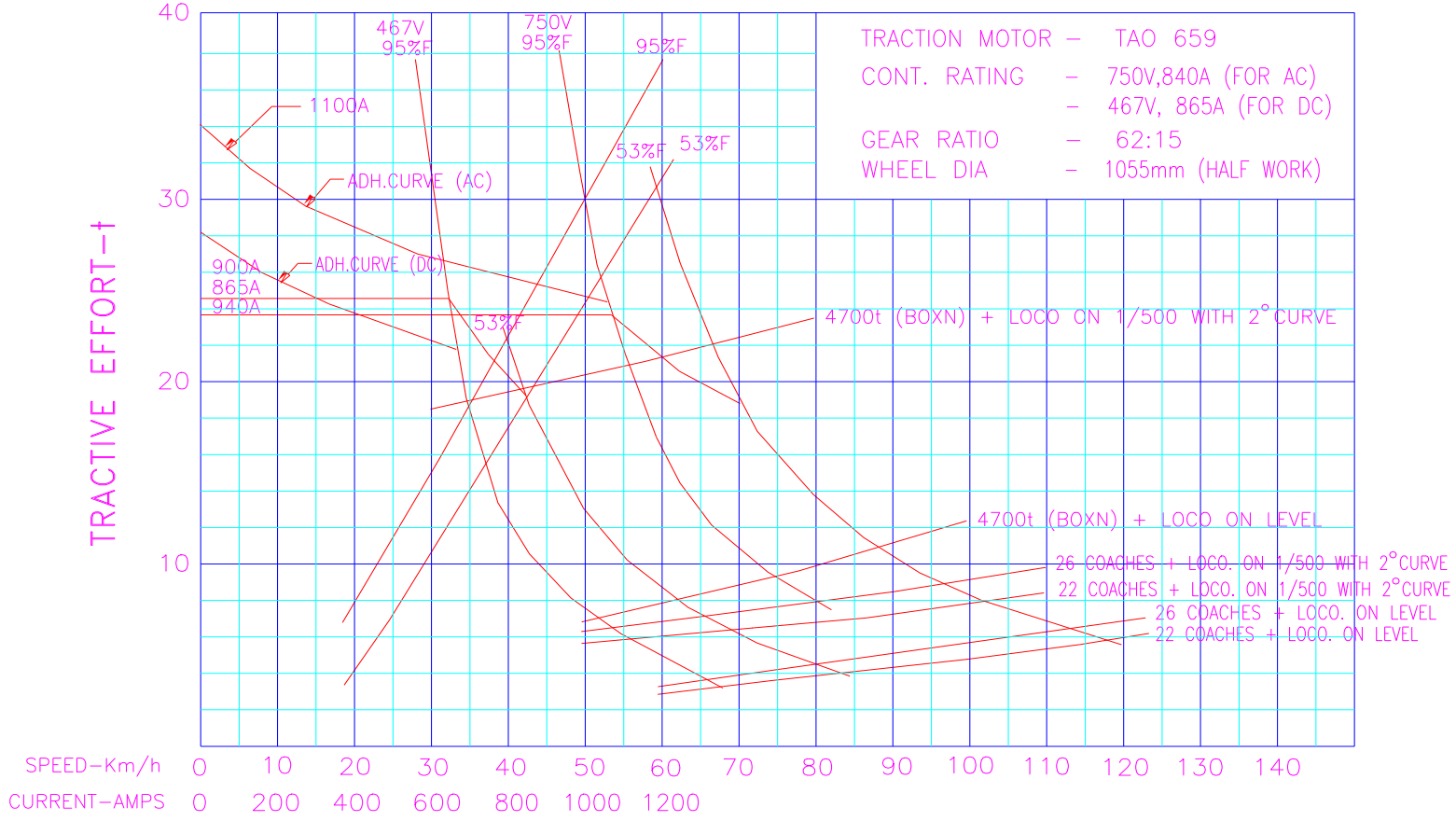
DRG. No.
3 719 00 03 003

SHEET NO. 01 IIO OF SHTS 01


EFFICIENCY IN %
SPEED IN RPM.
TORQUE IN mdan
94
93
92
91
90
2450
2400
2200
2000
1800
1600
1400
1200
1000
700
500
300
100
0
500
1000
CURRENT – AMP.
TORQUE 95% FIELD STRENGTH
TORQUE 42.8% FIELD STRENGTH
EFFICIENCY 42.8% FIELD STRENGTH
EFFICIENCY 95% FIELD STRENGTH
SPEED 42.8% FIELD STRENGTH
SPEED 95% FIELD STRENGTH
CHARACTERISTICS CURVE OF T.M. TAO – 659 AT 750V. DC
APPROVED BY:
FOR DG.
GEL – 1064

DT	6.6.96
D	
T	
C	

ANNEXURE – 3



REVISION.A :–

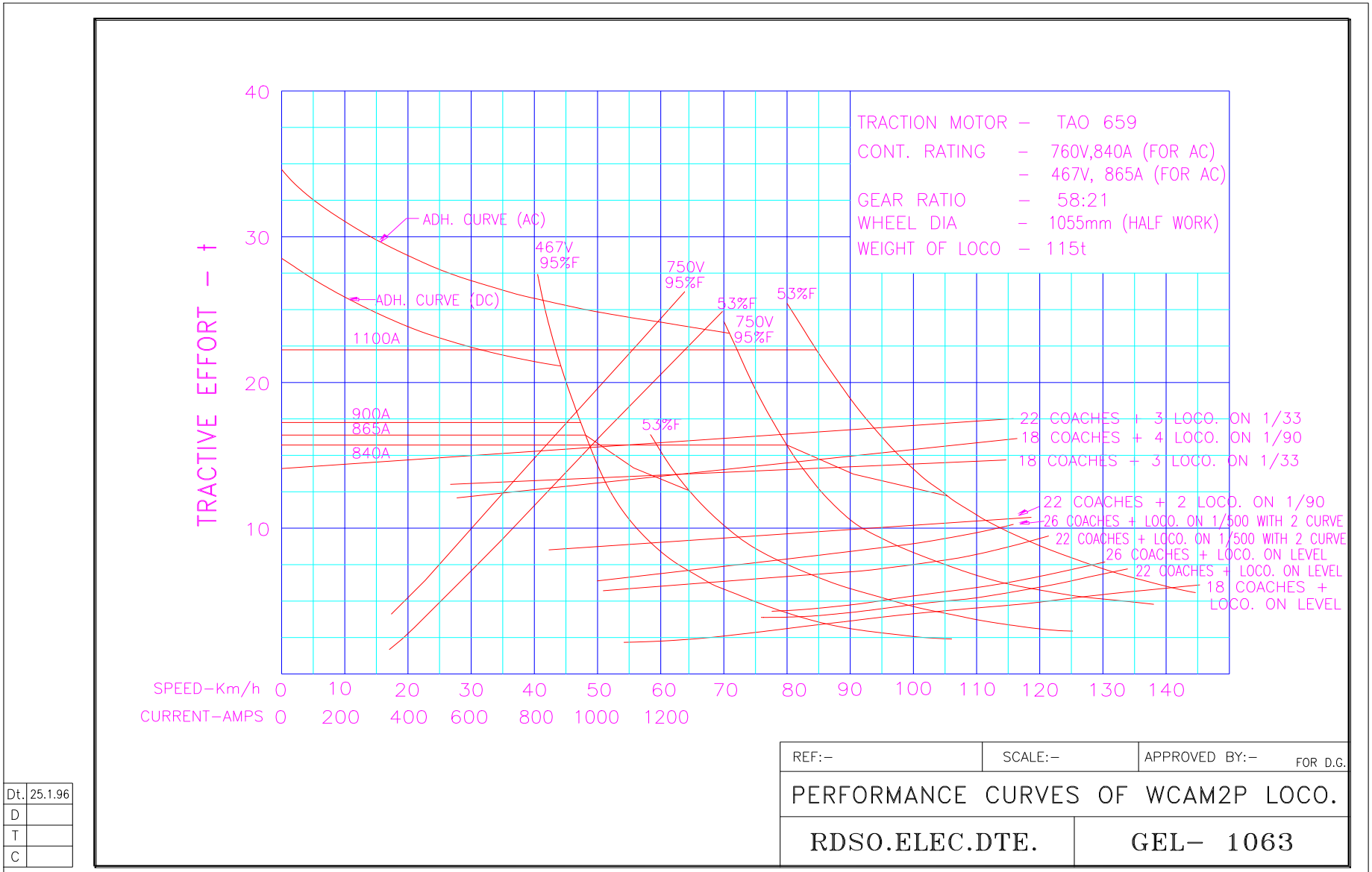
1. WEAKEST FELD STRENGN CHANGED.
2. WEAK FELD CURVE ADDED FOR D–C ORERATON.

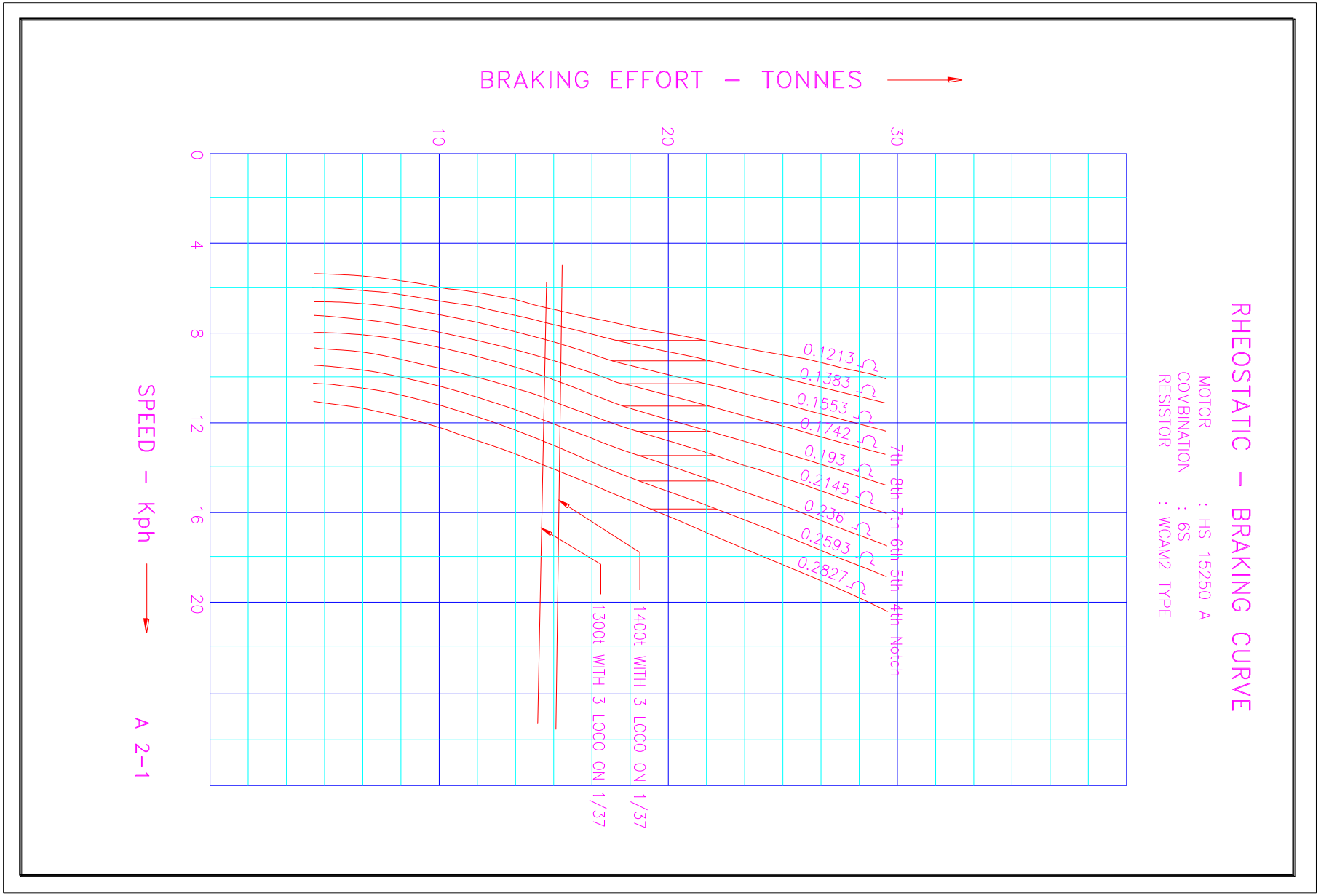
Dt.	25.1.96
D	
T	
C	

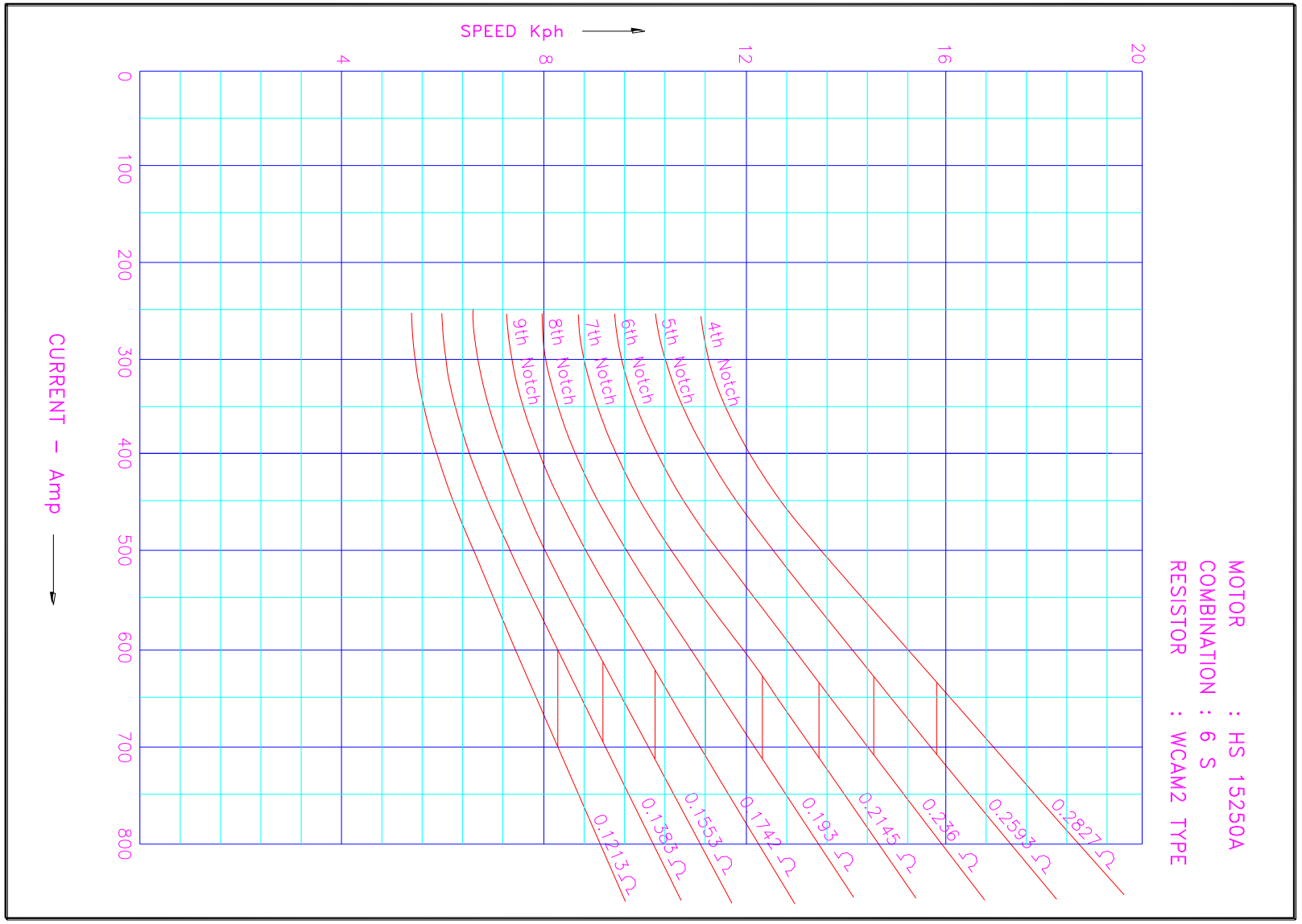
PERFORMANCE CURVES OF WCAM2 LOCOMOTVE

APPROVED SD. FOR D.G.

RDSO GEL–1022


TRACTIVE EFFORT – t
40
30
20
10
TRACTION MOTOR – TAO 659
CONT. RATING – 760V,840A (FOR AC)
– 467V, 865A (FOR AC)
GEAR RATIO – 58:21
WHEEL DIA – 1055mm (HALF WORK)
WEIGHT OF LOCO – 115t
ADH. CURVE (AC)
ADH. CURVE (DC)
467V 95%F
750V 95%F
53%F
53%F
750V 95%F
1100A
900A
865A
840A
53%F
22 COACHES + 3 LOCO. ON 1/33
18 COACHES + 4 LOCO. ON 1/90
18 COACHES + 3 LOCO. ON 1/33
22 COACHES + 2 LOCO. ON 1/90
26 COACHES + LOCO. ON 1/500 WITH 2 CURVE
22 COACHES + LOCO. ON 1/500 WITH 2 CURVE
26 COACHES + LOCO. ON LEVEL
22 COACHES + LOCO. ON LEVEL
18 COACHES + LOCO. ON LEVEL
SPEED–Km/h 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
CURRENT–AMPS 0 200 400 600 800 1000 1200
REF:–
SCALE:–
APPROVED BY:–
FOR D.G.
PERFORMANCE CURVES OF WCAM2P LOCO.
RDSO.ELEC.DTE.
GEL– 1063
Dt. 25.1.96
D
T
C


RHEOSTATIC – BRAKING CURVE
MOTOR : HS 15250 A
COMBINATION : 6S
RESISTOR : WCAM2 TYPE
BRAKING EFFORT – TONNES
SPEED – Kph
A 2–1
0
4
8
12
16
20
10
20
30
0.1213 Ω
0.1383 Ω
0.1553 Ω
0.1742 Ω
0.193 Ω
0.2145 Ω
0.236 Ω
0.2593 Ω
0.2827 Ω
7th 8th 7th 6th 5th 4th Notch
1400t WITH 3 LOCO ON 1/37
1300t WITH 3 LOCO ON 1/37


SPEED Kph
4
8
12
16
20
0
100
200
300
400
500
600
700
800
CURRENT – Amp
4th Notch
5th Notch
6th Notch
7th Notch
8th Notch
9th Notch
0.2827 Ω
0.2593 Ω
0.236 Ω
0.2145 Ω
0.193 Ω
0.1742 Ω
0.1553 Ω
0.1385 Ω
0.1213 Ω
MOTOR : HS 15250A
COMBINATION : 6 S
RESISTOR : WCAM2 TYPE

WCAM 2

HAULAGE CAPACITY OF WCAM 2 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) ac WORKING
G.R. 4.13 (15:62) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →						3825					ABOVE 6000
		1/500	← ABOVE 6000 →		5880	5415	4445	3610	2385					ABOVE 6000
		1/200	3250	3250	3250	3140	2650	2215	1495					3250
		1/150	2540	2540	2540	2535	2155	1815	1230					2540
		1/100	1750	1750	1750	1750	1555	1325	895					1750
		1/50	985	975	960	950	815	695	460					1090
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →											ABOVE 6000
		1/500	4640	4640	4640	4640	4640	4640	3200					4640
		1/200	3215	3215	3215	3215	3020	2580	1790					3215
		1/150	2735	2735	2735	2735	2395	2050	1425					2735
		1/100	2020	1995	1965	1935	1680	1445	1000					2105
		1/50	1010	1000	995	980	850	730	490					1215
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →									1460	1020	ABOVE 1500
		1/500	← ABOVE 1500 →								1305	965	665	-DO-
		1/200	← ABOVE 1500 →							1115	810	585	415	-DO-
		1/150	← ABOVE 1500 →						1300	910	660	475	340	-DO-
		1/100	← ABOVE 1500 →					1365	935	650	470	335	230	-DO-
		1/50	1010	995	980	965	830	710	475	320	225	145	90	1265

Dt	13.4.94
D	L.K.MISRA
T	
C	P.N.SETH

WCAM 2

HAULAGE CAPACITY OF WCAM 2 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) ac WORKING
G.R. 4.13 (15:62) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →											ABOVE 6000
		1/500	5415	5415	5415	5415	5415	4835	3280					5415
		1/200	3570	3570	3570	3570	3090	2610	1815					3570
		1/150	2995	2965	2900	2830	2440	2085	1440					2995
		1/100	2065	2030	2000	1965	1700	1460	1010					2255
		1/50	1020	1010	1000	990	860	735	495					1265
PASSENGER SERVICE	ICF COACH	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												

Dt	13.4.94
D	L.K.MISRA
T	
C	P.N.SETH

WCAM 2

HAULAGE CAPACITY OF WCAM 2 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) dc WORKING
G.R. 4.13 (15:62) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)										START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →			5615	3195	1895	1160					ABOVE 6000
		1/500	3420	3420	3420	2940	1765	1090	690					3420
		1/200	2120	2120	2120	1685	1025	640	409					2120
		1/150	1700	1700	1700	1350	820	510	320					1700
		1/100	1250	1250	1250	950	570	380	240					1250
		1/50	790	790	870	475	270	145	70					790
	BOGIE WAGONS (BOX)	LEVEL	5060	5060	5060	5060	4950	3050	1945					5060
		1/500	3585	3585	3585	3580	2205	1410	930					3585
		1/200	2475	2475	2475	1880	1165	745	485					2475
		1/150	2105	2105	2105	1475	910	575	370					2105
		1/100	1610	1610	1610	1015	620	380	235					1610
		1/50	920	920	825	490	280	155	75					920
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →						1375	765				ABOVE 1500
		1/500	← ABOVE 1500 →					1195	770	430				–DO–
		1/200	← ABOVE 1500 →				1075	705	435	230				–DO–
		1/150	← ABOVE 1500 →			1400	855	530	335	175				–DO–
		1/100	← ABOVE 1500 →			980	590	360	220	55				–DO–
		1/50	960	960	815	480	275	150	75	10				960

Dt	13.4.94
D	L.K.MISRA
T	
C	P.N.SETH

WCAM 2

HAULAGE CAPACITY OF WCAM 2 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) dc WORKING
G.R. 4.13 (15:62) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →				5455	3275	2050					ABOVE 6000
		1/500	4180	4180	4180	3765	2305	1460	955					4180
		1/200	2750	2750	2750	1930	1195	760	490					2750
		1/150	2300	2300	2300	1505	925	585	375					2300
		1/100	1725	1725	1680	1030	625	385	240					1725
		1/50	960	960	830	495	280	155	75					960
PASSENGER SERVICE	ICF COACH	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												

Dt	13.4.94
D	L.K.MISRA
T	
C	P.N.SETH

WCAM 2

HAULAGE CAPACITY OF WCAM 2 (P) LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) ac WORKING
G.R. ..... (21:58) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5865	5045	4015					ABOVE 6000
		1/500	← 2840 →						2750					2840
		1/200	← 1540 →											1540
		1/150	← 1320 →											1320
		1/100	← 1020 →											1020
		1/50	615	610	600	590	580	565	550					660
	BOGIE WAGONS (BOXN)	LEVEL	← 5380 →								4925			5380
		1/500	← 3545 →							3140	2645			3545
		1/200	← 2325 →				2265	2185	2105	1775	1530			2325
		1/150	1945	1925	1880	1830	1780	1730	1675	1420	1225			1945
		1/100	1330	1305	1285	1260	1235	1205	1175	1000	865			1455
		1/50	635	630	625	615	605	595	585	495	430			800
	BOGIE WAGONS (BOX)	LEVEL	← 4304 →											4304
		1/500	← 3040 →								2620			3040
		1/200	← 2095 →						2080	1760	1520			2095
		1/150	← 1775 →				1745	1700	1660	1410	1220			1775
		1/100	1300	1285	1265	1240	1215	1190	1170	995	865			1355
		1/50	630	625	620	610	605	595	585	495	430			770

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 2

HAULAGE CAPACITY OF WCAM 2 (P) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE) ac WORKING

G.R. .....(21:58) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICF COACH	LEVEL	ABOVE 1500											ABOVE 1500
		1/500	ABOVE 1500										1230	-DO-
		1/200	ABOVE 1500								1315	175	800	-DO-
		1/150	ABOVE 1500						1505	1260	1085	885	660	-DO-
		1/100	1300	1265	1230	1195	1160	1125	1090	915	790	650	480	1455
		1/50	630	620	610	600	585	575	565	470	405	330	235	800

Dt	23.1.96
D	L.K.MISRA
T	
C	R.K.B.RAO

WCAM 2

HAULAGE CAPACITY OF WCAM 2(P) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE) dc OPERATON

G.R. ..... (21 : 58) T.M. TAO-659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICE COACH	LEVEL	← ABOVE 1500 →								1135	710	430	ABOVE 1500
		1/500	← ABOVE 1500 →						1380	960	690	435	260	-DO-
		1/200	← ABOVE 1500 →					1205	810	570	410	250	140	-DO-
		1/150	← ABOVE 1500 →				1380	965	650	455	355	195	100	1495
		1/100	1110	1110	1110	1110	975	680	455	310	215	120	50	1110
		1/50	600	600	600	600	485	325	205	130	75	–	–	600

Dt	11.06.99
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 2

HAULAGE CAPACITY OF WCAM 2 (P) LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE) dc WORKING

G.R. ..... (21 : 58) T.M. TAO–659

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				4990	3195	2030					ABOVE 6000
		1/500	← 1500 →						1245					1500
		1/200	← 1160 →					1135	760					1160
		1/150	← 1020 →					920	615					1020
		1/100	← 820 →					655	435					820
		1/50	← 495 →				475	320	200					495
	BOXN WAGONS	LEVEL	← 4180 →						3585	2450	1700			4180
		1/500	← 2745 →					2530	1710	1215	880			2745
		1/200	← 1795 →					1355	925	660	475			1795
		1/150	← 1495 →					1060	720	510	370			1495
		1/100	← 1110 →				1035	725	490	340	240			1110
		1/50	665	660	650	625	500	340	215	135	80			600
	BOX WAGONS	LEVEL	← 3340 →							2380	1675			3340
		1/500	← 2355 →						1680	1200	870			2355
		1/200	← 1615 →					1330	915	650	475			1615
		1/150	← 1365 →					1045	715	510	365			1365
		1/100	← 1035 →				1020	720	485	340	240			1035
		1/50	660	655	645	620	495	340	215	135	80			575

Dt	11.06.99
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 3

CONT. RAIL P.S. 5000 (AC) / 4600 (DC)
CO-CO TYPE WCAM 3 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WCAM–3 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

FIFTY THREE DUAL VOLTAGE LOCOMOTIVES OF THE TYPE HAVE BEEN ORDERED ON B H E L TO THE DESIGN OF R D S O. THE LOCOMOTIVE IS DESIGNED FOR OPERATION ON 25 k V a o AND 1500 V d c OVERHEAD TRACTION SYSTEM FOR CENTRAL RAILWAY. FIRST PROTOTYPE LOCOMOTIVE IS SENT ON LINE IN AUGUST 1996. THE CONTINUOUS RAIL HORSE POWER OF THE LOCOMOTIVE IS 5000 H P AT 50 kmph. DURING AC OPERATION AND 5000 HP AT 47 kmph. DURING dc OPERATION.

THE LOCOMOTIVE IS POWERED BY SIX AXLE HUNG NOSE SUSPENDED FORCED VENTILATED TYPE HITACHI d c SERIES TRACTION MOTORS. THE BOGIE IS HIGH ADHESION BOGIE FITTED WITH UNIDIRECTIONAL TRACTION MOTORS TO REDUCE WEIGHT TRANSFORMER. SPEED CONTROL IS ACHIEVED BY GROUPING THE MOTORS IN DIFFERENT COMBINATIONS AND BY FIELD WEAKENING OF THE MOTORS. THE VOLTAGE CONTROL IS OBTAINED BY TAP CHANGER IN a c OPERATION AND BY RESISTANCE NOTCHING IN d c OPERATION. SILICON RECTIFIERS ARE UTILISED FOR CONVERSION OF a c POWER INTO d c. STATIC CONVERTER IMPORTED FROM A C E C/BELGIUM IS ADOPTED FOR SUPPLYING THE AUXILIARIES 3–PHASE SUPPLY IN BOTH ac & dc SECTION.

COMPRESSED AIR BRAKE FOR THE LOCOMOTIVE AND AIR BRAKE FOR THE TRAIN ARE PROVIDED. THE LOCO IS PROVIDED RHEOSTATIC BRAKING IN dc MODE BY SELF EXCITATION OF TRACTION MOTORS & IS AVAILABLE UP TO A SPEED OF 17 kmph ONLY. THE LOCOMOTIVE IS SUITABLE FOR MULTIPLE OPERATION (UPTO 4 LOCO). UNDERFRAME IS OF MONOCOQUE DESIGN.

P R O C U R E M E N T P A R T I C U L A R S

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DGR. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
RSP/91/4413	27.11.97	B H E L	1996	21881–21934	RDSO No.E.17/20 (R2)SEPT 1995	WCAM–3	53	

MAIN PARTICULARS OF WCAM–3 LOCO

GENERAL :–

SYSTEM OF CURRENT	– AC/DC
LINE VOLTAGE	– 25000V/1500V
WEIGHT IN W.O.	– 121 t.
ADHESIVE WEIGHT	– 121 t.
MAX. AXLE LOAD	– 20.2 t.

CONTINUOUS RATING :–

P.S.	– 5000/4600 H.P.
T.E.	– 26800 Kg/26800 kg.
SPEED	– 55 Kmph/47 Kmph.
MAX. T.E. ac/dc	– 40.2t./26.8t.
MAX. SPEED	– 105 Kmph

WHEEL DIA

HALF WORN	– 1055 mm.
FULL WORN	– 1016 mm.
NEW	– 1092 mm.

BOGIE :–

DRIVE ARGT.	– GEAR PINION
DESIGN	– 3 AXLE,FABRICATED HIGH ADHESION BOGIE WITH SECONDARY SUSPENSION.

BRAKES :–

DRIVE ARGT.	– GEAR PINION.
DESIGN	– 3–AXLE.FABRICATED HIGH ADHESION BOGIE WITH SECONDARY SUSPENSION.

SANDING :–

NO. OF BOXES	– 16.
CAPACITY	–

PANTOGRAPH :–

NO.	– 2 (1.ac.1.dc)
MAKE	– STONE INDIA.
TYPE	– AM12 (ac)/AM 18 B 2 (dc).

TRANSFORMER :–

MAKE	– BHEL
TYPE	– 5400 AC/DC OLTC CONTROLLED.
NUMBER	– 1.
WT. COMPLETE	– 17200kg.
COOLING	– FORCED OIL (INHIBITED)
INSULATION	– "A" CLASS.
TAPS ON H.T.	– 32.
RATING PRIMARY	– 5670 kVA.22.5kV,252A.
SECONDARY	– 5400kVA.2X1000V,2700A.
TERTIARY	– 270kVA,1000V,270A.

SILICON RECTIFIER :–

NUMBER	– 2.(CONNECTED IN SERIES)
INPUT VOLTAGE	– 1000 Vrms.
OUTPUT VOLTAGE	– 900 V.DC
CURRENT	– 3600A (3Mt.).CONT.–2700A.
COOLING	– FORCED AIR.
TYPE OF CELL	– D1800N44(SIEMENS GERMAN)
CONNECTION	– BRIDGE.
NO.OF CELLS	– 16 PER BRIDGE. (4 IN PARALLEL PERARMS)

STATIC CONVERTER 3–PHASE :–

NUMBER	– 1
RATING	– 180kVA
INPUT	– 1000 VRMS(ac REGION). 1500Vdc (dc REGION).
OUTPUT	– 415 ± 5%.
PHASE	– 3 PHASE WITH NEUTRAL FOR PROTECTION.
FREQUENCY	– 50Hz ± 3%
RATED OUTPUT	– 180 kVA.
P.F.	– MIN. 0.8 AT FULL LOAD.

TRACTION MOTOR :–

MAKE	– HITACHI	
TYPE	– HS 15250A.	
NUMBER	– 6.	
INSULATION	– ARM."C",FIELD"C".	
SUSPENSION	– AXLE HUNG NOSE SUSDENDED	
VENTILATION	– FORCED.	
WT.COMPLETE	– 3650 Kg.	
TEMP. RISE (BY RESISTANCE)	– ARM. 90DEG.C.	FIELD 70DEG.C.

COIL RESISTANCE AT 110 DEG.CENT.

ARMATURE	– 0.0126 OHMS.
MAIN POLE	– 0.0117 OHMS.
INTERPOLE	– 0.0089 OHMS.

RATING :–

CONTINUOUS	– 630KW.,760V.,900., 895 R.P.M.
ONE HOUR	– 670KW.,750V.,960A., 877 R.P.M.
AIR GAP	
MAIN POLE	– 6.35 mm.
INTERPOLE	– 10.0 mm.
BRUSH GRADE	– EG–105.
No.OF HOLDER	– 6.
BRUSH PER HOLDER	– 6.
SIZE (W X L)	– 200X40X64 mm.
MIN.HEIGHT	– NEW=52,WORN=25.

MOTOR GROUPING :–

S – 1, 4, 2, 5, 3, 6.

d c SERIES OPERATION.

SP	–1–4–2 } 3–6–5 }	dc OPERATION
P	1–4 } 2–5 } 3–6 }	ac OPERATION

GEAR RATIO – 18 : 64

AUXILIARY :–

HEAD LIGHT	– 2 NoS, 350W, 32V
VOLTAGE STABLIZER	– 380/32, 24 & 16V.
RATING	– 500VA.
CAB FAN	
TRANSFORMER	– 380/110V.ac. – 220/110V.dc.

BATTERY :–

TYPE	– LEAD ACID
NO.OF CELLS	– 50
RATING	– 110V,75AH

MAIN STARTING RESISTOR :–

NUMBER	1&2	3
TYPE	CSN600F	CSN450F
MAKE	SCHNIEWINDT GERMANY	SCHNIEWINDT GERMANY
CONT.	400/570/900A	900A
CURRENT	FOR 30SEC.	FOR 30SEC.
VOLTAGE	1500VDC	1500VDC
POWER	1026KW	800KW
PEAK		
INSULATION	6KV/50HZ	6KV/50HZ
LEVEL	FOR 1 mint.	FOR 1 mint.
COOLING	6cu.m/Seec.	3.4 cu.m/Sec
AIR FLOW		
WEIGHT	645Kg.	480Kg.
MOTOR :–		
COOLING FAN	4.5cum	3.4cu.m
OUTPUT	/Sec	/Sec
POWER RATING	18kw.	15kw.
SUPPLY	415V,ac	415V,ac
VOLTAGE	3–PHASE 50Hz	3–PHASE 5Hz
SPEED	2900 rpm	2900 rpm
INSULATION CLASS	HORF	F

COMPRESSOR :–

NO.	– 3
MAKE	– ELGI.
CAPACITY	– 1000 L/M,AT 10.5KG/CM.Sq.
TYPE	– TRC 1000MN.
MOTOR	– 415V, 14 HP, 24A.

PROTECTIVE DEVICES :–

DEAD MAN CONTROL	– NO
SLIP CONTROL	– YES
MAIN OVER LOAD RELAY	– YES
MOTOR OVER LOAD RELAY	– YES
OVER VOLTAGE RELAY	– YES
LOW VOLTAGE RELAY	– NO
EARTH FAULT RELAY	– YES
OIL PRESSURE GOVERNOR	– YES
VACCUME CONTROL GOV.	– YES
BRAKE CYL. C/O VALVE	– YES

TRACTION MOTOR BLOWER :–

No.	– 2
MAKE	– SF (I) LTD.
RYPE	– MLBR–42–5–1–H4.
AIR DELIVERY	– 276 Cb.m/Mt. AT 308 mm WG.
MOTOR	– 2.
RATING	– 415 V,26 kW.,50A., 2920 rpm.

SMOOTHING REACTOR BLOWER :–

NO.	– 2.
MAKE	– SF (I) LTD.
TYPE	– PFT–59
CAPACITY	– 4200 Cb.M/hr.AT 85 mm WG
MOTOR	– 2.2kW,415V.,2860 rpm

SILICON RECTIFIER BLOWER :–

NO.	– 2.
MAKE	– SF (I).
TYPE	– P H M X.–40–6.
CAPACITY	– 3100 Cb.m/hr.46 mm WG
MOTOR	– 2.2kW,415 V,4.8A 2860 r p m.

OIL COOLER BLOWER :–

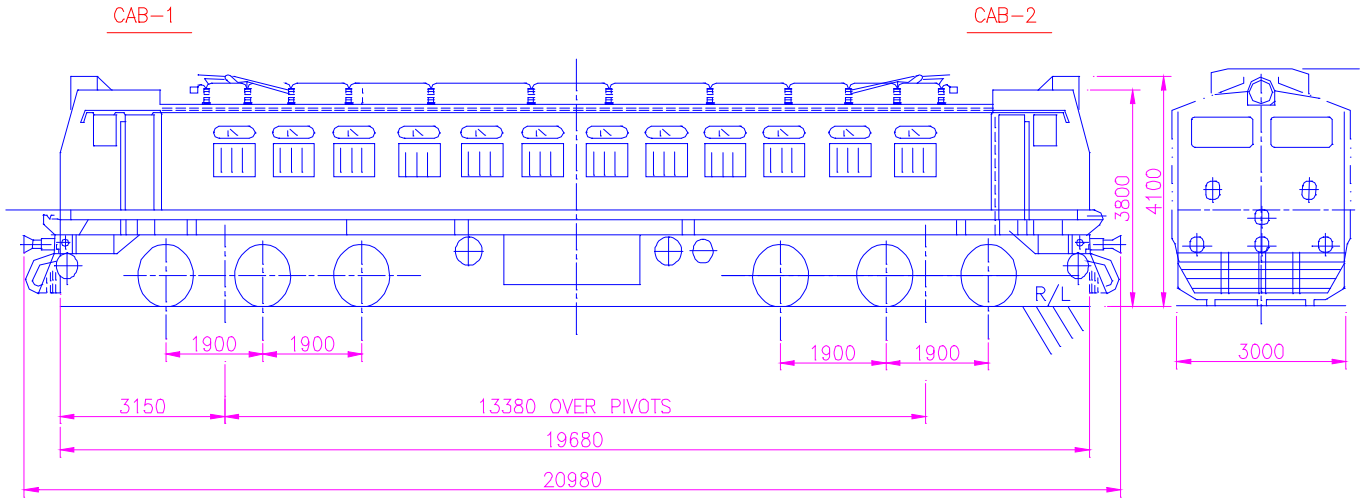
NO.	– 1.
MAKE	– SF (I) LTD.
TYPE	– M L B H – 60 – 1 – HB
CAPACITY	– 22200 Cb.m/hr.,AT190 mm WG
MOTOR	– 22kW,415 V.,45A., 1450 rpm.

OIL PUMP FOR TRANSFORMER :–

NO.	– 1.
MAKE	– BEST & CO. Pvt. Ltd.
CAPACITY	– 740 L/M,AT 11000mm WG
MOTOR	– 3.2 kW.,415V, 2865 rpm.

SMOOTHING REACTOR FOR T.M. :–

TYPE	– SL 30.
RATING	– 1250 V.,1350A.
REACTANCE	– 2.68 mH.
RESISTANCE AT 110 DEG. CENT.	– 0.00544 Ohms.



TYPE OF SERVICE	MIXED
APPLY CURRENT	25 KV A C /1500 V DC
CLASS OF LOCO	WCAM 3
TRACK GAUGE	CO–CO
MAX. OPERATING SPEED	1676 mm (BROAD GAUGE)
TRANSFORMER	105 kph
TRACTION MOTOR	54 KVA
	6 NOS. TYPE HS 15250 A

BREAK EQPT.	AIR BRAKE SYSTEM
MAX. AXLE LOAD	20.2 Tonnes
TOTAL WEIGHT OF LOAD.	121 TONNES

Dt.	
D	
C	
T	

DATE	ALT.		REV.	DATE	ALT.
	CKD.				CKD.
	APPD.				APPD.

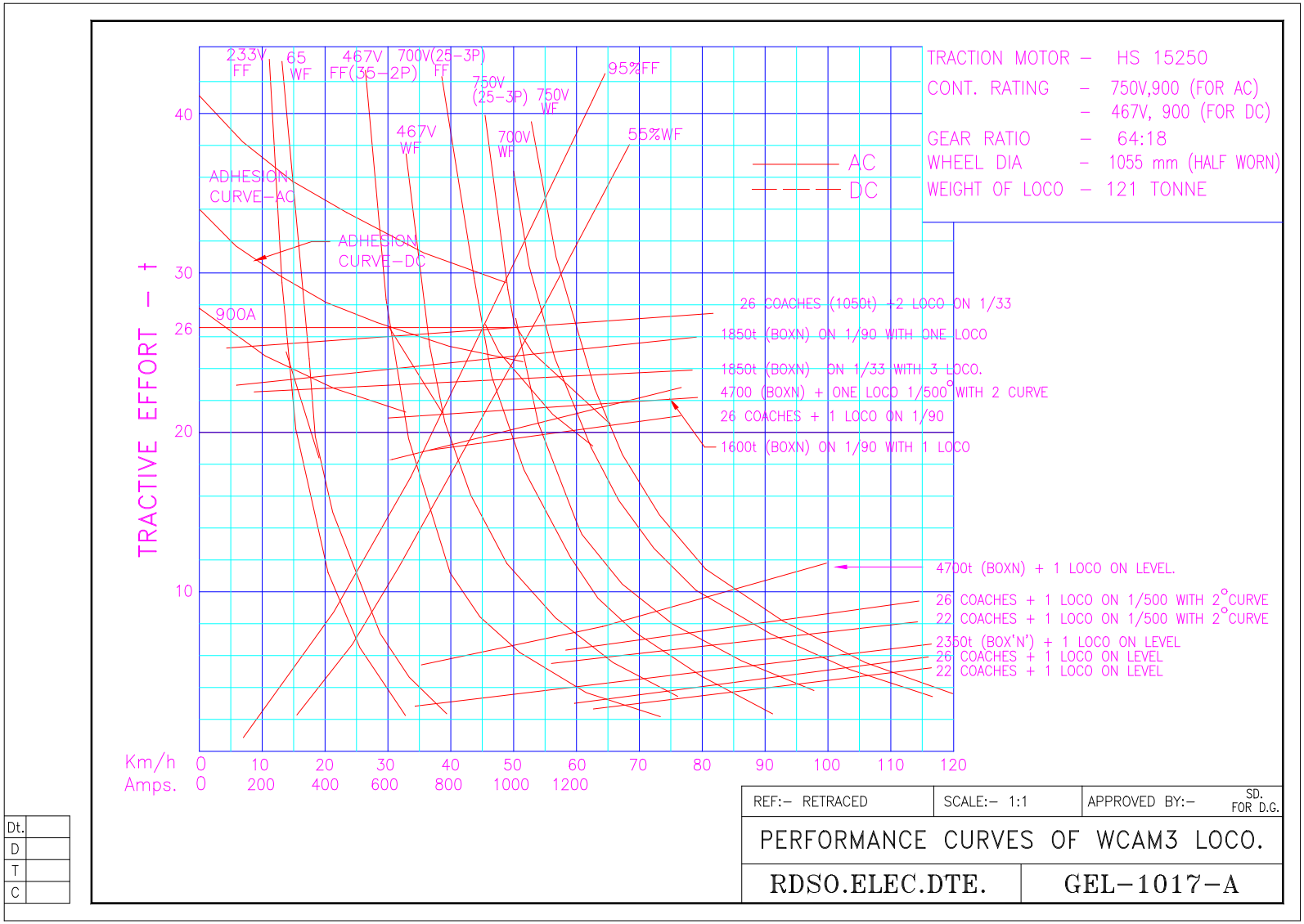
BHARAT HEAVY ELECTRICALS LIMITED
JHANSI

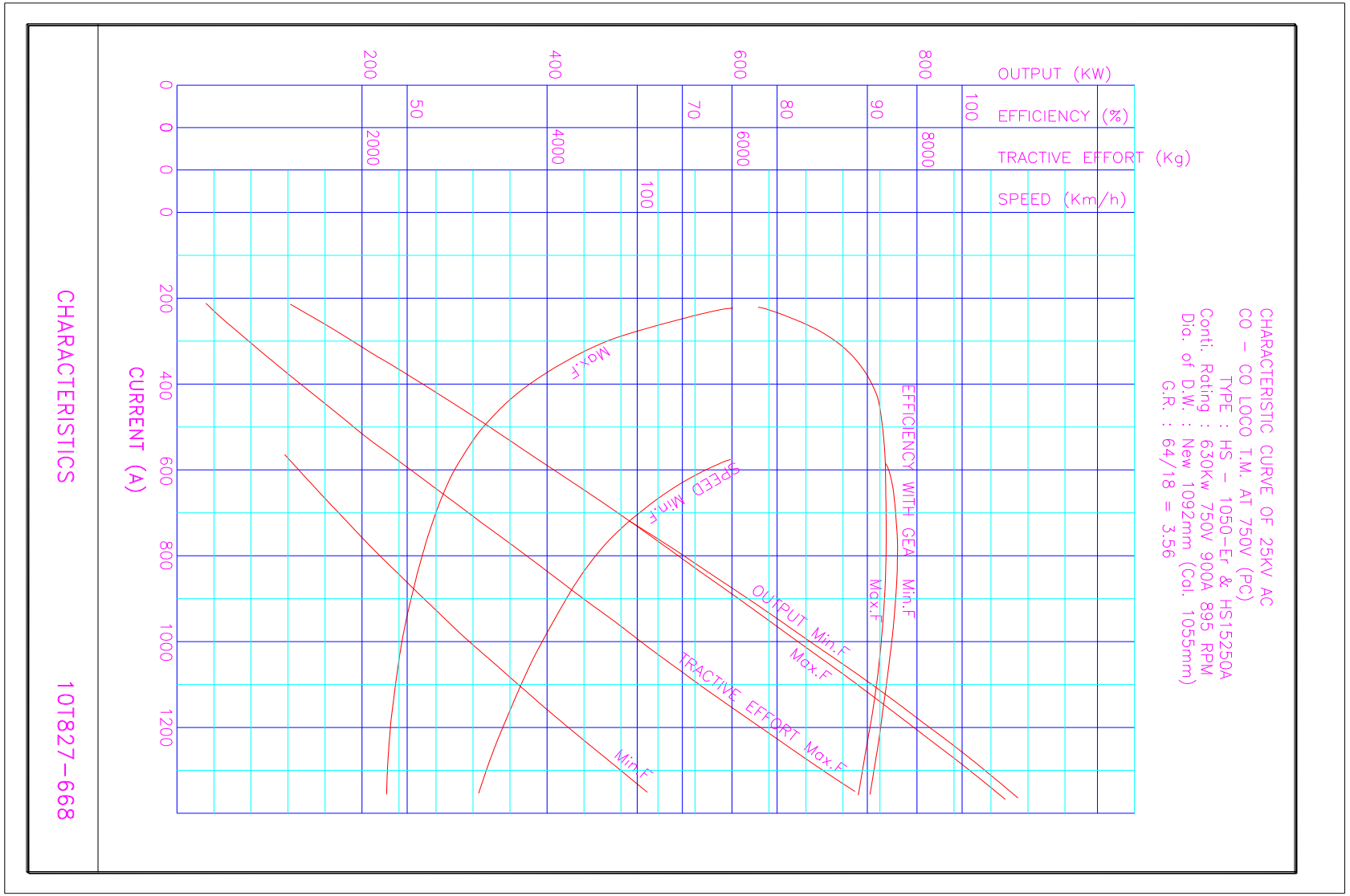
TYPE OF PROJECT (AC/DC LOCO TYPE WCAM3)
OR
NAME OF CUSTOMER RAIWAY BOARD

TITLE
LOCOMOTIVE DIAGRAM
(AC/DC LOCO TYPE WCAM3)

	NAME	SIGN	DATE
DRN	BHAGWAT		6.11.95
CKD	V.VORMA		6.11.95
APPD	PSC		6.11.95

DRG. No.
3 719 00 04 000


TRACTIVE EFFORT – t
40
30
26
20
10
Km/h 0 10 20 30 40 50 60 70 80 90 100 110 120
Amps. 0 200 400 600 800 1000 1200
233V FF
65 WF
467V FF(35–2P)
700V(25–3P) FF
750V (25–3P)
750V WF
95%FF
467V WF
700V WF
55%WF
ADHESION CURVE–AC
ADHESION CURVE–DC
900A
AC
DC
TRACTION MOTOR – HS 15250
CONT. RATING – 750V,900 (FOR AC)
– 467V, 900 (FOR DC)
GEAR RATIO – 64:18
WHEEL DIA – 1055 mm (HALF WORN)
WEIGHT OF LOCO – 121 TONNE
26 COACHES (1050t) +2 LOCO ON 1/33
1850t (BOXN) ON 1/90 WITH ONE LOCO
1850t (BOXN) ON 1/33 WITH 3 LOCO.
4700 (BOXN) + ONE LOCO 1/500° WITH 2 CURVE
26 COACHES + 1 LOCO ON 1/90
1600t (BOXN) ON 1/90 WITH 1 LOCO
4700t (BOXN) + 1 LOCO ON LEVEL.
26 COACHES + 1 LOCO ON 1/500 WITH 2°CURVE
22 COACHES + 1 LOCO ON 1/500 WITH 2°CURVE
2350t (BOX'N') + 1 LOCO ON LEVEL
26 COACHES + 1 LOCO ON LEVEL
22 COACHES + 1 LOCO ON LEVEL
REF:– RETRACED
SCALE:– 1:1
APPROVED BY:–
SD. FOR D.G.
PERFORMANCE CURVES OF WCAM3 LOCO.
RDSO.ELEC.DTE.
GEL–1017–A
Dt.
D
T
C


CHARACTERISTIC CURVE OF 25KV AC
CO – CO LOCO T.M. AT 750V (PC)
TYPE : HS – 1050–Er & HS15250A
Conti. Rating : 630Kw 750V 900A 895 RPM
Dia. of D.W. : New 1092mm (Cal. 1055mm)
G.R. : 64/18 = 3.56
OUTPUT (KW)
EFFICIENCY (%)
TRACTIVE EFFORT (Kg)
SPEED (Km/h)
CURRENT (A)
EFFICIENCY WITH GEA Min.F
Max.F
OUTPUT Min.F
Max.F
TRACTIVE EFFORT Max.F
Min.F
SPEED Min.F
Max.F
CHARACTERISTICS
10T827–668

WCAM 3

HAULAGE CAPACITY OF WCAM 3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE) ac WORKING

G.R. 1:3 : 55 (18: 64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →					5635	3365					ABOVE 6000
		1/500	← ABOVE 6000 →				4655	3345	2085					-DO-
		1/200	3935	3825	3690	3545	2775	2050	1300					4000
		1/150	3115	3045	2960	2860	2255	1675	1065					3400
		1/100	2485	2150	2105	2050	1625	1215	770					2400
		1/50	1115	1105	1090	1075	855	635	390					1300
	BOXN WAGONS	LEVEL	← ABOVE 6000 →						5940	4015	2625			ABOVE 6000
		1/500	← ABOVE 6000 →					4505	2870	2025	1380			-DO-
		1/200	4415	4305	4190	4065	3235	2445	1575	1125	775			4415
		1/150	3415	3345	3275	3195	2555	1935	1250	890	610			3705
		1/100	2330	2295	2260	2220	1780	1350	865	610	410			2795
		1/50	1155	1145	1135	1125	895	670	415	280	175			1580
	BOX WAGONS	LEVEL	← ABOVE 6000 →						5735	3905	2585			ABOVE 6000
		1/500	5730	5730	5730	5730	5730	4355	2820	1995	1370			5730
		1/200	3975	3975	3975	3955	3160	2395	1560	1115	770			3975
		1/150	3315	3255	3195	3125	2505	1905	1240	885	605			3390
		1/100	2285	2255	2220	2185	1755	1335	860	610	410			2610
		1/50	1145	1135	1125	1115	890	670	415	280	175			1515

Dt	4.1.96
D	L.K.MISRA
T	
C	

WCAM 3

HAULAGE CAPACITY OF WCAM 3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE) ac WORKING

G.R. 1:3:55 (18:64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
	BOGIE WAGONS (BOX)	LEVEL												
		1/500												
		1/200												
		1/150												
		1/100												
		1/50												
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →									1105		ABOVE 1500
		1/500	← ABOVE 1500 →								1085	695		-DO-
		1/200	← ABOVE 1500 →						1385	975	665	425		-DO-
		1/150	← ABOVE 1500 →						1125	790	535	335		-DO-
		1/100	← ABOVE 1500 →					1260	800	560	375	230		-DO-
		1/50	1140	1125	1110	1090	865	645	400	265	165	80		-DO-

Dt	08.01.96
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAM 3

HAULAGE CAPACITY OF WCAM 3 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE) dc WORKING

G.R. 1:3:55 (18:64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →					4580	2840					ABOVE 6000
		1/500	4000	4000	4000	4000	4000	2710	1750					4000
		1/200	2200	2200	2200	2200	2200	1650	1085					2200
		1/150	1680	1680	1680	1680	1680	1345	885					1680
		1/100	1300	1300	1300	1300	1300	970	635					1300
		1/50	815	815	815	805	775	495	310					815
	BOXN WAGONS	LEVEL	← ABOVE 6000 →						5015	3365	2210			ABOVE 6000
		1/500	← ABOVE 4300 →				4300	3650	2415	1690	1155			4300
		1/200	2825	2825	2825	2825	2825	1970	1320	930	640			2825
		1/150	2365	2365	2365	2365	2335	1555	1040	730	500			2365
		1/100	1775	1775	1775	1690	1625	1075	715	495	330			1775
		1/50	985	955	900	840	810	525	335	215	130			985
	BOX WAGONS	LEVEL	5210	5210	5210	5210	5210	5210	4840	3275	2175			5210
		1/500	3690	3690	3690	3690	3690	3525	2370	1665	1145			3690
		1/200	2545	2545	2545	2545	2545	1930	1305	920	635			2545
		1/150	2165	2165	2165	2165	2165	1530	1030	725	495			2165
		1/100	1655	1655	1655	1655	1600	1065	710	495	330			1655
		1/50	945	945	890	835	805	520	330	210	130			945

Dt	8.1.96
D	L.K.MISRA
T	
C	P.N.SETH

WCAM 3

HAULAGE CAPACITY OF WCAM 3 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE) dc WORKING
G.R. 1:3:55 (18:64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →					4580	2840					ABOVE 6000
		1/500	4000	4000	4000	4000	4000	2710	1750					4000
		1/200	2200	2200	2200	2200	2200	1650	1085					2200
		1/150	1680	1680	1680	1680	1680	1345	855					1680
		1/100	1300	1300	1300	1300	1300	970	635					1300
		1/50	815	815	815	805	775	495	310					815
	BOX WAGONS	LEVEL	← ABOVE 6000 →						5015	3365	2210			ABOVE 6000
		1/500	← ABOVE 6000 →					5575	3650	2415	1690	1155		4300
		1/200	2825	2825	2825	2825	2825	1970	1320	930	640			2825
		1/150	2365	2365	2365	2365	2335	1555	1040	730	500			2365
		1/100	1775	1775	1775	1690	1625	1075	715	495	330			1775
		1/50	985	955	900	840	810	525	335	215	130			985
	BOX WAGONS	LEVEL	5210	5210	5210	5210	5210	5210	4840	3275	2175			5210
		1/500	3690	3690	3690	3690	3690	3525	2370	1665	1145			3690
		1/200	2545	2545	2545	2545	2545	1930	1305	920	635			2545
		1/150	2165	2165	2165	2165	2165	1530	1030	725	495			2165
		1/100	1655	1655	1655	1655	1600	1065	710	495	330			1655
		1/50	945	945	890	835	805	520	330	210	130			945

D†	08.01.96
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCAG 1

CONT. RAIL P.S. 5000 (AC) / 4600 (DC)
CO-CO TYPE WCAG 1 ELECTRIC LOCOMOTIVE
1676 mm GAUGE

CO–CO TYPE WCAGI CLASS ELECTRIC LOCOMOTIVE 1676 MM GAUGE

TWELVE DUAL VOLTAGE LOCOMOTIVES OF THIS TYPE HAVE BEEN ORDERED ON BHEL TO THE DESIGN OF RDSO. THE LOCOMOTIVE IS DESIGNED FOR OPERATION ON 25 kV a c AND 1500 V d c OVERHEAD TRACTION SYSTEM FOR CENTRAL RAILWAY. FIRST PROTOTYPE LOCOMOTIVE IS SENT ON LINE IN MARCH 1999. THE CONTINUOUS RAIL HORSE POWER OF THE LOCOMOTIVES IS 5000 HP AT 44 kmph. DURING ac OPERATION AND 4600 HP AT 40 kmph DURING dc OPERATION.

THE LOCOMOTIVE IS POWERED BY SIX AXLE HUNG, NOSE SUSPENDED FORCED VENTILATED TYPE HITACHE dc SERIES TRACTION MOTORS. THE BOGIE IS HIGH ADHESION BOGIE FITTED WITH UNIDIRECTIONAL TRACTION MOTORS TO REDUCE WEIGHT TRANSFER. SPEED CONTROL IS ACHIEVED BY GROUPING THE MOTORS IN DIFFERENT COMBINATIONS AND BY FIELD WEAKENING OF THE MOTORS. THE VOLTAGE CONTROL IS OBTAINED BY TAP CHANGER IN ac OPERATION AND BY RESISTANCE NOTCHING IN dc OPERATION. SILICON RECTIFIERS ARE UTILISED FOR CONVERSION OF ac POWER INTO dc. STATIC CONVERTER IMPORTED FROM ACEC/BELGIUM IS ADOPTED FOR SUPPLYING THE AUXILIARIES 3–PHASE SUPPLY IN BOTH ac & dc SECTION.

COMPRESSED AIR BRAKE FOR THE LOCOMOTIVE AND DUAL BRAKE FOR THE TRAIN ARE PROVIDED. THE LOCO IS PROVIDED WITH RHEOSTATIC BRAKING IN dc MODE BY SELF EXCITATION OF TRACTION MOTORS & IS AVAILABLE UP TO A SPEED OF 17 kmph ONLY. THE LOCOMOTIVE IS SUITABLE FOR MULTIPLE OPERATION (UPTP 4 LOCO). UNDERFRAME IS OF MONOCOQUE DESIGN.

PROCUREMENT PARTICULARS

C O N T R A C T		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBER	PARTICULAR SPEC.NO.	AS MADE DRG.SET	TOTEL NO. ORDERED	REMARKS
NUMBER	DATE							
981/RSF/459/3/2 SG/BHEL	26.03.99	BHEL	March '99	21971	RDSO No. E–17/ 20 Sept '95	WCAG1	12	

MAIN PARTICULARS OF WCAG1 LOCO

GENERAL:–

SYSTEM OF CURRET	– AC/DC
LINE VOTAGE	– 25000V/1500V
WEIGHT IN W.O.	– 128 t
ADHGESIVE WEIGHT	– 128 t
MAX. AXLE LOAD	– 21.3 t

CONTINUOUS RATING

P.S.	– 5000/4600H.P.
T.E.	– 31000Kg/30000Kg
SPEED	– 44kmph/40kmph
MAX.T.E.ac/dc	– 44t/30t
MAX.SPEED	– 100kmph
WHEEL DIA	
HALF WORN	– 1055 mm
FULL WORN	– 1016 mm
NEW	– 1029 mm

BOGIE

DRIVE ARGT	– GEAR PINION
DESIGN	– 3–Axle Fabricated High Adhesion Bogie with Secondary Suspension.

BRAKES:–

LOCO	– Rheostatic, Air, Hand
TRAIN	– DUAL

SANDING

No. of Boxes	– 16
Capacity	

PANTOGRAPH:–

NO.	–2(1ac/1dc)
MAKE	–STONE INDIA
TYPE	–AM 12(ac) AM 18 B2

TRANSFORMER

MAKE	–BHEL
TYPE	–5400 AC/DC OLTC Controlled
NUMBER	–1
WT.COMPLETE	–17200Kg
COOLING	FORCED OIL(INHIBITED)
INSULATION	–"A"
TAP ON H.T.	–32
RATING PRIMARY	–5670kVA,22.5kV,252A
SECONDARY	5400kVA 2x 1000V, 2700A
TERTIARY	–270 kVA,1000V, 270A

SILICON RECTIFIER

NUMBER	–2(CONNECTED IN SERIES)
INPUT VOLTAGE	–1000 V rms
OUTPUT VOLTAGE	–900 V.DC
CURRENT	–3600A (SML).CONT 2700A
COOLING	–FORCED AIR
TYPE OF CELL	–D1800N44(SIIMI NS GERMAN)
CONNECTION	–BRIDGE
No. OF CELLS	–16 PER BRIDGE (4 IN PARALLEL PER ARMS)

TRACTION MOTOR

MAKE	– HITACHI
TYPE	– HS 15250 A
NUMBER	– 6
INSULATION	– ARM "C" FIELD "C"
SUSPENSION	– AXLE HUNG NOSE – SUSPENDED
VENTILATION	– FORCED
WT.COMPLETE	– 3650 Kg
TEMP.RISE	– ARM. FIELD
(BY RESISTANCE)	– 90DEG.C. 70 DEG.C
COIL RESISTANCE AT 110DEG CENT.	
ARMATURE	– 0.0126 OHMS
MAIN POLE	– 0.0117 OHMS
INTER POLE	– 0.0089 OHMS
RATING:	
CONTINUOUS	– 630 KW,750 V,900A 895 R.P.M.
ONE HOUR	– 670 KW,750 V,960 A 877 R.P.M.
AIR GAP	
MAIN POLE	– 6.35 mm
INTER POLE	– 10.0 mm
BRUSH GRADE	– EG–105
No. OF HOLDER	– 6
BRUSH PER HOLDER	– 6
SIZE (W x L x H)	– 20 x 40 x 64 mm
MIN HEIGHT(BRUSH WEAR)	25 mm
MOTOR GROUPING:	
S	– 1,4,2,5,3,6
dc SERISE OPERATION	
SP	– 1–4–2) dc OPERATION 3–6–5)
P	1 – 4) 2 – 5) ac OPERATION 3 – 6)
GEAR RATIO	– 16 : 65

WCAG1

AUXILIARY

HEAD LIGHT	– 2Nos,350 W,32 V
VOLTAGE STABILIZER	– 380/32, 24 & 16 V
RATING	– 500 VA
CAB FAN	
TRANSFORMER	– 380/110 V ac
	– 220/110 V dc

BATTERY

TYPE	– LEAD ACID
NO. OF CELLS	– 50
RATING	– 110 V,75 AH

MAIN STARTING RESISTOR

NUMBER	1&2	3
TYPE	CSN600F	CSN450F
MAKE	SCHNIEWINDT GERMANY	SCHNIEWINDT GERMANY
CONT.	400/570/900 A	900 A
CURRENT	FOR 30 SEC	FOR 30 SEC
VOLTAGE	1500 VDC	1500 VDC
POWER	1026 KW	800 KW
PEAK		
INSULATION LEVEL	6KV/50HZ FOR 1 MINT.	6KV/50HZ FOR 1 MINT.
COOLING AIR FLOW	6CU.M/Sec.	3.4cu.m/Sec

MAIN STARTING RESISTOR (CONT.)

WEIGHT	645Kg	480Kg
MOTOR		
COOLING FAN	4.5cum	3.4cu.m
OUTPUT	/Sec	/Sec
POWER RATING	18kw	15kw
SUPPLY	415 V ac	415 V ac
VOLTAGE	3–Phase 50Hz	3–Phase 50Hz
SPEED	2900 rpm	2900rpm
INSULATION CLASS	H or F	F

COMPRESSOR

NO.	–3
MAKE	–ELGI
CAPACITY	–1000 L/M, at 10.5 Kg/Cm.sq
TYPE	TRC 1000 MN
MOTOR	–415 V,14 HP, 24 A

TRACTION MOTOR BLOWER

NO.	–2
MAKE	–SF(I) LTD
TYPE	MLBR–42–5–1–H4
AIR DELIVERY	–276 Cb.m/Mt AT 308 MM WG
MOTOR	–2
RATING	–415V,26kW,50A,2920 rpm

SMOOTHING REACTOR BLOWER

NO.	– 2
MAKE	– SF(I) LTD.
TYPE	– PFT–59
CAPACITY	– 4200 Cb.M/hr. AT 85 mm WG
MOTOR	– 2.3 Kw,415 V,2860 rpm

SILICON RECTIFIER BLOWER

NO.	– 2
MAKE	– SF(I).
TYPE	– PHMX –40–6
CAPACITY	– 3100 Cb.M/hr. AT 85 mm – WG
MOTOR	– 2.2 Kw,415 V,4.8 A 2860 rpm

OIL COOLER BLOWER

NO.	– 2
MAKE	– SF(I) LTD.
TYPE	– MLBH –60–1–HB
CAPACITY	– 22200 Cb.M/HR. AT 190 mm WG
MOTOR	– 22 Kw,415 V,45 A 1450 rpm

WCAG1

STATIC CONVERTER 3–PHASE:

NUMBER	– 1
RATING	– 180 kVA
INPUT	– 1000 VRMS(ac REGION)
	– 1500 Vdc (dc REGION)
OUTPUT	– 415 + 5%
PHASE	– 3–PHASE WITH
FREQUENCY	– 50Hz + 3%
RATED OUTPUT	– 180 kVA
P.F.	– MIN 0.8 AT FULL LOAD

OIL PUMP FOR TRANSFORMER

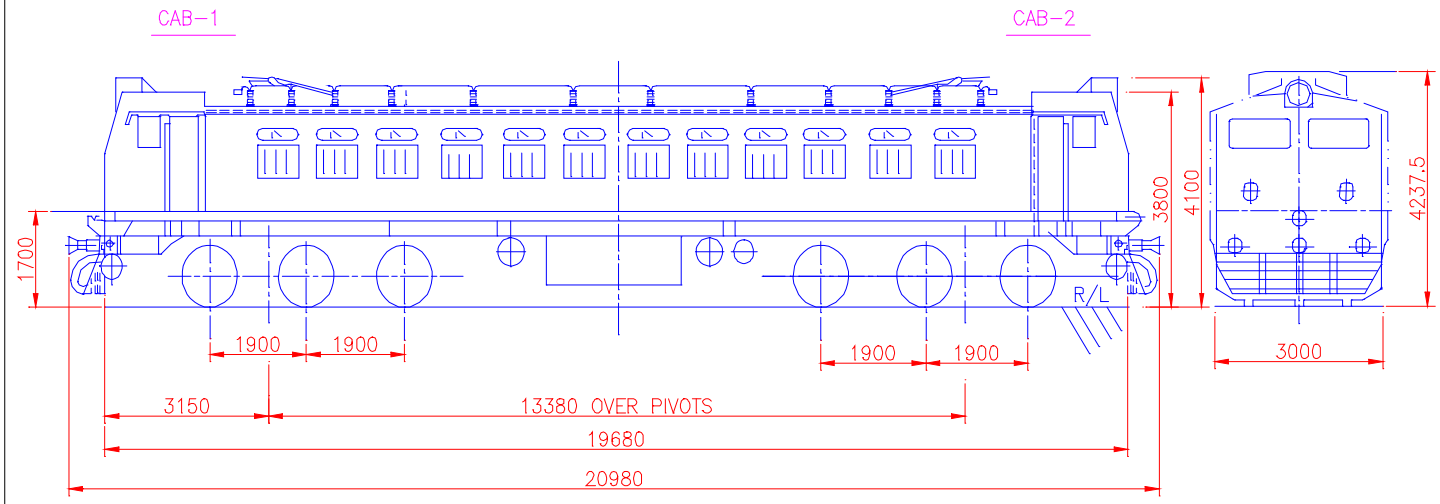
NO	– 1
MAKE	– BEST & CO PVT. LTD.
CAPACITY	– 740 L/M AT 11000 mm WG
MOTOR	– 3.2 Kw,415 V,2865 rpm

SMOOTHING REACTOR FOR T.M.

TYPE	– SL30
RATING	– 1250 V,1350 A
REACTANCE	– 2.68 mH
RESISTANCE AT 110 DEG CENT.	– 0.00544 Ohms

PROTECTIVE DECVICE

DEAD MAN CONTROL	– NO
SLIP COTROL	– YES
MAIN OVER LOAD RELAY	– YES
MOTOR OVER LOAD RELAY	– YES
OVER VOLTAGE RELAY	– YES
EARTH FAULT RELAY	– YES
OIL PRESSURE GOVERNOR	– YES
VACUUM CONTROL GOV	– YES
BRAKE CYL. C/O VALVE	– YES
LOW VOLTAGE RELAY	– NO



TYPE OF SERVICE	GOODS
SUPPLY CURRENT	25 KV A C /1500V DC
CLASS OF LOCO	WCAG 1
TYPE OF LOCO	CO–CO
TRACK GAUGE	167 mm (BROAD GAUGE)
TRANSFORMER	5400 KVA
TRACTION MOTOR	6 NOS. TYPE HS 15250 A

BREAK EQPT.	DUAL BRAKE SYSTEM
MAX. AXLE LOAD	21.33 Tonnes
TOTAL WEIGHT OF LOAD.	128 Tonnes

Dt.	
D	
C	
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DATE	ALT.		REV.	DATE	ALT.
	CKD.				CKD.
	APPD.				APPD.

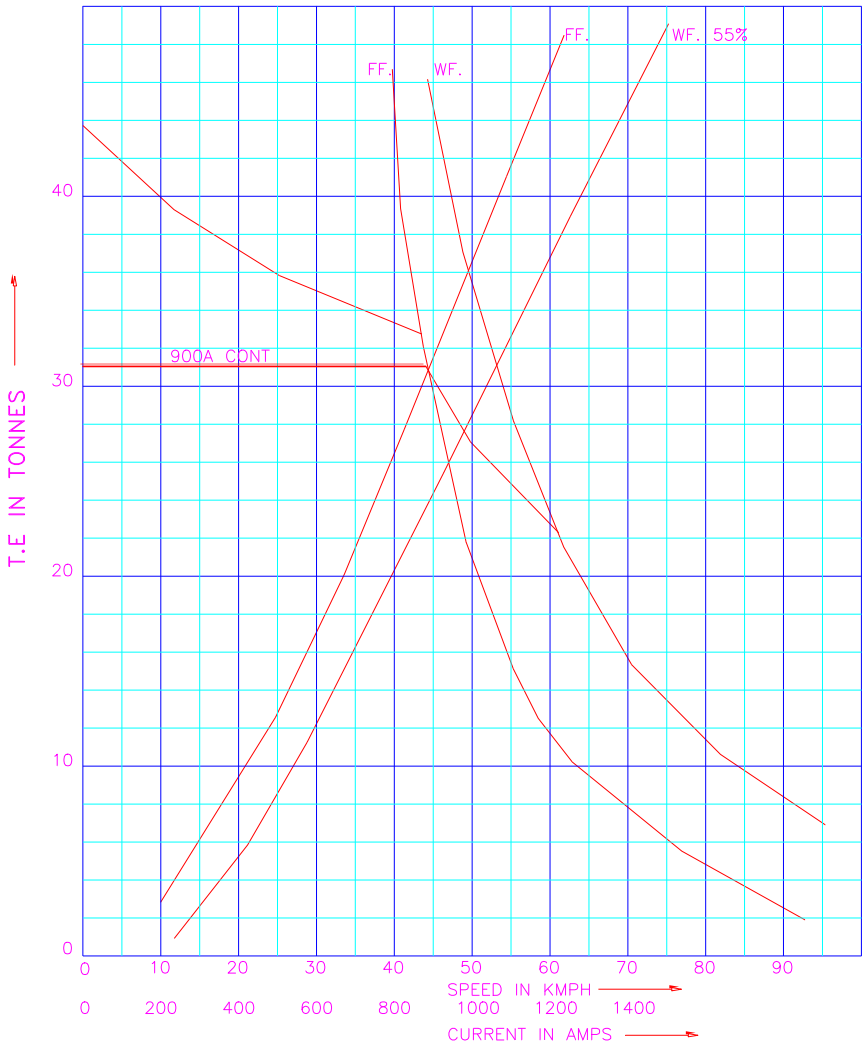
BHARAT HEAVY ELECTRICALS LIMITED
JHANSI

TYPE OF PROJECT (AC/DC LOCO TYPE WCAG1)
OR
NAME OF CUSTOMER RAIWAY BOARD

TITLE
LOCOMOTIVE DIAGRAM
(AC/DC LOCO TYPE WCAG1)

	NAME	SIGN	DATE
DRN	BHAGWAT		6.11.95
CKD	V.VORMA		6.11.95
APPD	PSC		6.11.95

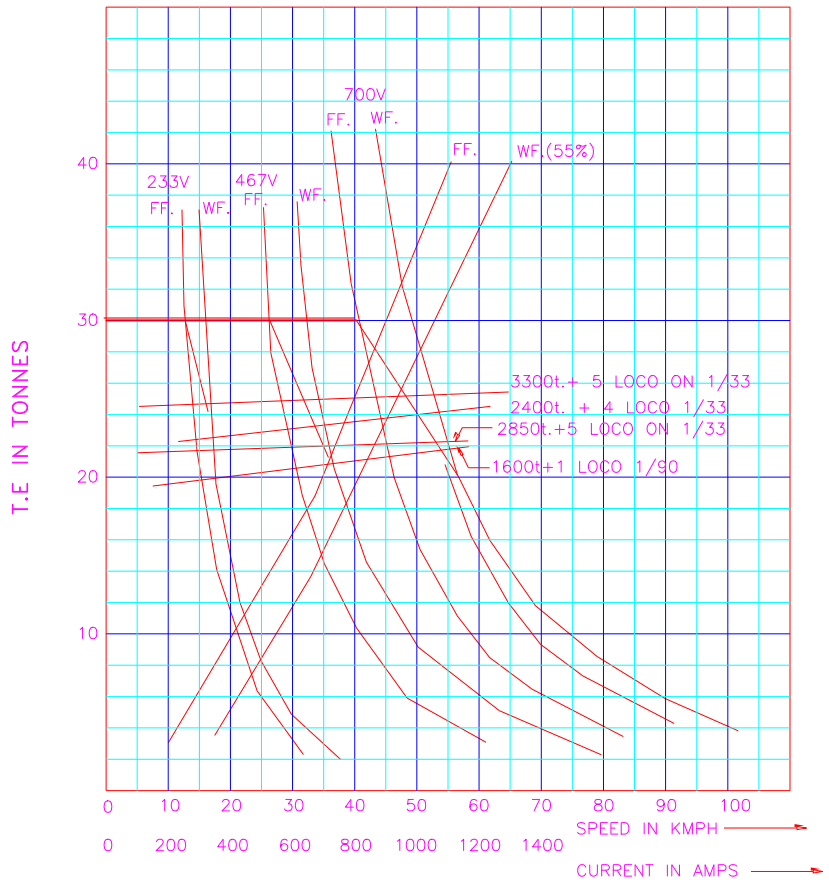
DRG. No.
3 719 00 04 000



TRACTION MOTOR	–	HS 15250A
No. OF MOTORS	–	6
CONT. RATING	–	750V, 900A
GEAR RATIO	–	16 : 65
WHEEL DIA	–	1055 mm
WEIGHT OF LOCO	–	128 t

REF:–	SCALE:–	APPROVED BY:– SD.	FOR D.G.
PERFORMANCE CURVE OF WCAG–1 (A.C.) LOCOMOTIVE			
RDSO.ELEC.DTE.		GEL–1079	

Dt.	
D	
T	
C	



TRACTION MOTOR	– HS 15250A
No. OF MOTORS	– 6
CONT. RATING	– 700V, 900A, – 467V, 900A, – 233V, 900A
GEAR RATIO	– 16 : 65
WHEEL DIA	– 1055 mm
WEIGHT OF LOCO	– 128 t

REF:–	SCALE:–	APPROVED BY:– SD. FOR D.G.
PERFORMANCE CURVE OF WCAG–1 (D.C.) LOCOMOTIVE		
RDSO.ELEC.DTE.	GEL–1076	

Dt.	
D	
T	
C	

HAULAGE CAPACITY OF WCAG1 LOCOMOTIVE(WITHOUT ACCELERATION RESERVE)

GR-16:65(4.06) TM-HS 15250 A LOCO WT-128 T

AC-OPERATION

TYPE OF WAGON	GRADE	TONNES AT KMPH (TANGENT TRACK)											START
		20	30	40	50	60	70	80	90	100			
B O X 'N'	LEVEL	← ABOVE 7500 →						5743	3714	2307			10815
	1/500	7169	7169	7169	7169	6192	4078	2770	1876	1205			7169
	1/200	4738	4738	4738	4085	3285	2205	1519	1038	666			4738
	1/150	3960	3880	3795	3210	2590	1742	1202	820	521			3977
	1/100	2705	2665	2625	2225	1805	1211	830	560	346			3002
	1/50	1345	1335	1320	1120	905	595	393	249	134			1700
B O X	LEVEL	← ABOVE 7500 →						5463	3599	2269			8664
	1/500	← ABOVE 6000 →				5930	3942	2702	1845	1194			6152
	1/200	4268	4268	4268	4040	3212	2163	1498	1028	662			4268
	1/150	3642	3642	3642	3249	2545	1717	1188	813	518			3642
	1/100	2655	2620	2580	2196	1780	1197	823	556	345			2802
	1/50	1334	1324	1312	1114	899	591	391	248	134			1630

Dt	13.4.94
D	L.K.MISRA
T	
C	P.N.SETH

HAULAGE CAPACITY OF WCAG1 LOCOMOTIVE(WITHOUT ACCELERATION RESERVE)

GR-16:65(4.06) TM-HS 15250 A LOCO WT-128 T

DC-OPERATION

TYPE OF WAGON	GRADE	TONNES AT KMPH (TANGENT TRACK)											START
		20	30	40	50	60	70	80	90	100			
B O X 'N'	LEVEL	7308	7308	7308	7308	7308	6332	4000	2614	1563			7308
	1/500	4829	4829	4829	4829	4673	2874	1909	1302	798			4829
	1/200	3176	3176	3176	3176	2469	1537	1030	704	423			3176
	1/150	2662	2662	2662	2662	1943	1207	807	543	322			2662
	1/100	1996	1996	1996	1970	1343	827	545	362	201			1996
	1/50	1110	1110	1110	988	660	388	238	141	54			1110
B O X	LEVEL	5846	5846	5846	5846	5846	5846	3801	2533	1537			5846
	1/500	4139	4139	4139	4139	4139	2778	1861	1280	790			4139
	1/200	2859	2859	2859	2859	2412	1508	1015	698	421			2859
	1/150	2433	2433	2433	2433	1907	1198	796	544	321			2433
	1/100	1863	1863	1863	1863	1325	818	540	360	200			1863
	1/50	1066	1066	1066	979	655	385	237	141	54			1066

Dt	13.4.94
D	L.K.MISRA
T	
C	P.N.SETH

HAULAGE CAPACITY OF WCAG1 LOCOMOTIVE(WITHOUT ACCELERATION RESERVE)

GR-16:65, TM-HS 15250 A, LOCO WT-128 T

AC OPERATION

TYPE OF WAGON	GRADE	TONNES AT KMPH (TANGENT TRACK)							START
4-wh		20	30	40	50	60	70	80	
	LEVEL	← ABOVE 6000 →					5110	3250	ABOVE 6000
	1/500	← ABOVE 6000 →			6165	4745	3025	2010	-DO-
	1/200	4540	4410	4260	3570	2825	1850	1250	5000
	1/150	3600	3520	3420	2885	2300	1510	1020	3800
	1/100	2525	2485	2430	2065	1655	1090	735	2650
	1/50	1295	1285	1270	1080	865	560	365	1400

Dt	
D	
T	
C	

HAULAGE CAPACITY OF WCAG1 LOCOMOTIVE(WITHOUT ACCELERATION RESERVE)

GR-16:65, TM-HS 15250 A, LOCO WT-128 T

DC-OPERATION

TYPE OF WAGON	GRADE	TONNES AT KMPH (TANGENT TRACK)							START
4-wh		20	30	40	50	60	70	80	
	LEVEL	← ABOVE 6000 →					3625	2265	ABOVE 6000
	1/500	5000	5000	5000	5000	3575	2130	1385	5000
	1/200	2700	2700	2700	2700	2115	1285	845	2700
	1/150	2050	2050	2050	2050	1715	1045	685	2050
	1/100	1500	1500	1500	1500	1225	745	485	1500
	1/50	920	920	920	920	625	365	220	920

Dt	
D	
T	
C	

WCG 2

CONT. RAIL P.S. 4200
CO-CO TYPE WCG2 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WCG2

Co_Co TYPE WCG2 CLASS ELECTRIC LOCOMOTIVE
1676 mm Gauge

Fifty seven locomotives of this type ordered on Chittaranjan Locomotive works to the design of R.D.S.O. First prototype locomotive was put in service in February 1971. The continuous rail horse power of the locomotive is 4200 P.S.at 52.5 km/h.

The typical feature of this locomotive is vernier control on the main starting resistance. This improves the adhesion of the locomotives. The locomotive has ac auxiliaries.

The locomotive is powered by six axle hung, nose suspended forced ventilated type dc traction motors. Speed control is achieved by grouping the motors in three different combinations and by field weakening the motors.

This can be used for a multiple unit operation to a maximum of three units.

Compressed air brake for the locomotive and vaccum brake for the train are provided. In addition, these locomotives have been provided with regenerative braking.

P R O C U R E M E N T P A R T I C U L A R S

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
64/Elect/440/10	30.12.1966	RDSO/CLW	1971	20104–20130	R.D.S.O. C.WCG.004	WCG2	27	
66/RSP/459/1	17.1.1968			20131–20160			30	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCG2	Co–Co			RDSO/CLW	1971	20104–20161	RDSO C.WCG.004	WCG2	57

MAIN PARTICULARS OF LOCO

WCG2

GENERAL

SYSTEM OF CURRENT –	d.c.
LINE VOLTAGE –	1500
WEIGHT IN W.O. –	132.0t
ADHESIVE WEIGHT –	132.0t
MAX. AXLE LOAD	22.5t
MIN. AXLE LOAD –	21.5t
1 HR. RATING (SERIES)	
P.S. –	1640
T.E.–	30000kg
SPEED –	15.0km/h
CONTINUOUS RATING –	(PARALLEL)
P.S. –	4200
T.E. –	21900KG
SPEED –	52.5KF/H
MAX. T.E. –	35.6t(27% Adh)
MAX. SPEED –	80 km/h
WHEEL DIA –	NEW 1092mm
	HALF WORN 1055 mm
	FULL WORN 1016 mm

BOGIE

DRIVE ARGT –	GEAR PINION
DESIGN –	3AXLE, TRIMOUNT CAST FRAME, WITH EQUALIZER BEAMS.

BRAKES

LOCO –	AIR, HAND, REGEN.
TRAIN –	VACUUM

SANDING

NO. OF BOXES –	16
CAPACITY EACH –	

CONTROLS –

NUMBER –	MULTIPLES 3 UNITS

PANTOGRAPH

NUMBERS	2
MAKE	FAIVELEY
TYPE	AM18B

TRACTION MOTOR

MAKE –	HEIL
TYPE –	TM4939AZ
NUMBER –	6
INSULATION – ARM.	FIELD
	H H
SUSPENSION–AXLE	HUNG NOSE SUSPENDED
VENTILATION –	FORCED
WT. COMPLETE –	3670kg
1HR. RATING F.F. –	233V, 1020A
CONTINUOUS RATING F.F. –	690HP, 700V, 800A, 1070 RPM, 467V, 880A 233V, 920A
TEMP. RISE(BY RESISTANCE)–	ARM. FIELD 140°C 160°C

COIL RESISTANCE AT 110°C

ARMATURE –	0.0134 ohm
MAIN POLE –	0.00668 ohm
INTER POLE –	0.0055 ohm

AIR GAP

MAIN POLE –	5.0 mm
INTER POLE –	7.5 mm

BRUSHES

NO. OF HOLDERS –	4
BRUSH PER HOLDER–	3
SIZE(WXL) –	2X(9.5X57)
MIN. HEIGHT –	

MOTOR GROUPIG

S	1–4–2–3–6–5
SP	1–4–2
	3–6–5
P	1–4
	2–5
	6–33

GEAR RATIO	18:74

AUXILIARIES

HEAD LIGHT	2Nos. 350W, 32V
BATTERY	LEAD ACID, 50CELLS 110V, 75 AH (5 HR. RATE)

MOTOR ALTERNATOR

ALTERNATOR

MAKE	KIRLOSKAR
TYPE	SOA 749
RATING	180KVA, 400V, 270A 1500RPM, 50MZ 3–PHASE

MOTOR

MAKE	AEI–UK
TYPE	AY100AZ
RATING	210HP, 1500RPM 1400V, 136A 1100V, 176A

COMPRESSOR

NUMBER	2
MAKE	KIRLOSKAR
TYPE	2EC–38B
CAPACITY	790 L/min.
MOTOR	7.5 KW, 10HP,380V 16A, 1390 RPM

EXHAUSTER

NUMBER –	2
MAKE –	NORTHEY
TYPE –	250 RE
CAPACITY –	7000 l/min
MOTOR –	2Nos., 10/15 HP
	385V, 16/22 A
	970/1460 RPM

TRACTION MOTOR BLOWER

NUMBER –	2
MAKE –	S.F. INDIA LTD.
TYPE –	MLBR–40–1–H–4
CAPACITY –	$240m^3$/min at
	220 mm WG
MOTOR –	2 NOS., 30 HP, 400V
	40 A, 2910 RPM

PRESSURING FAN

NUMBER	2
MOTOR	2 NOS., 1 HP, 400V
	2.1 A, 2900 RPM

HEAD LIGHT TRANSFORMER

NUMBER	1
RATING	400V/33.55 V
	1840A, 50 HZ
	3–PHASE

PRISSURING FAN

RATING	500 VA, 400V/32V
	110V, 24V

MOTOR ALTERNATOR RESISTOR BLOWER

MOTOR	1NO. 1HP, 400 V
	3– PHASR, 50HZ
BLOWER	1NO, 3000 m^3/hour
	at 2900 RPM
	Make: CALCUTTA FAN

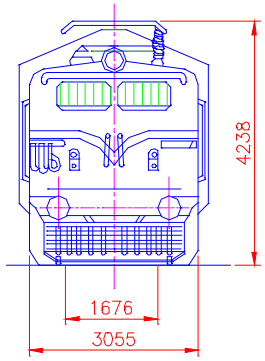
BLOWER FOR STARTING RESISTANCE

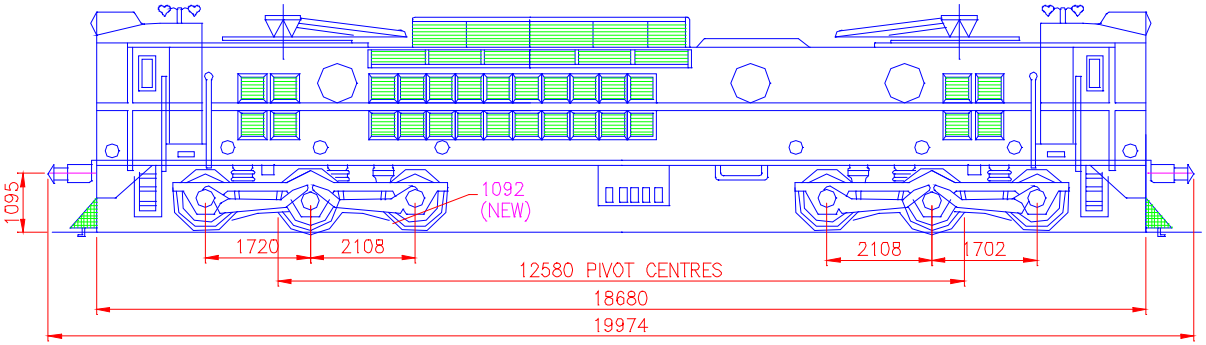
BLOWER	Make: S.F. INDIA LTD
	Type: PFTA–65–1
NUMBER	6
CAPACITY	190 m^3/min
MOTOR	9.3 KW, 400 V,18 A
	2925 RPM, 50 HZ
	3–PHASE, SIEMEN'S

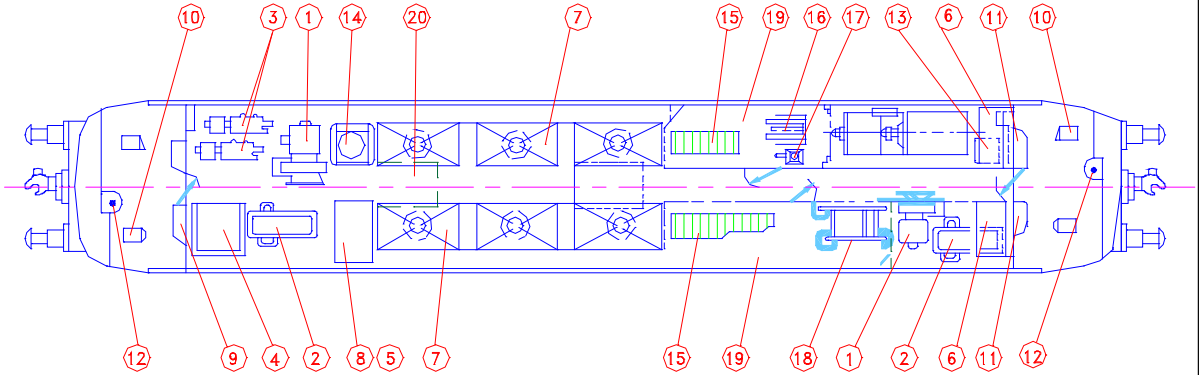
PROTECTIVE DEVICES

DEAD MAN CONTROL	NO
SLIP CONTROL	YES
MAIN O/L RELAY	NO
MOTOR O/L RELAY	YES
O/L RELAY	YES
NO CURRENT RELAY	YES
EARTH FAULT RELAY	YES
OVER SPEED TRIP	NO
LOW PR. GOV.	YES
VAC.CON.GOV.	YES
BRAKE CYL C/O VALVE	YES
E.A.V.	YES

WCG2



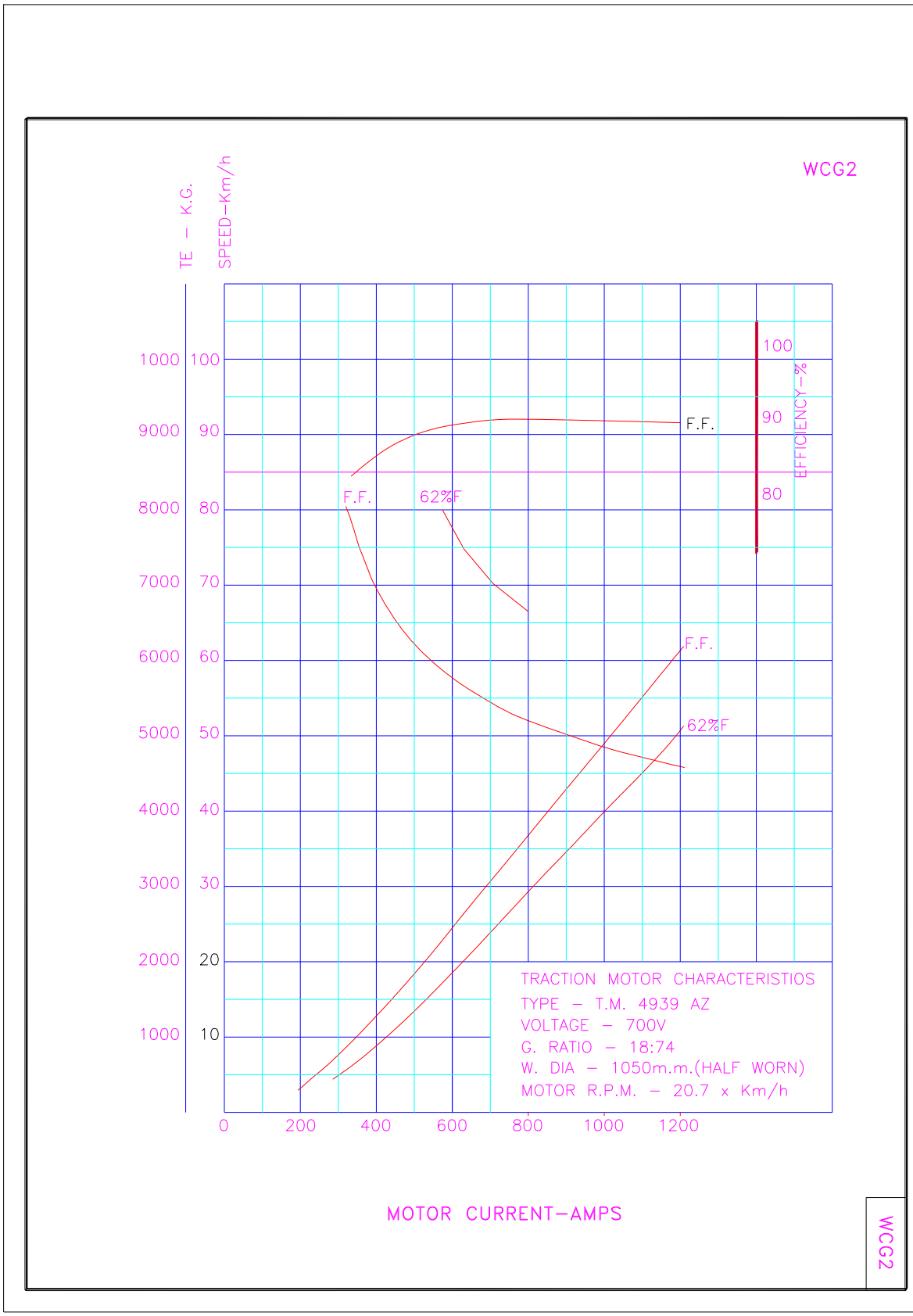


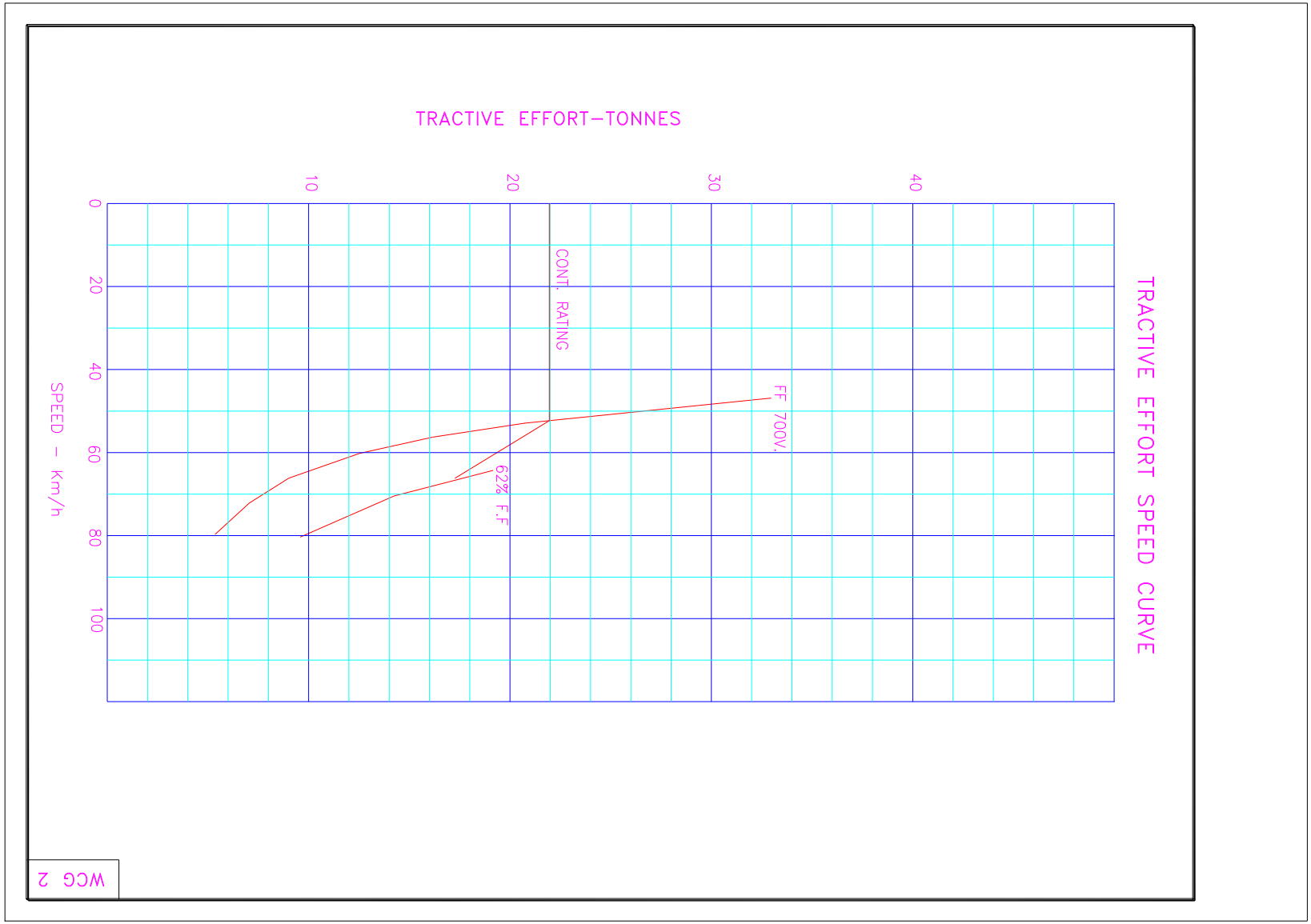


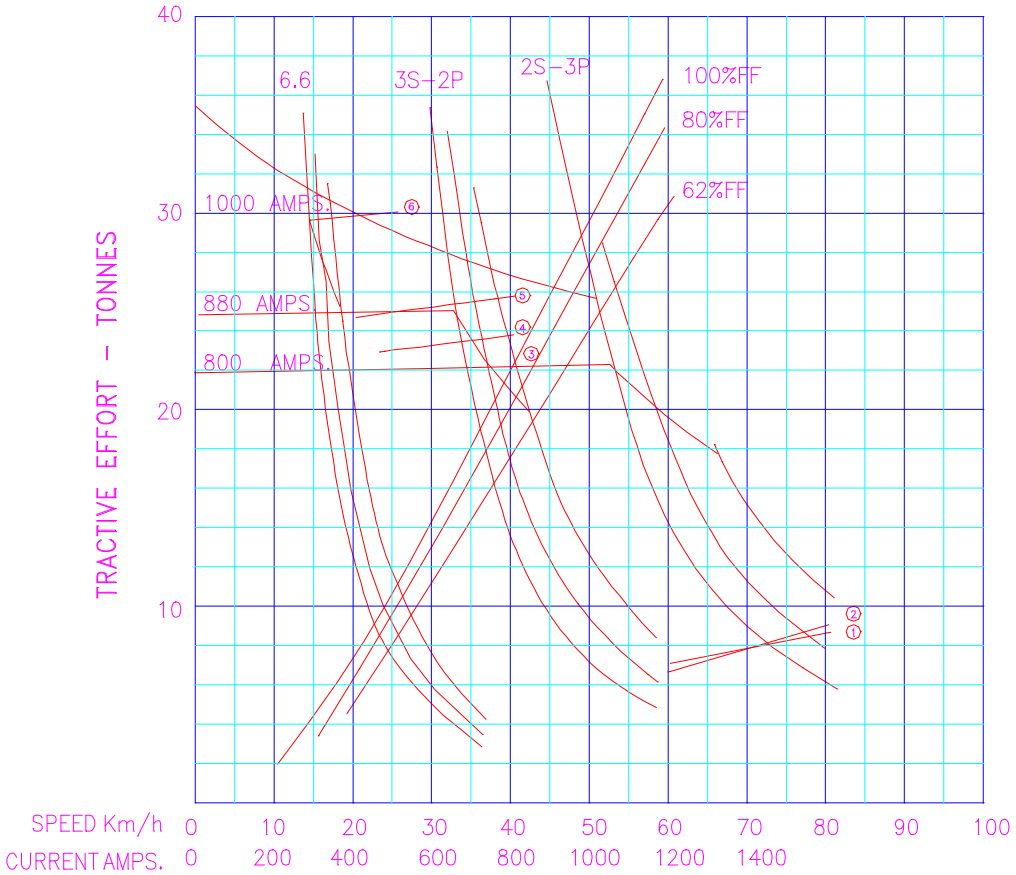
ITEM NO. DESCRIPTION

1. TRACTION MOTOR BLOWER SET
2. EXHAUSTER SET
3. COMPRESSOR SET
4. TRANSFORMER & RECTIFIER ASSEMBLY
5. MOTOR ALTERNATOR SET
6. AUXILIAY CONTAACTOR CUBICLE
7. MAIN STARTING RESISTOR
8. INDUCTIVE SHUNT PANEL
9. PNEUMATIC CUP BOARD
10. DRIVER'S SEAT
11. CONTROL CUBICLE
12. MASTER CONTROLLER
13. BATTERY CHARGER
14. M.A. RESISTOR (RS & MA RESISTOR)
15. CONTACTOR CUBICLE
16. H.S. CURCUIT BREAKER
17. EARTHING SWITCH
18. REVERSER & C T F
19. H.T. COMPARTMENT
20. BATTERY BOX

Dt.	15.02.91
D	---
T	--
C	----


WCG2
TE – K.G.
SPEED–Km/h
1000
9000
8000
7000
6000
5000
4000
3000
2000
1000
100
90
80
70
60
50
40
30
20
10
0
200
400
600
800
1000
1200
100
90
80
EFFICIENCY–%
F.F.
F.F.
62%F
F.F.
62%F
TRACTION MOTOR CHARACTERISTIOS
TYPE – T.M. 4939 AZ
VOLTAGE – 700V
G. RATIO – 18:74
W. DIA – 1050m.m.(HALF WORN)
MOTOR R.P.M. – 20.7 x Km/h
MOTOR CURRENT–AMPS
WCG2


TRACTIVE EFFORT—TONNES
10
20
30
40
0
20
40
60
80
100
SPEED — Km/h
CONT. RATING
FF 700V.
62% F.F
TRACTIVE EFFORT SPEED CURVE
WCG 2

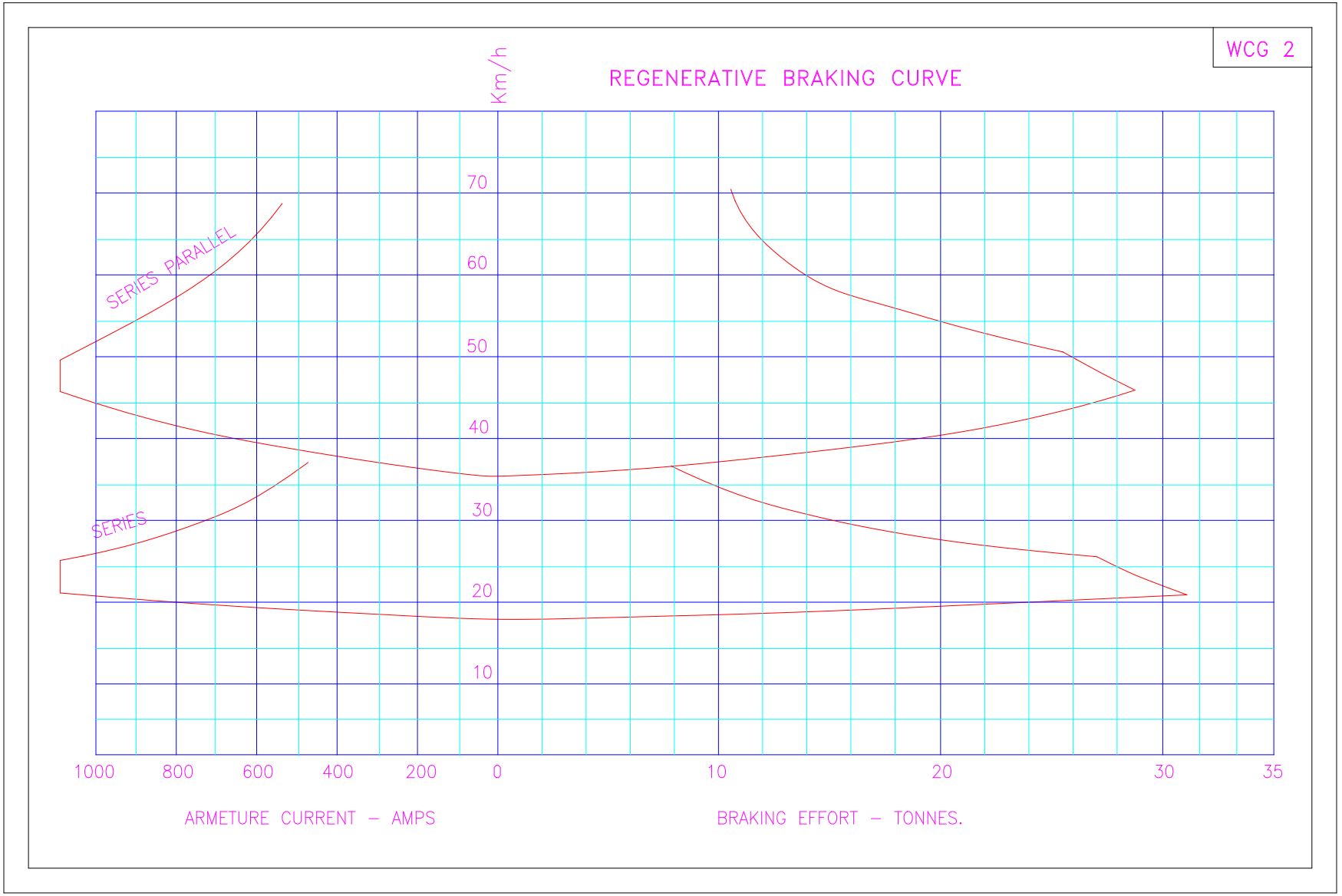


TRACTION MOTOR	– 4939AZ
NO. OF MOTORS	– 6
CONT. RATING	– 700V, 800A – 467V, 880A – 233V, 920A
ONE HR. RATING	– 233V, 1020A
GEAR RATIO	– 18:74
WHEEL DIA	– 1055 mm.
WEIGHT OF LOCO	– 132 t

① 3650 + (BOX) ON LEVEL
② 2250 + (4W) ON LEVEL
③ 1850 + (BOX) ON 1/100
④ 1830 + (4W) ON 1/100
⑤ 2000 + (4W) ON 1/100
⑥ 1830 + (4W) + 2 LOCOS ON 1/37

D	
T	
C	

WCG2 LOCO PERFORMANCE CURVE	REF. APP: RDSO. GEL-515


WCG 2
REGENERATIVE BRAKING CURVE
Km/h
70
60
50
40
30
20
10
SERIES PARALLEL
SERIES
1000
800
600
400
200
0
10
20
30
35
ARMETURE CURRENT – AMPS
BRAKING EFFORT – TONNES.

WCG 2

HAULAGE CAPACITY OF WCG 2 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:4.11 (18:74) T.M. TM 4339 AZ

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →					4580	2665					ABOVE 6000
		1/500	← ABOVE 6000 →		5325	4965	3615	2700	1740					ABOVE 6000
		1/200	3580	3540	2960	2870	2140	1540	1070					3580
		1/150	2800	2800	2385	2310	1730	1330	875					2800
		1/100	1920	1920	1770	1725	1240	955	625					1920
		1/50	1020	1010	860	845	630							1110
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						4470					ABOVE 6000
		1/500	5020	5020	5020	5020	4520	3490	2200					5020
		1/200	3450	3450	3290	3200	2365	1910	1205					3450
		1/150	2940	2940	2550	2525	1920	1510	950					2940
		1/100	2100	2075	1870	1840	1310	1050	650					2240
		1/50	1045	1030	885	875	660	510	296					1300
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →						4705					ABOVE 6000
		1/500	5755	5755	5755	5755	5200	3560	2255					5755
		1/200	3790	3790	3370	3270	2750	1915	1225					3790
		1/150	3180	3180	2630	2565	2165	1510	960					3180
		1/100	2265	2230	1800	1770	1500	1040	655					2390
		1/50	1115	1105	890	880	740	500	295					1340

Dt	15.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCM1

CONT. RAIL P.S. 3170
CO-CO TYPE WCM 1, CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

WCM1

Co_Co TYPE WCM1 CLASS ELECTRIC LOCOMOTIVES
1676 mm Gauge

These locos have been built by English Electric Company Limited and were put into service in 1955. These are built for mixed traffic operation. The continuous rail horse power of the locomotive is 3170 P.S. at a speed of 48.3 Km/h.

The locomotive is powered by six axle hung, nose suspended; forced ventilated type D.C. traction motors. Speed control is achieved by grouping the motors in three different combination and by weak fielding the motors.

Compressed air brake for the locomotive and vaccum brake for the trains are provided. In addition, the locomotive is provided with regenerative braking.

P R O C U R E M E N T P A R T I C U L A R S

CONTRACT		BUILDER	TEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
M3559/53261/51	1951	E.E.CO.LTD.& VULCAN FOUNDRY	1955	20066–20072	R.D.S.O. 27.6.51	EM (WCM1) 1	7	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCM1	Co–Co	M3599/5326/51	1951	E.E. CO LTD & VULCAN FOUNDRY	1955	20066 – 20072	R.D.S.O. 27.6.51	EM1	7

MAIN PARTICULARS OF LOCO

WCM1

GENERAL

SYSTEM OF CURRENT – D.C.
LINE VOLTAGE – 1500
WEIGHT IN W.O. – 123.98t
ADHESIVE WEIGHT – 123.98t
MAX. AXLE LOAD 20.83t
MIN. AXLE LOAD – 20.52t
1 HR. RATING:–
P.S. – 3700
T.E.– 21772kg
SPEED – 45.9kmph
CONTINUOUS RATING –
P.S. – 3170
T.E. – 17690kg
SPEED – 48.3kmph
MAX. T.E. – 31000kg(25% Ad)
MAX. SPEED – 120.5kmph
WHEEL DIA – New 1220mm
Half worn 1182 mm
Full worn 1144 mm

BOGIE

DRIVE ARGT – GEAR PINION
DESIGN – 3AXLE FATRICATED FRAME, SWING BOLSTER WITH EQUALIZER BEAMS.

BRAKES

LOCO – AIR, HAND, REGEN
TRAIN – VACCUM

SANDING

NO. OF BOXES – 8+8
CAPACITY EACH –

CONTROLS – SINGLE UNIT

PANTOGRAPH –

NOS – 2
MAKE – E.E.CO. LTD.
TYPE – PNL4 –F1

TRACTION MOTORS

MAKE – E.E.CO. LTD
TYPE – E.E.514/2C
NUMBER – 6
INSULATION – ARM B FIELD B
SUSPENSION – AXLE HUNG NOSE SUSPENDED
VENTILATION – FORCED
WT. COMPLETE – 3594 kg
1 HR RATING F.F.–
615 HP, 700V, 700A, 738 RPM
CONTINUOUS RATING F.F.–
530 HP, 700V, 600A, 776 RPM
TEMP. RISE – ARM FIELD
(By Resistance 120 °C 120 °C
COIL RESISTANCE:–
ARMATURE – 0.01979Ω
MAIN POLE – 0.007526Ω
INTERPOLE – 0.007276Ω

AIR GAP:–
MAIN POLE 7.5 mm
INTERPOLE
BRUSHES :–
NO. OF HOLDERS – 4
BRUSH PER HOLDER – 3
SIZE (LxWxH) – 44.5x19x54
MIN. HEIGHT– 25 mm
MOTOR GROUPING:–
S – 1–3–2–4–6–5
SP – 1–3–2, 4–6–5
P – 1–3, 2–5, 4–6
GEAR RATIO – 1:3.69(16:59)

AUXILIARIES

HEAD LIGHT –2 NOS, 250W, 110V
BATTERY – NI–CD, 72 CELLS.
100–122V, 40AH, (5HR. RATE)
AUX. GEN. –
1 NO, 5.94 KW, 110V, 54A, 1170 RPM.
M. G. EXC. SET MOTOR –
1 NO, 51 HP, 1400V, 32A, 1170 RPM.
COMPRESSOR (2):–
MAKE – WESTING HOUSE
TYPE – CM 38/2
CAPACITY – 10761/MIN, 7Kg/cm.
MOTOR – 2 NOS, 8.72 HP.
1500V, 4.33A, 1200 RPM
EXHAUSTER (2) :–
MAKE – WESTING HOUSE
TYPE – 2V 200
CAPACITY –
MOTOR – 2 NOS.
8HP,1400V,6.1A, 750 RPM
BLOWER (2):–
CAPACITY –
MOTOR – 2 NOS.
15HP,1400V,11A, 1880 RPM

PRESSORISING FAN (2) :–
CAPACITY –
MOTOR – 2 NOS, 1.15 HP
110V,10.6A, 2000 RPM

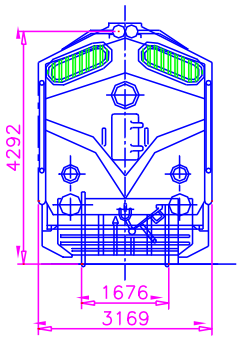
EXCITER GEN:–

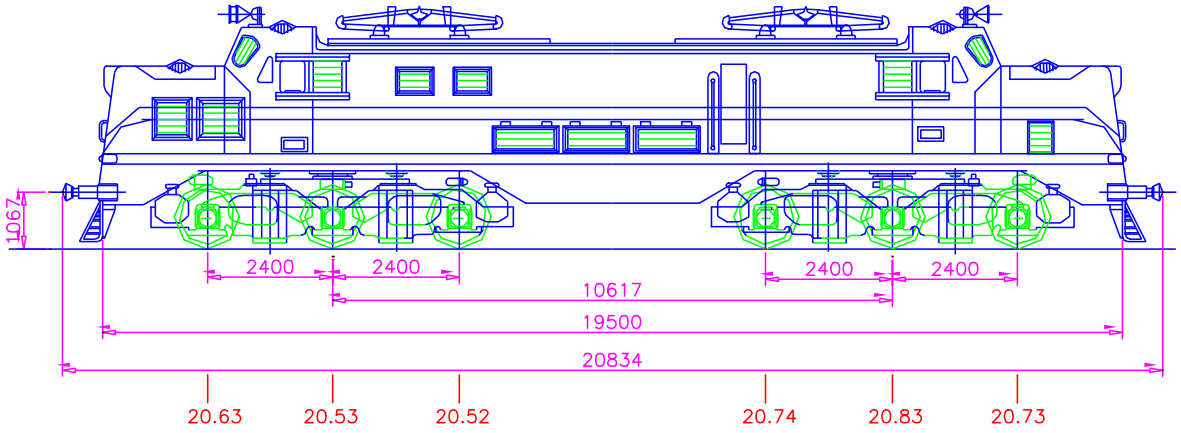
24 kw, 60 V, 400 A, 1170 RPM.

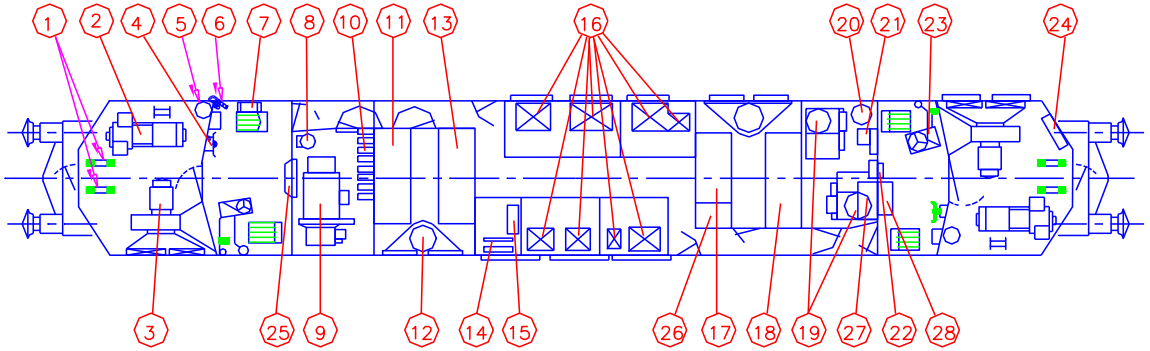
PROTECTIVE DEVICES

DEADMAN CONTROL– N
SLIP CONTROL– Y
MAIN O/L RELAY– Y
MOTOR O/L RELAY– Y
O/V RELAY – Y
NO CURRENT RELAY– Y
EARTH FAULT RELAY –
OVER SPEED TRIP
LOW PR.GOV.– Y
VAC.CON.GOV.– Y
BRAKE CYL C/O VALVE – Y
E.A.V. – Y

WCM1



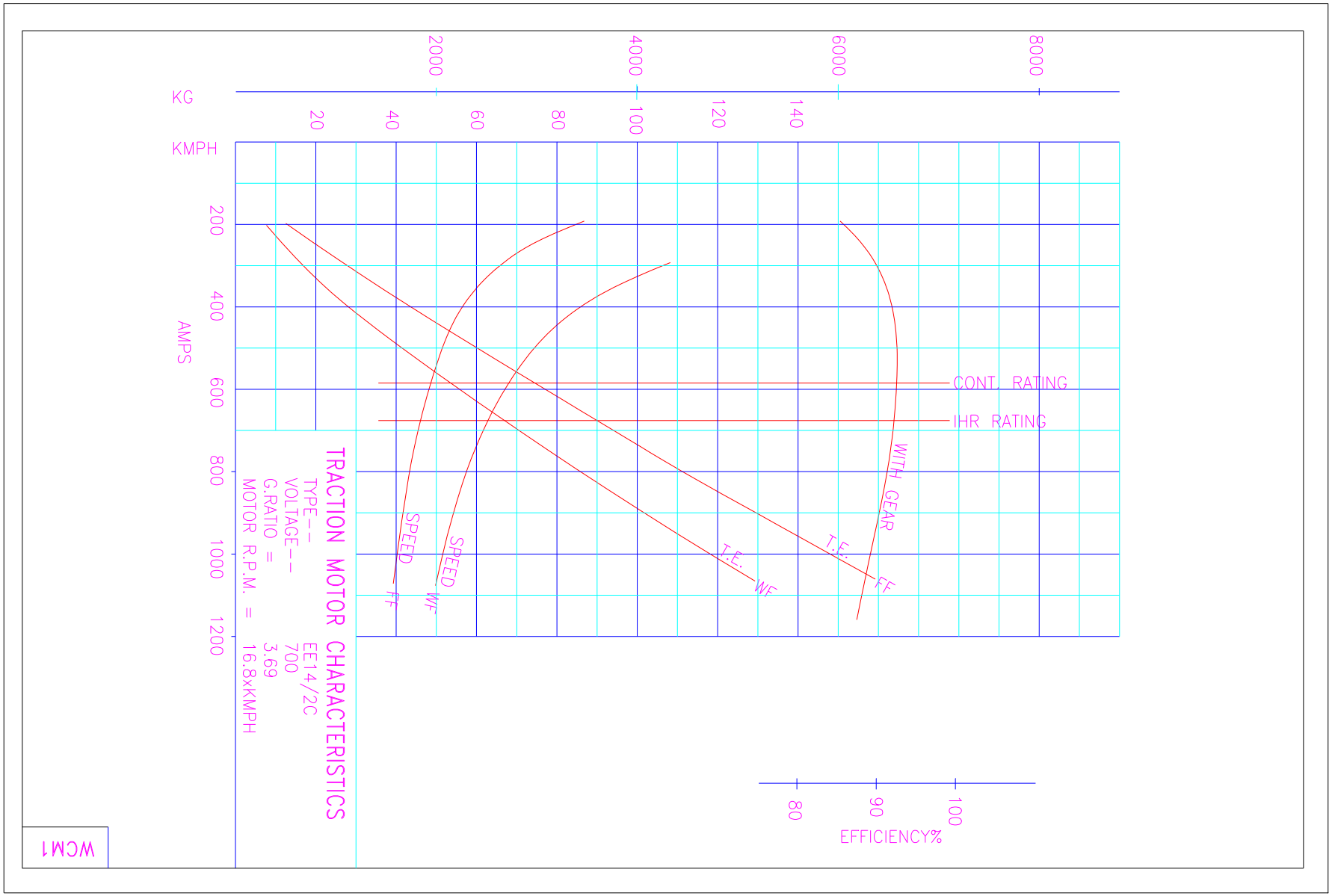


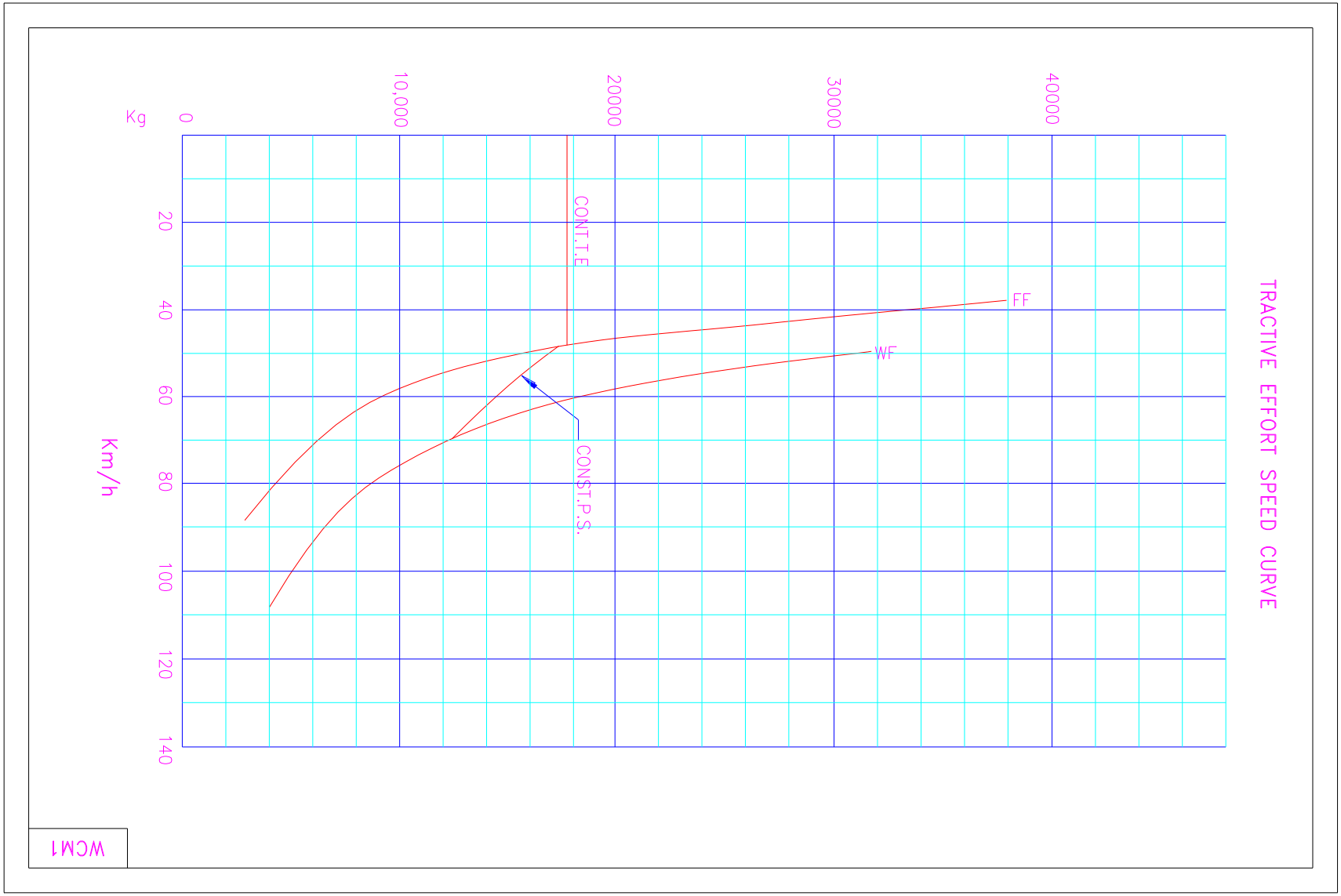


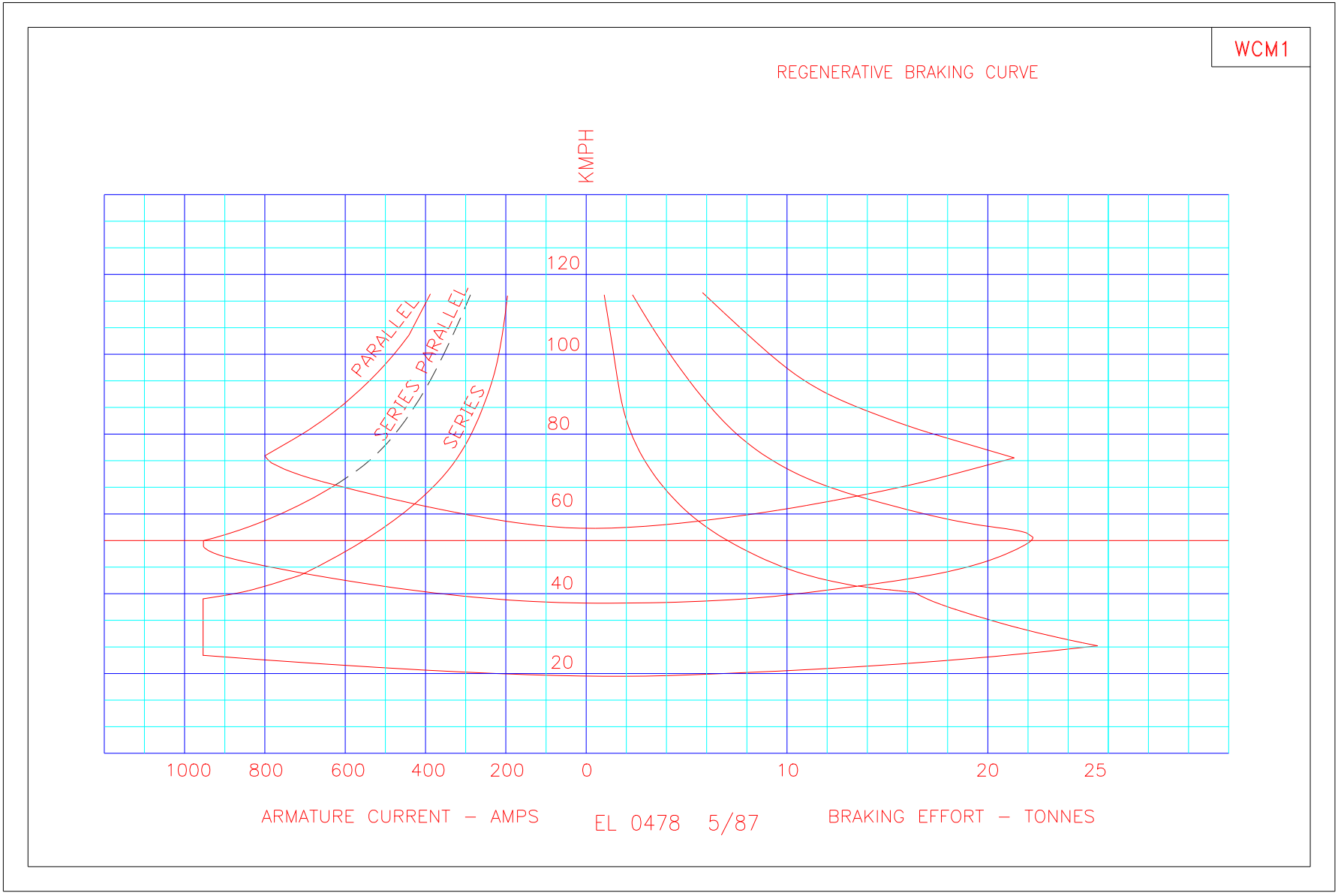
ITEM NO. DESCRIPTION

1. SUPERSTRUCTURE LIFTING BARS
2. EXHAUSTERS
3. TRACTION MOTOR BLOWERS
4. HAND BRADE
5. VACUUM RESSRVOIRS
6. FIRE EXTINGUISHER
7. PANTOGRAPH FOOT PUMP
8. PANTOGRAPH AIR RESERVOIR
9. M.G. EXTENSIONS
10. ARC CHUTE EXTENSIONS
11. NO. I.H.T. EQUIP. FRAME
12. PRESSURISING FANS
13. NO.2 H.T.EQUIP. FRAME
14. AUX. H.T. RESISTOR FRAMES
15. L.T. RESESTOR FRAME
16. MAIN RESISTOR FRAME AIR INLETS
17. NO 3 H.T. EQUIP. FRAME
18. NO 4 H.T. EQUIP. FRAME
19. AIR COMPRESSORS
20. CONTROL AIR RESERVOIR
21. VOLTAGE REGULATOR
22. NO. 2 AUX. CONTROL CUPBOARD
23. MASTER CONTRLLER
24. TOOL BOX
25. NO. 1 AUX. CONTROL CUPBOARD
26. BATTERY COMPARTMENT
27. L.T. EQUIPMENT CASE
28. DRIVER'S LOCKER

Dt.	15.02.91
D	---
T	--
C	----


KG
2000
4000
6000
8000
20
40
60
80
100
120
140
KMPH
AMPS
200
400
600
800
1000
1200
CONT. RATING
IHR RATING
WITH GEAR
SPEED
FF
SPEED
WF
T.E.
WF
T.E.
FF
TRACTION MOTOR CHARACTERISTICS
TYPE--
EE14/2C
VOLTAGE--
700
G.RATIO =
3.69
MOTOR R.P.M. =
16.8×KMPH
80
90
100
EFFICIENCY%
WCM1


TRACTIVE EFFORT SPEED CURVE
Kg
0
10,000
20000
30000
40000
Km/h
20
40
60
80
100
120
140
CONT.T.E
CONST.P.S.
FF
WF
WCM1


WCM1
REGENERATIVE BRAKING CURVE
KMPH
120
100
80
60
40
20
PARALLEL
SERIES PARALLEL
SERIES
1000
800
600
400
200
0
10
20
25
ARMATURE CURRENT – AMPS
EL 0478 5/87
BRAKING EFFORT – TONNES

WCM 1

HAULAGE CAPACITY OF WCM 1 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:3.69 (16:59) T.M. EE514/2C

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5060	3380	2100					ABOVE 6000
		1/500	4550	4325	4070	3640	2800	1980	1290					5600
		1/200	2430	2350	2275	2100	1650	1190	775					2930
		1/150	1910	1870	1810	1675	1330	960	630					2270
		1/100	1325	1300	1275	1190	940	680						1550
		1/50	650	640	630	600								970
	BOGIE WAGONS (BOX)	LEVEL	6250	6250	6250	6250	6250	5400	3460					6250
		1/500	4400	4400	4400	4400	3500	2550	1700					4400
		1/200	2620	2550	2500	2340	1870	1380	925					3025
		1/150	2040	2000	1950	1840	1480	1100	730					2580
		1/100	1390	1360	1345	1260	1010	750	500					1970
		1/50	660	650	645	620								1130
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1015	885		ABOVE 1500
		1/500	← ABOVE 1500 →							985	610	565		–DO–
		1/200	← ABOVE 1500 →					1375	900	580	355	325		–DO–
		1/150	← ABOVE 1500 →				1470	1105	720	460	275	250		–DO–
		1/100	1455	1420	1380	1285	1035	780	500	315	175	160		–DO–
		1/50	705	695	685	640	515	375	225	125	50	40		1155

Dt	13.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCM2

CONT. RAIL P.S. 2810

CO-CO TYPE WCM¬ 2, CLASS ELECTRIC LOCOMOTIVE

1676 mm GAUGE

WCM2

Co_Co TYPE WCM2 CLASS ELECTRIC LOCOMOTIVES
1676 mm Gauge

Twelve locos of this type were supplied by English Electric Company for 3000 VDC traction and were put into service in the year 1957. These are designed for mixed traffic operation. The continuous rail hourse power is 2810 P.S. at 61.7 Km/hr.

The locomotive is powered by six axle hung, nose suspended, forced ventilated type D.C. traction motors. Speed control is achieved by grouping the motors in three different combinations and by weak fielding the motors.

Compredded air brake for the locomotive and vacuum brake for the trains are provided.

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
/1205/5955/55	21.02.56	E.E.CO.LTD.& CULCAN FOUNDRY	1957	20175–20186	R.D.S.O. L9–1954	EM/2 (WCM2)	12	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCM2	Co–Co	R2/1205/5.955/55	21.2.56	E.E.CO. LTD. & VALUCAN FOUNDRY	1961	20073 – 20075		EM2	12

MAIN PARTICULARS OF LOCO

WCM2

GENERAL

SYSTEM OF CURRENT – D.C.
LINE VOLTAGE – 3000
WEIGHT IN W.O. – 112.8t
ADHESIVE WEIGHT – 112.8t
MAX. AXLE LOAD 18.80t
MIN. AXLE LOAD – 18.50t
1 HR. RATING:–
P.S. – 3090
T.E.– 14000Kg
SPEED – 59.5kmph
CONTINUOUS RATING –
P.S. – 2810
T.E. – 12300kg
SPEED – 61.7kmph
MAX. T.E. – 31298kg(25 Ad)
MAX. SPEED – 120.5kmph
WHEEL DIA – NEW 1092 mm
HALF WORN 1055 mm
FULL WORN 1016 mm

BOGIE

DRIVE ARGT – GEAR PINION
DESIGN – 3AXLE, FABRICATED FRAME, SWING BOLSTER WITH EQUALIZER BEAMS.

BRAKES

LOCO – AIR, HAND
TRAIN – VACCUM

SANDING

NO. OF BOXES – 24
CAPACITY EACH – 63.5 Kg

CONTROLS – SINGLE UNIT

PANTOGRAPH –

NOS – 2
MAKE – E.E.CO.
TYPE – PNL6–BI

TRACTION MOTORS

MAKE – E.E.CO. LTD.
TYPE – E.E. 531A
NUMBER – 6
INSULATION – ARM B FIELD B
SUSPENSION – AXLE HUNG NOSE SUSPENDED
VENTILATION – FORCED
WT. COMPLETE – 3445 Kg
1 HR RATING F.F.–
520 HP,1450 V,286A,1127 RPM
CONTINUOUS RATING F.F.–
475HP,1450V,260A,1165RPM
TEMP. RISE – ARM FIELD
(By Resistance 120°C 130°C
COIL RESISTANCE:– (110°C)
ARMATURE 0.0701Ω
MAIN POLE 0.02832Ω
INTER POLE 0.02818Ω

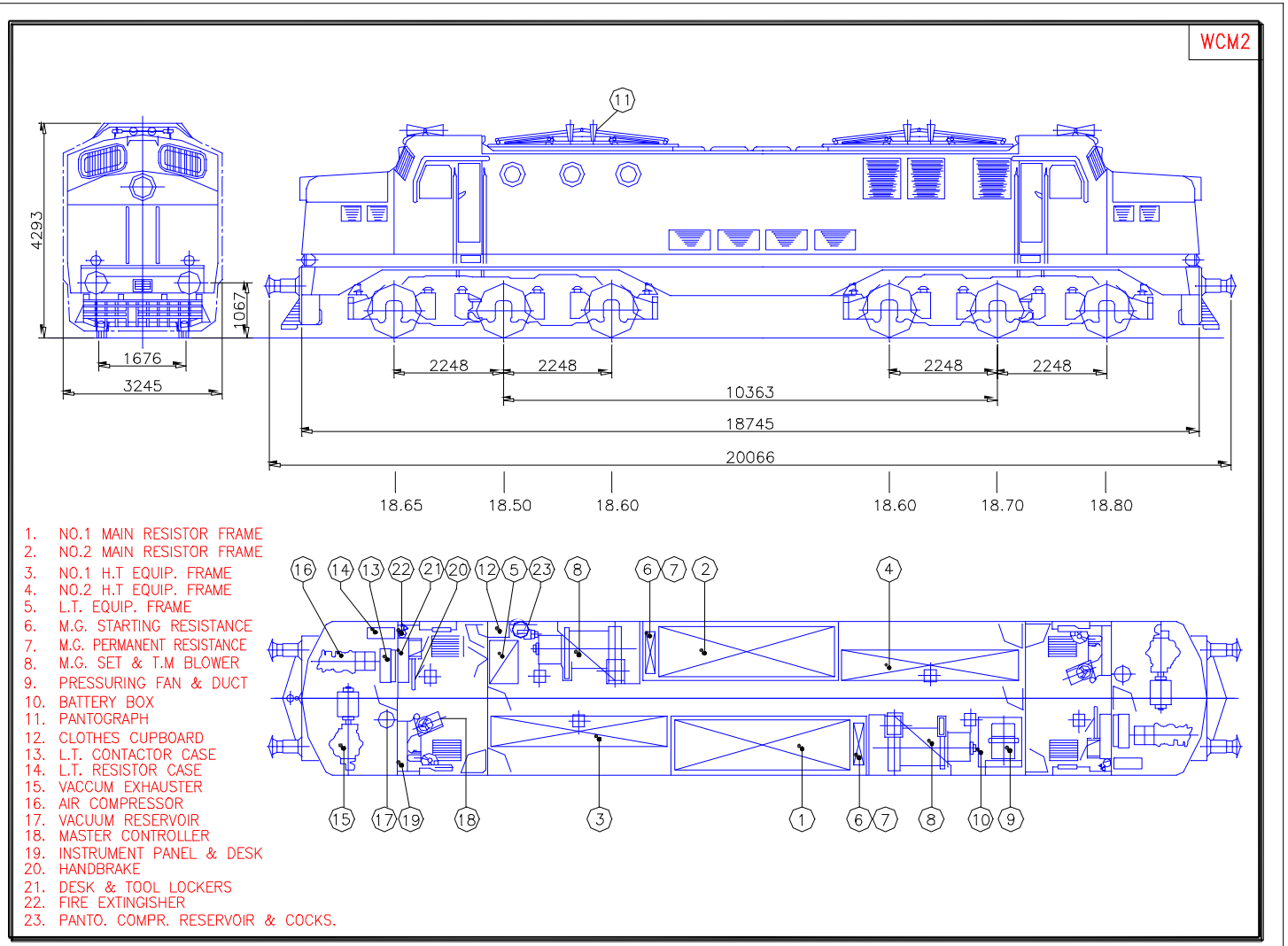
AIR GAP:–
MAIN POLE 8 mm
INTERPOLE 5 mm
BRUSHES :–
NO. OF HOLDERS – 4
BRUSH PER HOLDER – 3
SIZE (LxWxH) – 38*13*54
MIN. HEIGHT– 25 mm
MOTOR GROUPING:–
S – 1–3–2–5–4–6
SP – 1–3–2; 5–4–6
P – 1–3; 2–5;4–6
GEAR RATIO – 1:3.87(16:62)

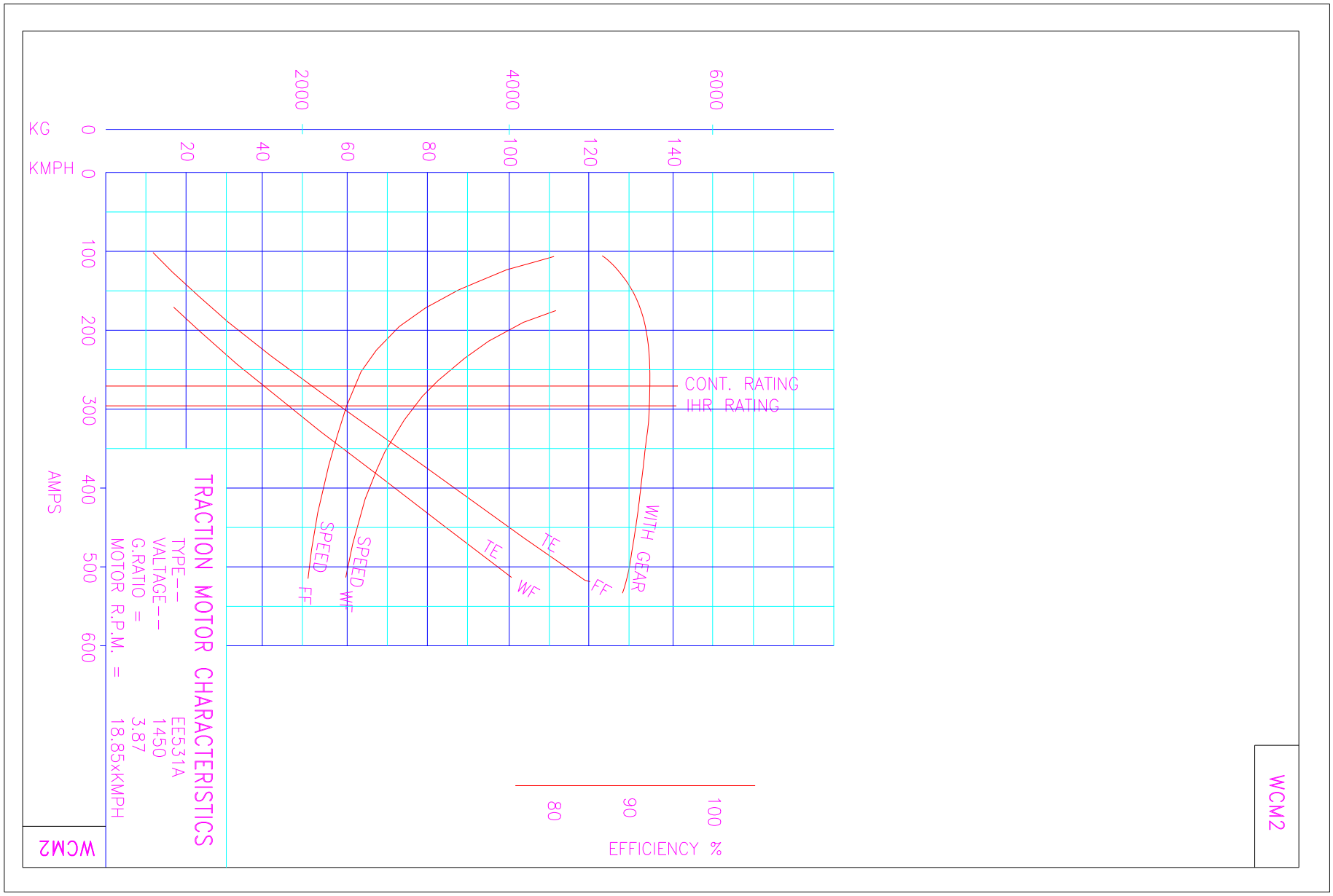
AUXILIARIES

HEAD LIGHT –2 NOS, 250W, 110V
BATTERY – NI–FE, 72CELLS 110V,40AH(5HR. RATE)
AUX. GEN. – 2NOS,21KW,110V,191A,1245RPM
M. G. MOTOR – 2NOS,50HP,2900V,16.4A,1245RPM
COMPRESSOR (2):–
MAKE – WESTING HOUSE
TYPE – DVC – 3
CAPACITY– 1246Lt/MIN,7.03KG/CM^2
MOTOR – 2 NOS, 11HP. 110V, 75A, 1610RPM
EXHAUSTER (2) :–
MAKE – NORTHY BOYCE
TYPE – 180 RE
CAPACITY – 5660Lt/min
MOTOR – 2NOS, 6.5HP 110V, 55A, 1000RPM
BLOWER (2):–
CAPACITY – 212m^3/min
MOTOR – M.G.BLOWER SET
PRESSURISING FAN 2 :–
CAPACITY –
MOTOR –(1hr) 2NOS,1.27HP, 110V,12.5A,1800RPM

PROTECTIVE DEVICES

DEADMAN CONTROL– NO
SLIP CONTROL– NO
MAIN O/L RELAY– YES
MOTOR O/L RELAY– YES
O/V RELAY –
NO CURRENT RELAY– YES
EARTH FAULT RELAY – NO
OVER SPEED TRIP NO
LOW PR.GOV.– YES
VAC.CON.GOV.– YES
BRAKE CYL C/O VALVE – YES
E.A.V. – NO


WCM2
4293
1067
1676
3245
2248
2248
2248
2248
10363
18745
20066
18.65
18.50
18.60
18.60
18.70
18.80
1. NO.1 MAIN RESISTOR FRAME
2. NO.2 MAIN RESISTOR FRAME
3. NO.1 H.T EQUIP. FRAME
4. NO.2 H.T EQUIP. FRAME
5. L.T. EQUIP. FRAME
6. M.G. STARTING RESISTANCE
7. M.G. PERMANENT RESISTANCE
8. M.G. SET & T.M BLOWER
9. PRESSURING FAN & DUCT
10. BATTERY BOX
11. PANTOGRAPH
12. CLOTHES CUPBOARD
13. L.T. CONTACTOR CASE
14. L.T. RESISTOR CASE
15. VACCUM EXHAUSTER
16. AIR COMPRESSOR
17. VACUUM RESERVOIR
18. MASTER CONTROLLER
19. INSTRUMENT PANEL & DESK
20. HANDBRAKE
21. DESK & TOOL LOCKERS
22. FIRE EXTINGISHER
23. PANTO. COMPR. RESERVOIR & COCKS.


KG
KMPH
AMPS
0
20
40
60
80
100
120
140
2000
4000
6000
100
200
300
400
500
600
CONT. RATING
1HR RATING
TE
WF
FF
SPEED
WITH GEAR
80
90
100
EFFICIENCY %
TRACTION MOTOR CHARACTERISTICS
TYPE--
EE531A
VALTAGE--
1450
G.RATIO =
3.87
MOTOR R.P.M. =
18.85xKMPH
WCM2
WCM2

TRACTIVE EFFORT-SPEED CURVE
KG
10000
20000
30000
40000
0
20
40
60
80
100
120
KMPH
CONT.T.E.
CONST.P.S.
FF
WF
WCM2
WCM2

WCM 2

HAULAGE CAPACITY OF WCM 2 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.875 (16:62) T.M. EE531A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	ABOVE 6000		5725		4350	3320	2490					ABOVE 6000
		1/500	3125		2800		2400	1937	1510					4720
		1/200	1665		1550		1425	1175	950					2470
		1/150	1325		1250		1185	950	760					1900
		1/100	900		875		825	700	550					1390
		1/50	440											870
	BOGIE WAGONS (BOX)	LEVEL	5630		5630		5630	5300	4100					5630
		1/500	3575		3300		2975	2500	2000					3960
		1/200	1800		1725		1600	1350	1120					2710
		1/150	1400		1350		1275	1100	890					2320
		1/100	950		925		880	750	625					1775
		1/50	450											1015
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1290	885		ABOVE 1500
		1/500	← ABOVE 1500 →							1190	790	550		–DO–
		1/200	← ABOVE 1500 →					1310	1080	715	475	330		–DO–
		1/150	1450		1350		1245	1050	870	575	355	260		–DO–
		1/100	985		930		875	740	615	400	260	170		–DO–
		1/50	465		450		430	360	295	180	100	50		1040

Dt	14.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCM3

CONT. RAIL P.S. 2460
CO-CO TYPE WCM 3. CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WCM3 CLASS ELECTRIC LOCOMOTIVES
1676 mm Gauge

Three locomotives of this type were supplied by M/s Hitachi (Japan) for 3000 VDC traction and were put into service in Calcutta area in 1958. These locomotives are designed for a mixid traffic operation. The continuous rail horse power is 2460 P.S. at 65.0 km/hr.*

Three locomotives have subsequently been converted to 1500 VDC for working in Bombay ares. The continuous rail horse power of the converted locomotive is 2460 P.S. at 65 km/h.

The locomotive is powered by six axle hung, nose suspended force ventilated type D.C. traction motors. Speed control is achieved by grouping the motors in three different combinations and by wead fielding the motors.

Compressed air brake for the locomotive and vacuum brake for the trains are provided.

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
55/459/18RE=109	15.12.95	HITACHI	1958	20073–20075	R.D.S.O. L9–1954	EM (WCM3) 3	3	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCM3	Co–Co			HITACHI	1961	20073 – 20075		EM3	3

MAIN PARTICULARS OF LOCO

WCM3

GENERAL

SYSTEM OF CURRENT – D.C.
LINE VOLTAGE – 1500
WEIGHT IN W.O. – 113t
ADHESIVE WEIGHT – 113t
MAX. AXLE LOAD 19.11t
MIN. AXLE LOAD – 18.91t
1 HR. RATING:–
P.S. – 3610
T.E.– 16900kg
SPEED – 57.6kmph
CONTINUOUS RATING –
P.S. – 2460
T.E. – 10220kg
SPEED – ※ 65.0knph
MAX. T.E. – 28200kg(25%Ad)
MAX. SPEED – 120.7kmph
WHEEL DIA – NEW 1200mm
HALF WORN 1182 mm
FULL WORN 1144 mm

BOGIE

DRIVE ARGT – GEAR PINION
DESIGN – 3AXLE, CAST STEEL FRAME, SWING BOLSTER WITH EQUALIZER BEAMS.

BRAKES

LOCO – AIR, HAND
TRAIN – VACUUM

SANDING

NO. OF BOXES – 24
CAPACITY EACH –

CONTROLS – SINGLE UNIT

PANTOGRAPH –

NOS – 2
MAKE –
TYPE –

TRACTION MOTORS

MAKE – HITACHI
TYPE – HS–373–AR–16
NUMBER – 6
INSULATION – ARM FIELD

SUSPENSION –
AXLE HUNG NOSE SUSPENDED
VENTILATION – FORCED
WT. COMPLETE –
1 HR RATING F.F.–
600HP, 1450V, 330A, 800RPM
CONTINUOUS RATING F.F.–
420HP, 1450V, 231A, 927RPM
TEMP. RISE – ARM FIELD
(By Resistance)120 °C 130 °C
COIL RESISTANCE:–
ARMATURE 0.0627 Ω
MAIN POLE 0.0585 Ω
INTER POLE 0.0320 Ω

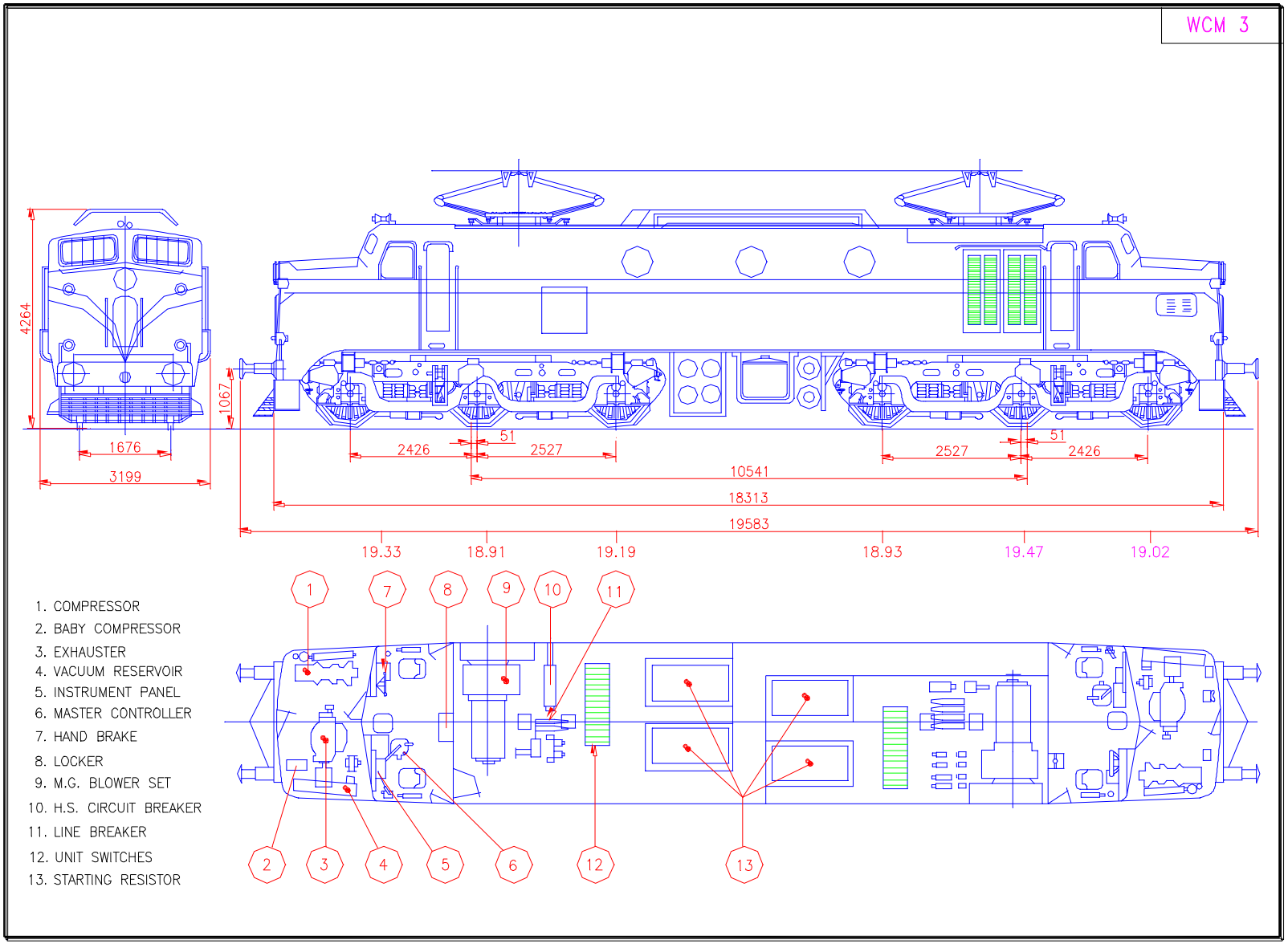
AIR GAP:–
MAIN POLE 9.5mm
INTERPOLE 11mm
BRUSHES :–
NO. OF HOLDERS – 4
BRUSH PER HOLDER – 2
SIZE (LxWxH) – 51X19X63.5
MIN. HEIGHT– 32mm
MOTOR GROUPING:–
S – 1–4–2, 3–6–5
SP – 1–4, 3–6, 5–2
P – 1,3,4,6,2,5
GEAR RATIO – 1:3.18(16:51)

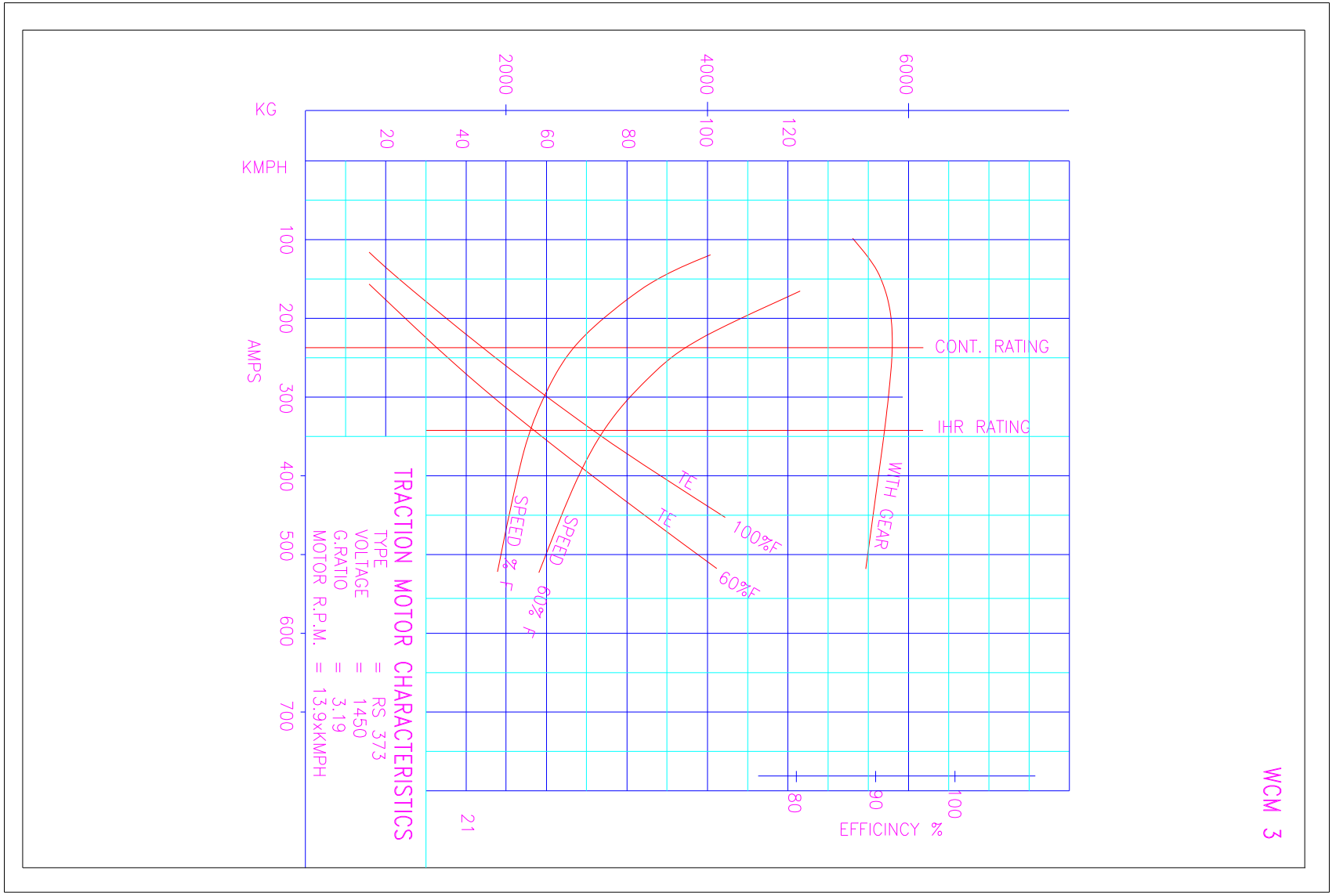
AUXILIARIES

HEAD LIGHT –2 NOS, 250W, 110V
BATTERY – ALKALINE, 76CELLS, 100AH, (10HR.RATE)
AUX. GEN. – 2 Nos.
14.5KW, 110V, 132A, 1400RPM
M. G. MOTOR – 2 Nos.
48.3HP, 1400V, 25.7A, 1400RPM
COMPRESSOR (2):–
MAKE – WESTING HOUSE
TYPE – DVC – 3
CAPACITY – 1246L/MIN, 7.Kg/cm²
MOTOR – 2 NOS,
110V, 75A, 1610RPM
EXHAUSTER (2) :–
MAKE – NORTHY BOYCE
TYPE – 180RE
CAPACITY – 5660L/min
MOTOR – 2NOS
6.5HP, 110V, 55A, 1000RPM
BLOWER (2):–
CAPACITY – 375m³ /min
MOTOR (M.G.BLOWER SET)

PROTECTIVE DEVICES

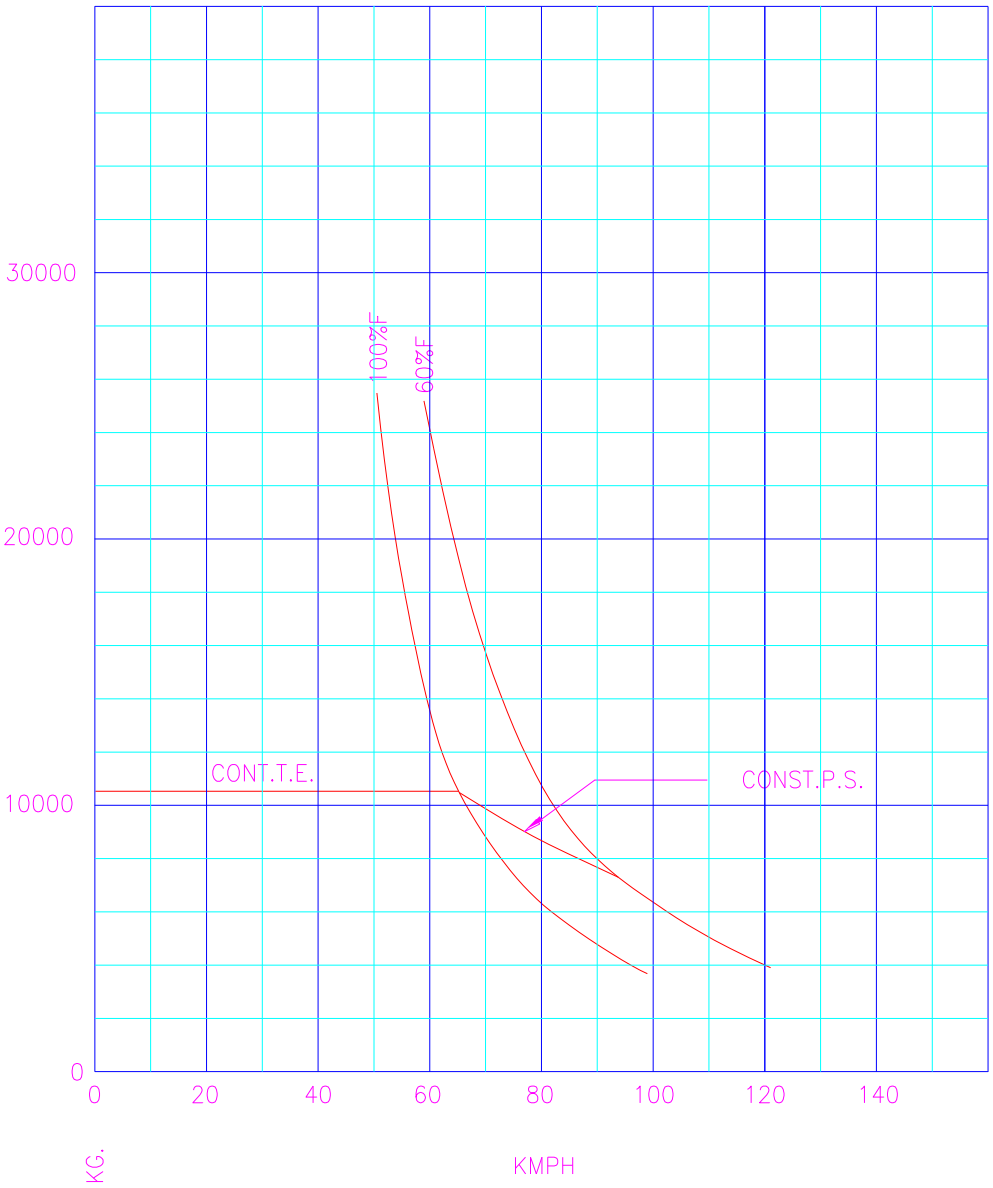
DEADMAN CONTROL– NO
SLIP CONTROL– YES
MAIN O/L RELAY– YES
MOTOR O/L RELAY– YES
O/V RELAY – YES
NO CURRENT RELAY– YES
EARTH FAULT RELAY –
OVER SPEED TRIP NO
LOW PR.GOV.–
VAC.CON.GOV.–
BRAKE CYL C/O VALVE –
E.A.V. –


WCM 3
4264
1067
1676
3199
2426
51
2527
10541
18313
19583
19.33
18.91
19.19
18.93
19.47
19.02
1. COMPRESSOR
2. BABY COMPRESSOR
3. EXHAUSTER
4. VACUUM RESERVOIR
5. INSTRUMENT PANEL
6. MASTER CONTROLLER
7. HAND BRAKE
8. LOCKER
9. M.G. BLOWER SET
10. H.S. CIRCUIT BREAKER
11. LINE BREAKER
12. UNIT SWITCHES
13. STARTING RESISTOR


KG
2000
4000
6000
KMPH
20
40
60
80
100
120
AMPS
100
200
300
400
500
600
700
CONT. RATING
IHR RATING
WITH GEAR
100%
60%
SPEED
SPEED
60%
80
90
100
EFFICINCY %
21
WCM 3
TRACTION MOTOR CHARACTERISTICS
TYPE = RS 373
VOLTAGE = 1450
G.RATIO = 3.19
MOTOR R.P.M. = 13.9xKMPH

WCM3

TRACTIVE EFFORT SPEED CURVE



WCM 3

WCM 3

HAULAGE CAPACITY OF WCM 3 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:3.19 (16:51) T.M. HS-373-AR-16

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	5950		4720		3580	2840	2130					ABOVE 6000
		1/500	2575		2300		1980	1670	1100					4720
		1/200	1360		1275		1155	1000	800					2470
		1/150	1060		1000		925	805	650					1900
		1/100	725		700		655	575	460					1390
		1/50	335											870
	BOGIE WAGONS (BOX)	LEVEL	5630		5630		5480	4550	3510					5630
		1/500	3000		2750		2460	2150	1730					3960
		1/200	1475		1400		1310	1160	950					2710
		1/150	1125		1080		1025	910	750					2320
		1/100	755		730		700	625	510					1775
		1/50	345											1015
PASSENGER SERVICE	ICF COACH	LEVEL	ABOVE 1500 →								1480	1010		ABOVE 1500
		1/500	ABOVE 1500 →							1230	915	635		-DO-
		1/200	ABOVE 1500		1405		1270	1125	915	744	555	385		-DO-
		1/150	1185		1100		1010	901	735	595	445	305		-DO-
		1/100	795		755		705	630	515	415	310	205		-DO-
		1/50	365		350		335	300	240	190	130	70		1050

Dt	14.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCM4

CONT. RAIL P.S. 3200
CO-CO TYPE WCM 4 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WCM4 CLASS ELECTRIC LOCOMOTIVES
1676 mm Gauge

Seven of these locos were ordered on Hitachi (Japan) and were put into service in 1961. These locos are built for mixed traffic operation. The ocntinous rail horse power is 3200 P.S. at 47.5 km/hr.

The locomotive is powered by six axle hung, nose suspended, forced ventilated type D.C. traction motors. Speed control is achieved by grouping the motors in three different combinations and by weak fielding the motors.

Compressed air brake for the locomotive and vacuum brake for the traias are provided. In addition the locomotive is provided with regenrative braking.

PROCUREMENT PARTICULARS

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
59/459/1/RS(F)	18.4.59	HITACHI	1961	20076–20082	R.D.S.O. EL–103.56	WCM4	7	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCM4	Co–Co	59/459/1/RS(F)	18–4–59	HITACHI	1961	20076–20082	R.D.S.O. EL.103.56	WCM4	7

MAIN PARTICULARS OF LOCO

WCM4

GENERAL

SYSTEM OF CURRENT – D.C.
LINE VOLTAGE – 1500
WEIGHT IN W.O. – 125.00t
ADHESIVE WEIGHT – 125.00t
MAX. AXLE LOAD 20.83t
MIN. AXLE LOAD – 20.18t
1 HR. RATING:–
P.S. – 4000
T.E.– 25300kg
SPEED – 42.7kmph
CONTINUOUS RATING –
P.S. – 3290
T.E. – 18700kg
SPEED – 47.5kmph
MAX. T.E. – 31250kg(25% Ad)
MAX. SPEED – 120.5 Kmph
WHEEL DIA – NEW 1220 mm
Half WORN 1182 mm
Full worn 1144 mm

BOGIE

DRIVE ARGT – GEAR PINION
DESIGN –3AXLE FABRICATED FRAME SWING BOLSTER WITH EQUALIZER BEAMS.

BRAKES

LOCO – AIR, HAND, REGEN
TRAIN – VACUUM

SANDING

NO. OF BOXES – 16
CAPACITY EACH –

CONTROLS – SINGLE UNIT

PANTOGRAPH –

NOS – 2
MAKE –
TYPE – KP–120

TRACTION MOTORS

MAKE – HITACHI
TYPE – HS–373–BR
NUMBER – 6
INSULATION – ARM F, FIELD F
SUSPENSION – AXLE HUNG NOSE SUSPENDED
VENTILATION – FORCED
WT. COMPLETE – 4500kg
1 HR RATING F.F.–
675 HP, 700V, 765A, 850RPM
CONTINUOUS RATING F.F.–
550 HP, 700V, 620A, 940RPM
TEMP. RISE – ARM FIELD
(By Resistance) 120°C 130°C

COIL RESISTANCE:– (AT 110°C)

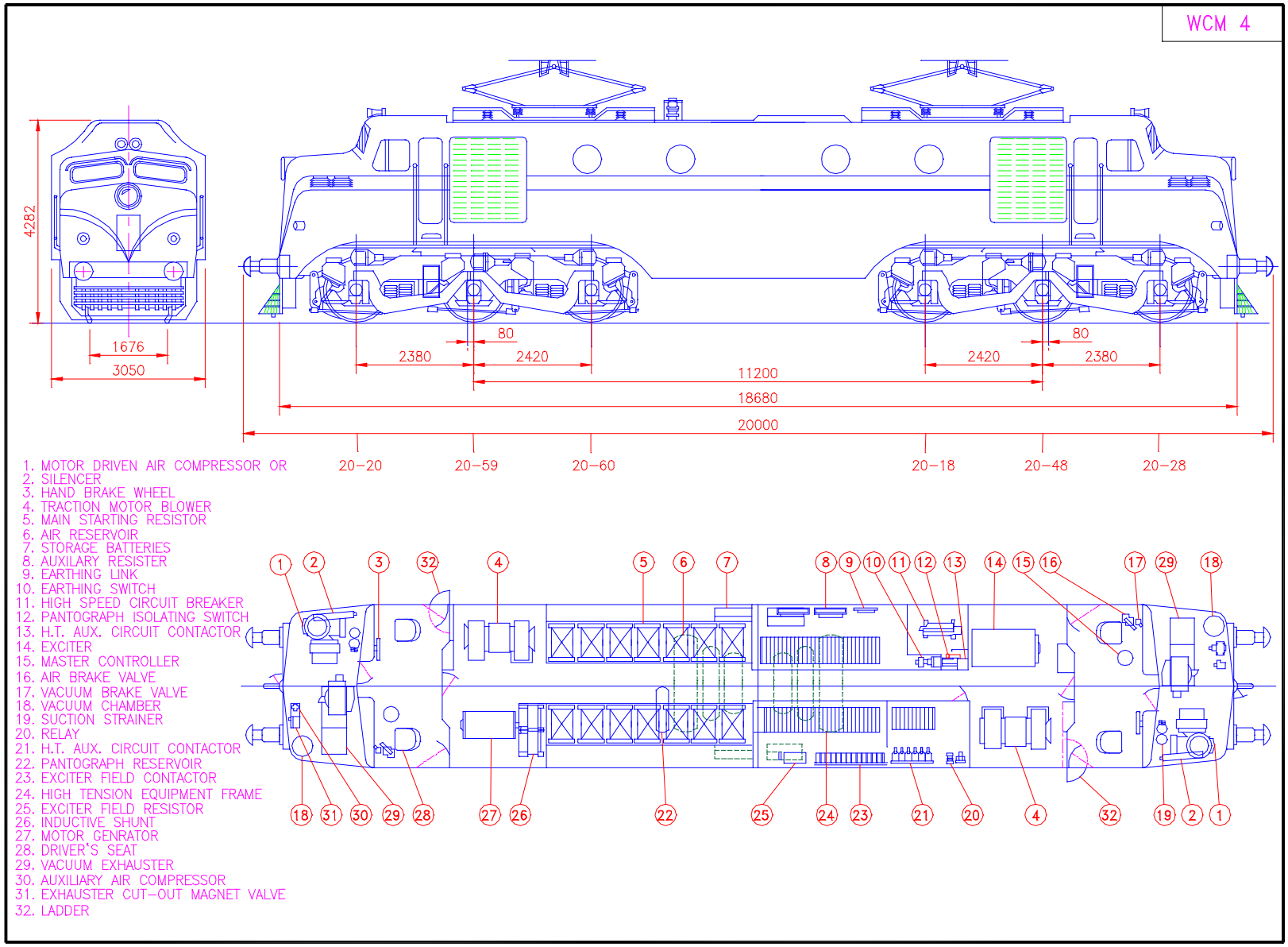
ARMATURE – 0.0143–0–
MAIN POLE – 0.0136–0–
INTERPOLE – 0.00752–0–
AIR GAP:–
MAIN POLE 12 mm
INTERPOLE 15 mm
BRUSHES :–
NO. OF HOLDERS – 4
BRUSH PER HOLDER – 3
SIZE (LxWxH) – 50.8x19.05x63.5mm
MIN. HEIGHT– 35.6mm
MOTOR GROUPING:–
S – 1–4–2–3–6–5
SP – 1–4–2, 3–6–5
P – 1–4, 2–5, 3–6
GEAR RATIO – 1:4.56 (16:73)

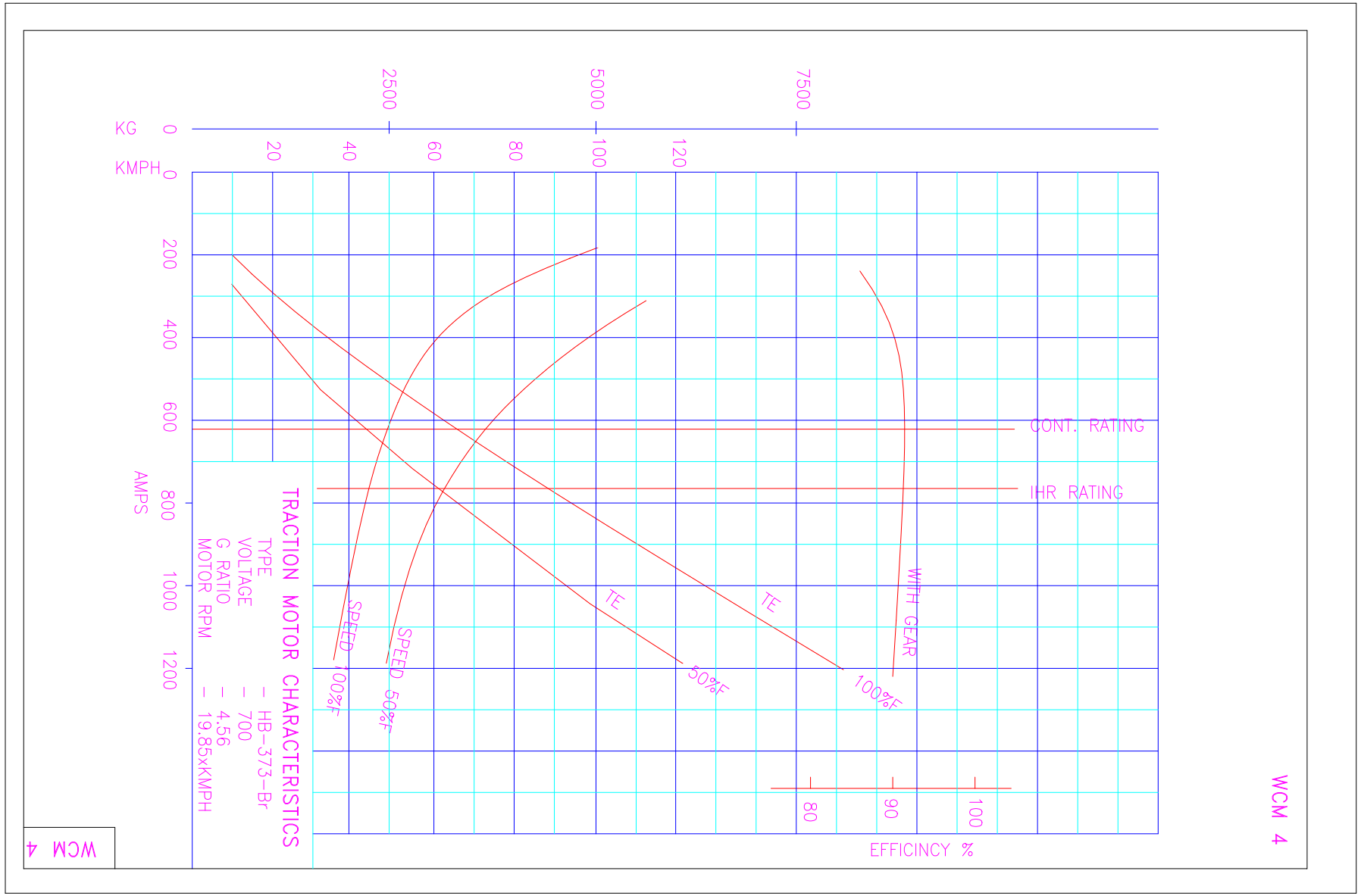
AUXILIARIES

HEAD LIGHT –2 NOS, 250W, 110V
BATTERY – ALKALINE, 76 CELLS, 110V, 60AH, (7HR. RATE)
AUX. GEN. – 1 NO. 6KW, 110V, 54.5A, 1800RPM.
M. G. EXC. SET MOTOR – 10.1HP, 1400 V, 6.8 A, 1800 RPM.
COMPRESSOR (2):–
MAKE – WESTING HOUSE
TYPE – CM38
CAPACITY – 1076L/min, 7Kg/Cm² 243 rpm
MOTOR – 2 NOS, 8.72 HP 1500V, 4.65A, 1200RPM
EXHAUSTER (2) :–
MAKE – NORTHY BOYCE
TYPE – 180 RE
CAPACITY – 5660L/min
MOTOR – 2NOS., 11.4/6.0HP, 1400V, 7.5/5.1A, 1700/1000RPM
BLOWER (2):–
CAPACITY – 360³m/min
MOTOR – 2 NOS. 34.9HP,1400V,22A, 1800RPM.
EXC.GEN.– (1hr) 1NO. 75KW, 50V,1500A,1800RPM.
EXC. GEN. MOTOR – (1hr) 1NO. 120.7HP, 1500V, 73A, 1800RPM.

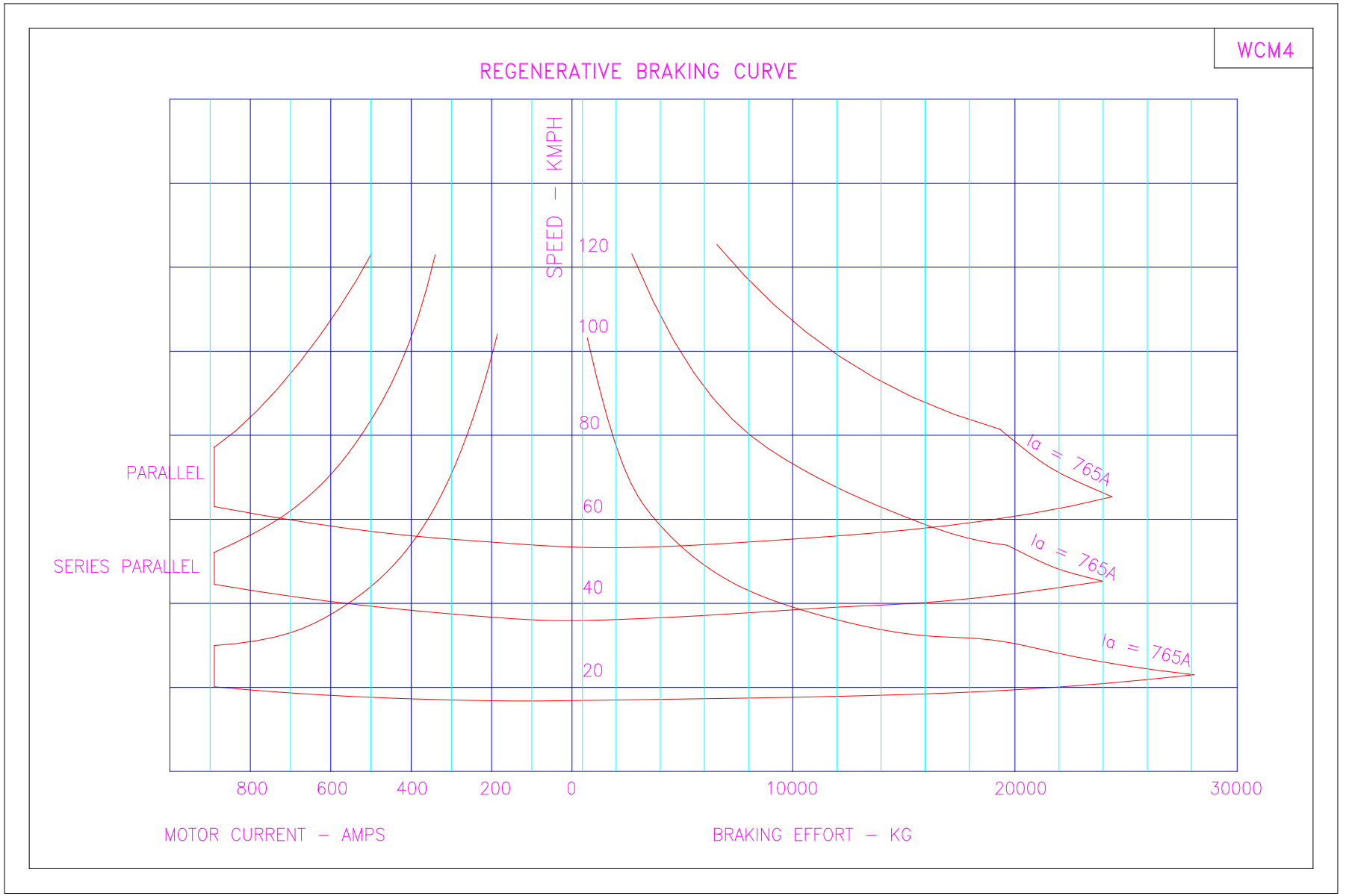
PROTECTIVE DEVICES

DEADMAN CONTROL– NO
SLIP CONTROL– YES
MAIN O/L RELAY– YES
MOTOR O/L RELAY– YES
O/V RELAY – YES
NO CURRENT RELAY– NO
EARTH FAULT RELAY – NO
OVER SPEED TRIP NO
LOW PR.GOV.– YES
VAC.CON.GOV.– YES
BRAKE CYL C/O VALVE – YES
E.A.V. – YES


WCM 4
4282
1676
3050
80
2380
2420
11200
18680
20000
80
2420
2380
20–20
20–59
20–60
20–18
20–48
20–28
1. MOTOR DRIVEN AIR COMPRESSOR OR
2. SILENCER
3. HAND BRAKE WHEEL
4. TRACTION MOTOR BLOWER
5. MAIN STARTING RESISTOR
6. AIR RESERVOIR
7. STORAGE BATTERIES
8. AUXILARY RESISTER
9. EARTHING LINK
10. EARTHING SWITCH
11. HIGH SPEED CIRCUIT BREAKER
12. PANTOGRAPH ISOLATING SWITCH
13. H.T. AUX. CIRCUIT CONTACTOR
14. EXCITER
15. MASTER CONTROLLER
16. AIR BRAKE VALVE
17. VACUUM BRAKE VALVE
18. VACUUM CHAMBER
19. SUCTION STRAINER
20. RELAY
21. H.T. AUX. CIRCUIT CONTACTOR
22. PANTOGRAPH RESERVOIR
23. EXCITER FIELD CONTACTOR
24. HIGH TENSION EQUIPMENT FRAME
25. EXCITER FIELD RESISTOR
26. INDUCTIVE SHUNT
27. MOTOR GENRATOR
28. DRIVER'S SEAT
29. VACUUM EXHAUSTER
30. AUXILIARY AIR COMPRESSOR
31. EXHAUSTER CUT–OUT MAGNET VALVE
32. LADDER


KG
KMPH
AMPS
EFFICINCY %
CONT. RATING
IHR RATING
WITH GEAR
TE
SPEED 100%F
SPEED 50%F
TRACTION MOTOR CHARACTERISTICS
TYPE - HB-373-Br
VOLTAGE - 700
G RATIO - 4.56
MOTOR RPM - 19.85xKMPH
WCM 4

20,000
40,000
60,000
KG
0
20
40
60
80
100
120
140
KMPH
CONST.T.E.
CONST.P.S.
100%F
50%F
TRACTIVE EFFORT – SPEED CURVE
WCM 4
WCM4


WCM4
REGENERATIVE BRAKING CURVE
SPEED – KMPH
120
100
80
60
40
20
PARALLEL
SERIES PARALLEL
Ia = 765A
Ia = 765A
Ia = 765A
800
600
400
200
0
10000
20000
30000
MOTOR CURRENT – AMPS
BRAKING EFFORT – KG

WCM 4

HAULAGE CAPACITY OF WCM 4 LOCOMOTIVE
(WITHOUT ACCELERATION RESERVE)
G.R. 1:3.56 (16:73) T.M. HS-373-BR

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5210	3790	2410					ABOVE 6000
		1/500	4800	4570	4300	3725	2900	2225	1480					5590
		1/200	2550	2480	2400	2130	1700	1340	910					2920
		1/150	2010	1970	1910	1710	1360	1090	740					2260
		1/100	1415	1400	1360	1230	990	790	525					1540
		1/50	700	695	690	625	500							965
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						3960					6240
		1/500	← ABOVE 4390 →				3600	2875	1950					4390
		1/200	2750	2700	2620	2380	1920	1550	1075					3020
		1/150	2150	2100	2050	1870	1500	1240	850					2570
		1/100	1490	1450	1430	1300	1050	850	590					1965
		1/50	720	710	700	650	510							1125
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1070	580		ABOVE 1500
		1/500	← ABOVE 1500 →							1060	650	350		-DO-
		1/200	← ABOVE 1500 →						1000	630	380	190		-DO-
		1/150	← ABOVE 1500 →				1470	1210	800	500	300	140		-DO-
		1/100	← ABOVE 1500 →		1470	1280	1035	860	560	340	190	75		-DO-
		1/50	750	740	730	640	510	420	260	140	60			1160

Dt	13.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCM5

CONT. RAIL P.S. 3170
CO-CO TYPE WCM5 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WCM5 CLASS ELECTRIC LOCOMOTIVE
1676 mm Gauge

Twenty–one locomotives of this type were built by Chittaranjan Locomotive Works of the design of R.D.S.O. and were put into service in 1961. These locos are built for mixed traffic operation. The continuous rail horse power is 3170 p.s.at 48.3 km/hr.

The locomotive is powered by six axle hung, nose suspended; forced ventilated type D.C. traction motors. Speed control is achieved by grouping the motors in three different combination and by weak fielding the motors.

Vaccu, brakes for both locomotive and trains are provided. In addition, the locomotive is provided with Regenerative Braking.

P R O C U R E M E N T P A R T I C U L A R S

CONTRACT		BUILDER	YEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
	DATE							
		C.L.W.	1961	20083–20092	R.D.S.O. EL–103.56	WCM5	10	
		C.L.W.					11	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCM5	Co–Co			C.L.W.	1961	20083–20092	R.D.S.O. EL.103.56	WCM5	10

MAIN PARTICULARS OF LOCO

WCM5

GENERAL

SYSTEM OF CURRENT – D.C.
LINE VOLTAGE – 1500
WEIGHT IN W.O. – 124.0t
ADHESIVE WEIGHT – 124.0t
MAX. AXLE LOAD
MIN. AXLE LOAD –
1 HR. RATING:–
P.S. – 3700
T.E.– 21772kg
SPEED – 45.9kmph
CONTINUOUS RATING –
P.S. – 3170
T.E. – 17690kg
SPEED – 48.3kmph
MAX. T.E. – 31000kg(25% Ad)*
MAX. SPEED –
WHEEL DIA – NEW 1220 mm
HALF WORN 1182 mm
FULL WORN 1144 mm

BOGIE

DRIVE ARGT – GEAR PINION
DESIGN– 3AXLE FABRICATED FRAME SWING BOLSTER WITH EQUALIZER BEAMS.

BRAKES

LOCO – VACUUM, HAND, REGEN
TRAIN –

SANDING

NO. OF BOXES – 16
CAPACITY EACH –

CONTROLS – SINGLE UNIT

PANTOGRAPH –

NOS – 2
MAKE – FAIVELEY
TYPE – AM28 B B

TRACTION MOTORS

MAKE – HITACHI
TYPE – HS–373–BR
NUMBER – 6
INSULATION – ARM F FIELD F
SUSPENSION – AXLE HUNG NOSE SUSPENDED
VENTILATION – FORCED
WT. COMPLETE – 4500kg
1 HR RATING F.F.–
675 HP, 700V, 765A, 850RPM
CONTINUOUS RATING F.F.–
550 HP, 700V, 620A, 940RPM
TEMP. RISE – ARM FIELD
(By Resistance) 120 C 130 C

COIL RESISTANCE:–

ARMATURE – 0.01979 ohm
MAIN POLE – 0.007526 ohm
INTERPOLE – 0.007276 ohm

AIR GAP:–
MAIN POLE 7.5 mm
INTERPOLE

BRUSHES :–
NO. OF HOLDERS – 4
BRUSH PER HOLDER – 3
SIZE (LxWxH) – 44.5x19x54
MIN. HEIGHT– 25mm
MOTOR GROUPING:–
S – 1–3–2–4–6–5
SP – 1–3–2–4–6–5
P – 1–3, 2–5, 4–6
GEAR RATIO – 1:4.69 (16:59)

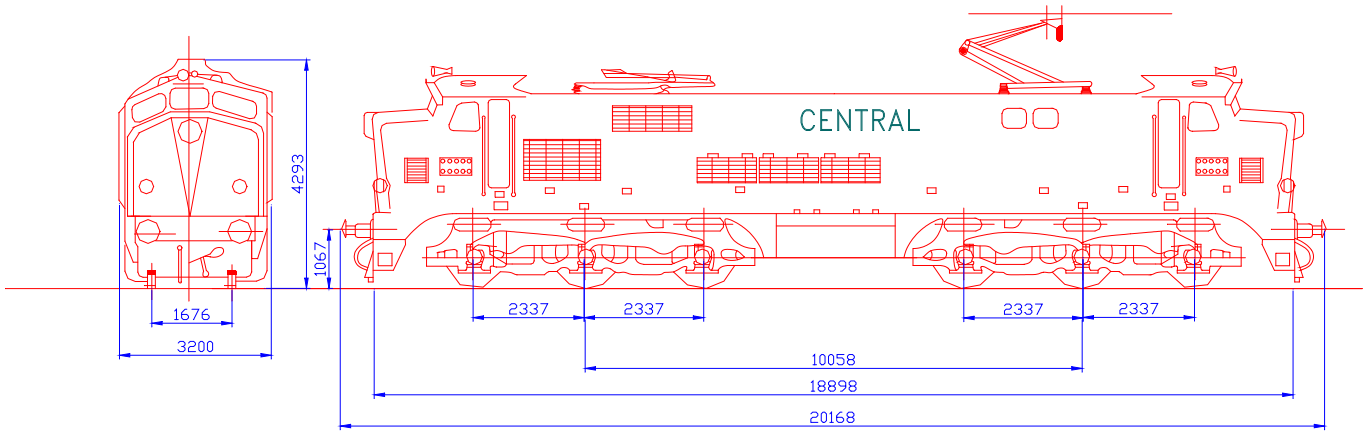
AUXILIARIES

HEAD LIGHT –2 NOS, 250W, 110V
BATTERY – ALKALINE, 76 CELLS, 110V, 60AH, (7HR. RATE)
AUX. GEN. – 1 NO.
6KW, 110V, 54.5A, 1800RPM.
M. G. EXC. SET MOTOR –
10.1HP, 1400 V, 6.8 A, 1800 RPM.
COMPRESSOR (2):–
MAKE – WESTING HOUSE
TYPE – CM38
CAPACITY – 1076L/MIN, 7KG/CM
MOTOR – 2 NOS, 8.72 HP.
1500V, 4.33A, 1200RPM
EXHAUSTER (2) :–
MAKE – NORTHY BOYCE
TYPE – 180 RE
CAPACITY – 5660L/min
MOTOR – 2NOS., 11.4/6.0HP,
1400V, 7.5/5.1A, 1700/1000RPM
BLOWER (2):–
CAPACITY – 360 m/min
MOTOR – 2 NOS.
34.9HP,1400V,22A, 1800RPM.
EXC.GEN.– (1hr) 1NO.
75KW, 50V,1500A,1800RPM.
EXC. GEN. MOTOR – (1hr) 1NO.
120.7HP, 1500V, 73A, 1800RPM.

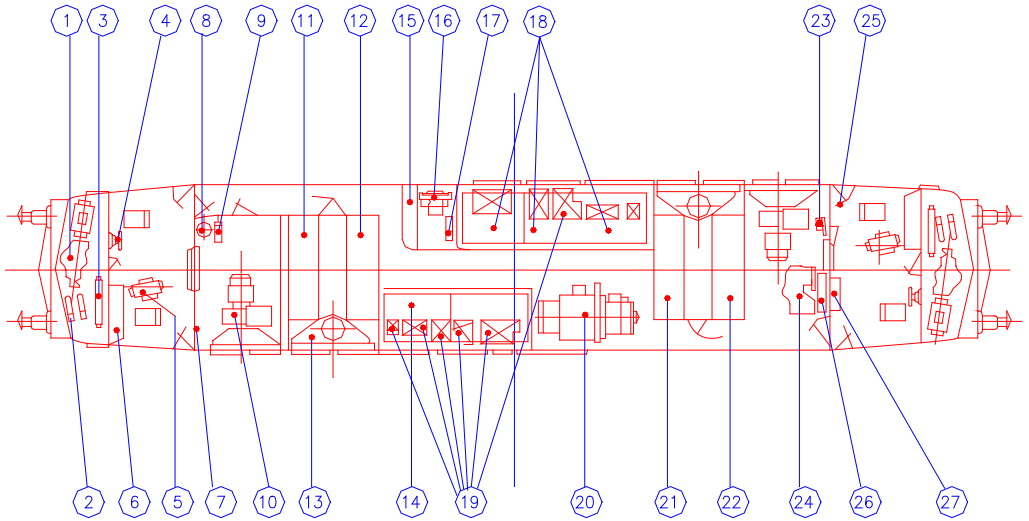
PROTECTIVE DEVICES

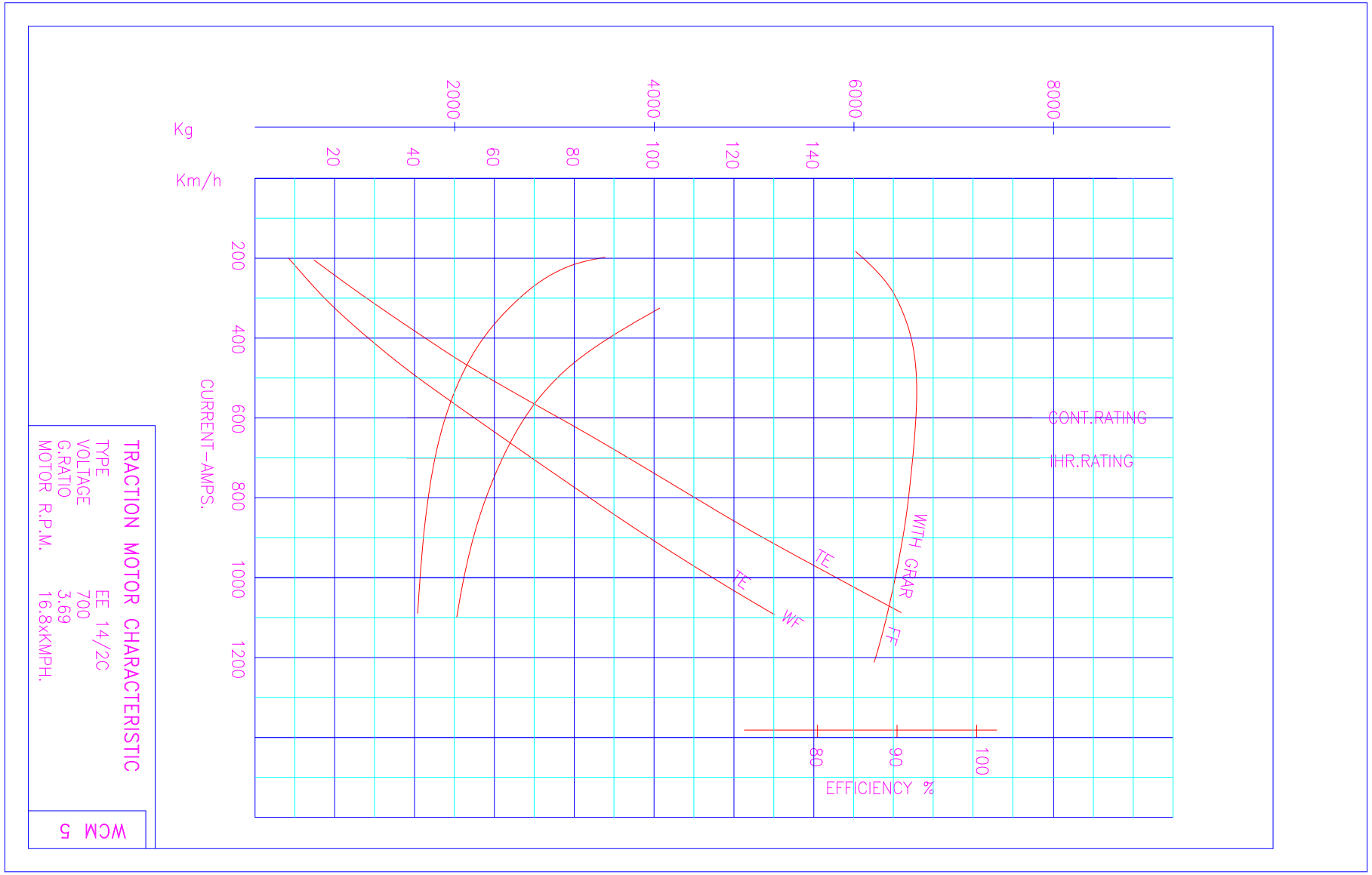
DEADMAN CONTROL– N
SLIP CONTROL– Y
MAIN O/L RELAY– Y
MOTOR O/L RELAY– Y
O/V RELAY – Y
NO CURRENT RELAY– N
EARTH FAULT RELAY – N
OVER SPEED TRIP N
LOW PR.GOV.– Y
VAC.CON.GOV.– Y
BRAKE CYL C/O VALVE – Y
E.A.V. – Y

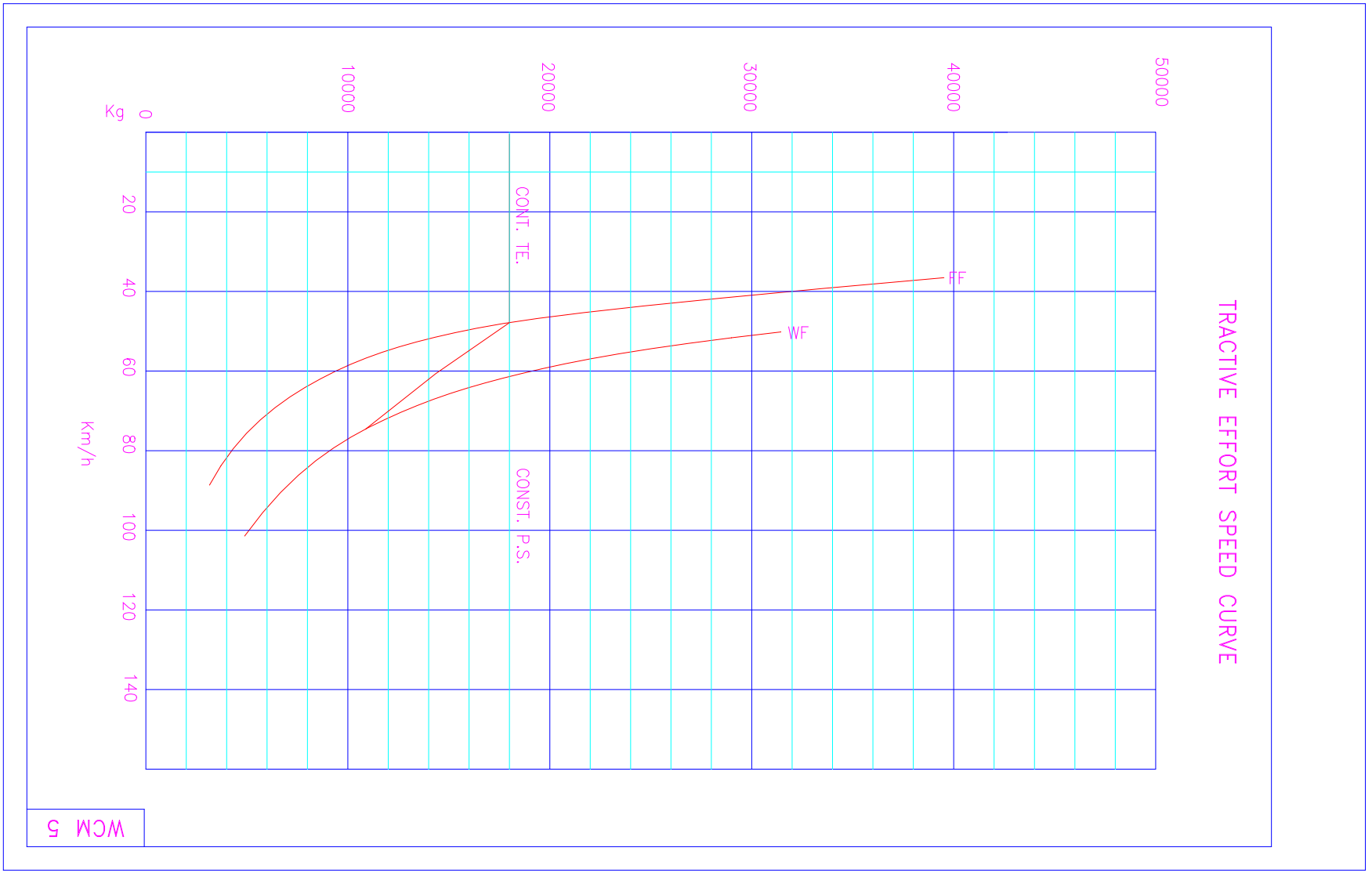
WCM 5

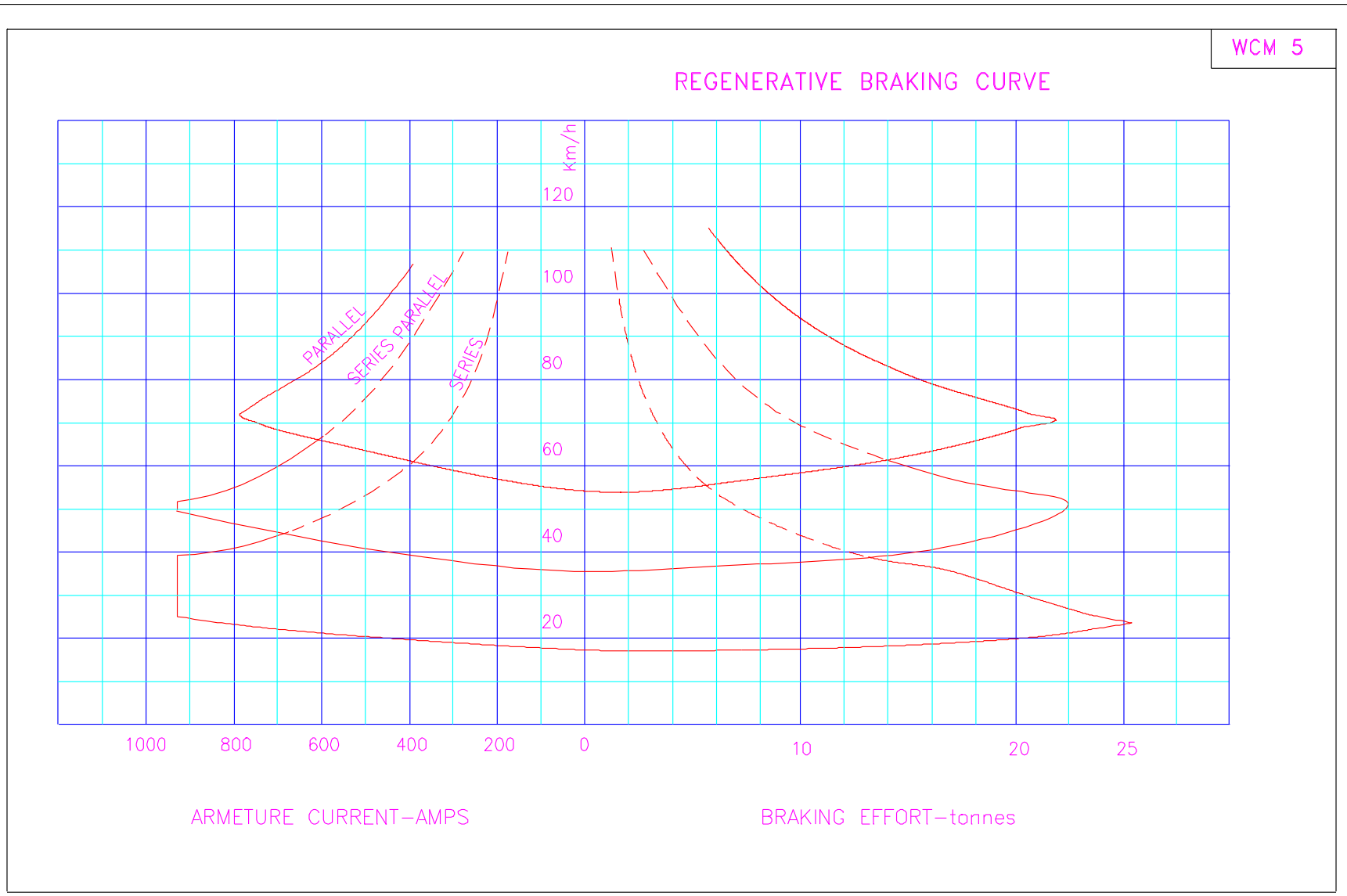


1. EXHAUSTER
2. LIFTING LUGS
3. SILENCER
4. HAND BRAKE
5. MASTER CONTROLLER
6. DRIVERS DESK
7. AUX. CUPBOARD NO.1
8. PANTO RESERVOIR
9. FOOT PUMP
10. BLOWER
11. NO.1 EQUIP. FRAME
12. NO.2 EQUIP. FRAME
13. PRESSURING FAN
14. MAIN RESISTOR FRAMES 'A'
15. BRAKE VALVE CUPBOARD
16. AUX. H.T. RESISTOR FRAME
17. L.T. RESISTOR FRAME
18. MAIN RESISTOR FRAME 'B'
19. MAIN RES. FRAME AIR INLETS
20. M.G. EXCITER SET
21. NO.3 EQUIP FRAME
22. NO.4 EQUIP FRAME
23. VOLTAGE REGULATOR
24. COMPRRESOR
25. AUX. CUPBOARD NO.2
26. SCAVENGE L.T. FRAME
27. LOCKER




Kg
2000
4000
6000
8000
Km/h
20
40
60
80
100
120
140
CURRENT-AMPS.
200
400
600
800
1000
1200
CONT.RATING
1HR.RATING
TE
TE
WF
WITH GEAR
FF
80
90
100
EFFICIENCY %
TRACTION MOTOR CHARACTERISTIC
TYPE EE 14/2C
VOLTAGE 700
G.RATIO 3.69
MOTOR R.P.M. 16.8xKMPH.
WCM 5


TRACTIVE EFFORT SPEED CURVE
Kg
0
10000
20000
30000
40000
50000
Km/h
20
40
60
80
100
120
140
CONT. TE.
CONST. P.S.
FF
WF
WCM 5


WCM 5
REGENERATIVE BRAKING CURVE
Km/h
120
100
80
60
40
20
PARALLEL
SERIES PARALLEL
SERIES
1000
800
600
400
200
0
10
20
25
ARMETURE CURRENT–AMPS
BRAKING EFFORT–tonnes

WCM 5

HAULAGE CAPACITY OF WCM 5 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.69 (16:59) T.M. EE514/2C

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 6000 →				5060	3380	2100					ABOVE 6000
		1/500	4550	4325	4070	3640	2800	1980	1290					5600
		1/200	2430	2350	2275	2100	1650	1190	775					2930
		1/150	1910	1870	1810	1675	1330	960	630					2270
		1/100	1325	1300	1275	1190	940	680						1550
		1/50	650	640	630	600								970
	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6250 →					5400	3460					6250
		1/500	4400	4400	4400	4400	3500	2550	1700					4400
		1/200	2620	2550	2500	2340	1870	1380	925					3025
		1/150	2040	2000	1950	1840	1480	1100	730					2580
		1/100	1390	1360	1345	1260	1010	750	500					1970
		1/50	660	650	645	620								1130
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →								1015	880		ABOVE 1500
		1/500	← ABOVE 1500 →							985	610	545		-DO-
		1/200	← ABOVE 1500 →					1375	900	580	355	325		-DO-
		1/150	← ABOVE 1500 →				1470	1105	720	460	275	250		-DO-
		1/100	1455	1420	1380	1285	1035	780	500	315	175	160		-DO-
		1/50	705	695	685	640	515	375	225	125	50	40		1155

Dt	13.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

WCM6

CONT. RAIL P.S. 4600
CO-CO TYPE WCM6 CLASS ELECTRIC LOCOMOTIVE
1676 mm GAUGE

Co_Co TYPE WCM-6 (SIMPLIFIED) CLASS ELECTRIC LOCOMOTIVES
1676 mm Gauge

Two locomotives of this prototype were ordered on Chittaranjan Locomotive works to the design of R.D.S.O. First prototype locomotive put in service in March '1996. The continuous rail horse power of the locomotive is 4600 P.S.at 63.5 km/h.

The typical feature of this locomotive is static converter imported from Siemens/Germany of 180 KVA capacity, and underslung compressor. The locomotive has ac auxiliaries.

The locomotive is power by six axle hung, high adhesion bogies with unidirectional, nose suspended forced ventilated type dc traction motors of Hitachi type HS:15250A to achieve high T.T. Speed control is achieved by grouping the motors in three different combination and by field weakening the motors.

This can be used for a multiple unit operation to a maximum of three units.

Compressed air brake for the locomotive and vaccum brake for the train are provided.

P R O C U R E M E N T P A R T I C U L A R S

CONTRACT		BUILDER	TEAR PUT ON LINE	I. R. LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NOS. ORDERED	REMARKS
NUMBER	DATE							
			1996		E.17/14(R-2)	WCM6	2	

CLASS	TYPE	CONTRACT		BUILDER	YEAR PUT ON LINE	I.R.LOCO NUMBERS	PARTICULAR SPEC. NO.	AS MADE DRG. SET	TOTAL NO ORDERED
		NUMBER	DATE						
WCM5	Co–Co			RDSO/LKO					

MAIN PARTICULARS OF LOCO

WCM6

GENERAL

SYSTEM OF CURRENT –	do
LINE VOLTAGE –	1500
WEIGHT IN W.O. –	120.00t
ADHESIVE WEIGHT –	120t+2%
MAX. AXLE LOAD	20t+2%
MIN. AXLE LOAD –	20t ±2%
HR RATING(SERIES):–	
P.S. –	4600
T.E.–	36t
SPEED –	1 km/h
CONTINUOUS RATING –	
P.S. –	4600
T.E. –	27t
SPEED –	46km/h
MAX. T.E. –	39.6t(27% Adh)
MAX. SPEED –	105km/h
WHEEL DIA (HALF–WORK)	1055 mm
(FULL–WORK)	1016 mm
NEW	1092 mm

BOGIE

DRIVE ARGT –	GEAR PINION
DESIGN –	HIGH ADHESIGN BOGIE

BRAKES

LOCO –	AIR,HAND,IRAVB–2 TYPE DUAL BRAKE
TRAIN –	

PANTOGRAPH

NUMBERS –	2
MAKE –	FAIVELEY
TYPE –	AM18B

TRACTION MOTOR

MAKE –	HITACHI
TYPE –	HS–15250A
NUMBER –	6
INSULATION–	ARM C, FIELD C
SUSPENSION	AXLE HUNG NOSE SUSPENDED
VENTILATION –	FORCED 80 m^3/m^2
WT.COMPLETE –	3650 Kg.

1 HR. RATING

F.F. – 670KW, 750V, 960A, 877RPM

CONTINUOUS RATING F.E.–

630KW, 750V, 960A, 877RPM

TEMP. RISE –	ARM	FIELD	COMM.
(By Resistance)	90°C	70°C	85°C

COIL RESISTANCE AT 110°C –0.0126 mm

ARMATURE –	
MAIN POLE –	0.0117 ohm
INTERPOLE –	0.0089 ohm
AIR GAP:–	
MAIN POLE	6.35 mm
INTERPOLE	10 mm

MOTOR GROUPING

S	1–2–3	4–5–6
SP	1,2,3	
	4,5,6	
P	1,3	
	2–5	
	6–4	
GEAR RATIO		18:64 (3:55)

AUXILIARIES

HEAD LIGHT	2 Nos.350W,32V
BATTERIES	LEAD ACID 50CELLS 110V, 75 AH (5HR, RATE)

STATIC CONVERTOR

RATING –	180 KVA
MAKE –	SIEMEN'S/GERMANY
VOLTAGE –	415 ± 5%
FREQUENCY –	50 Hz ± 1%

COMPRESSOR

NUMBER	2
MAKE	ELGI
TYPE	
CAPACITY –	1000 lit/min

SHEET NO.

EXHAUSTER

NUMBER	–	2
MAKE	–	SLM
TYPE	–	VL–30
CAPACITY	–	7000 l/min
MOTOR	–	2NOS. , 10/15 HP 385 V, 16/22 A 970/1460 RPM

TRACTION MOTOR BLOWER

NUMBER	–	2
MAKE	–	S.P. INDIA LTD.
TYPE	–	MLBR–42, 5–1H
CAPACITY	–	277.5 m^3/min at 220 mm WG
MOTOR	–	2NOS. 30 HP, 400V 40A, 2910 RPM

HEAD LIGHT TRANSFORMER

RATING	500VA, 400V/32V 110 V, 24 V

BLOWER FOR STARTING RESISTANCE

BLOWER	Make : Type :
NUMBER	3
CAPACITY	7m^3/sec. at 1350 Pa
MOTOR	24 KW, 415 V, 2580 rpm 32 HP

PROTECTIVE DEVICES

DEAD MAN CONTOL	NO
SLIP CONTROL	YES
MAIN O/L RELAY	NO
MOTOR O/L RELAY	YES
O/V RELAY	YES
NO CURRENT RELAY	YES
EARTH FAULT RELAY	YES
OVER SPEED TRIP	NO
LOW FR. COV.	YES
VAC. CON. GOV.	YES
BRAKE CYL C/O VALVE	YES
E.A.V.	YES

1 2 3 4 5 6 7 8 9

SANDING

NO. OF BOXES – 16

CAPACITY EACH –

CONTROLS

NUMBERS – MULTIPLES
3 UNITS

BRUSHES

GRADE – EG 1055/BG 1165

TYPE – 2 split (Mergenaite)

BRUSH PER –

HOLDER – 06

SIZE (WXL) – 200X40X64 mm

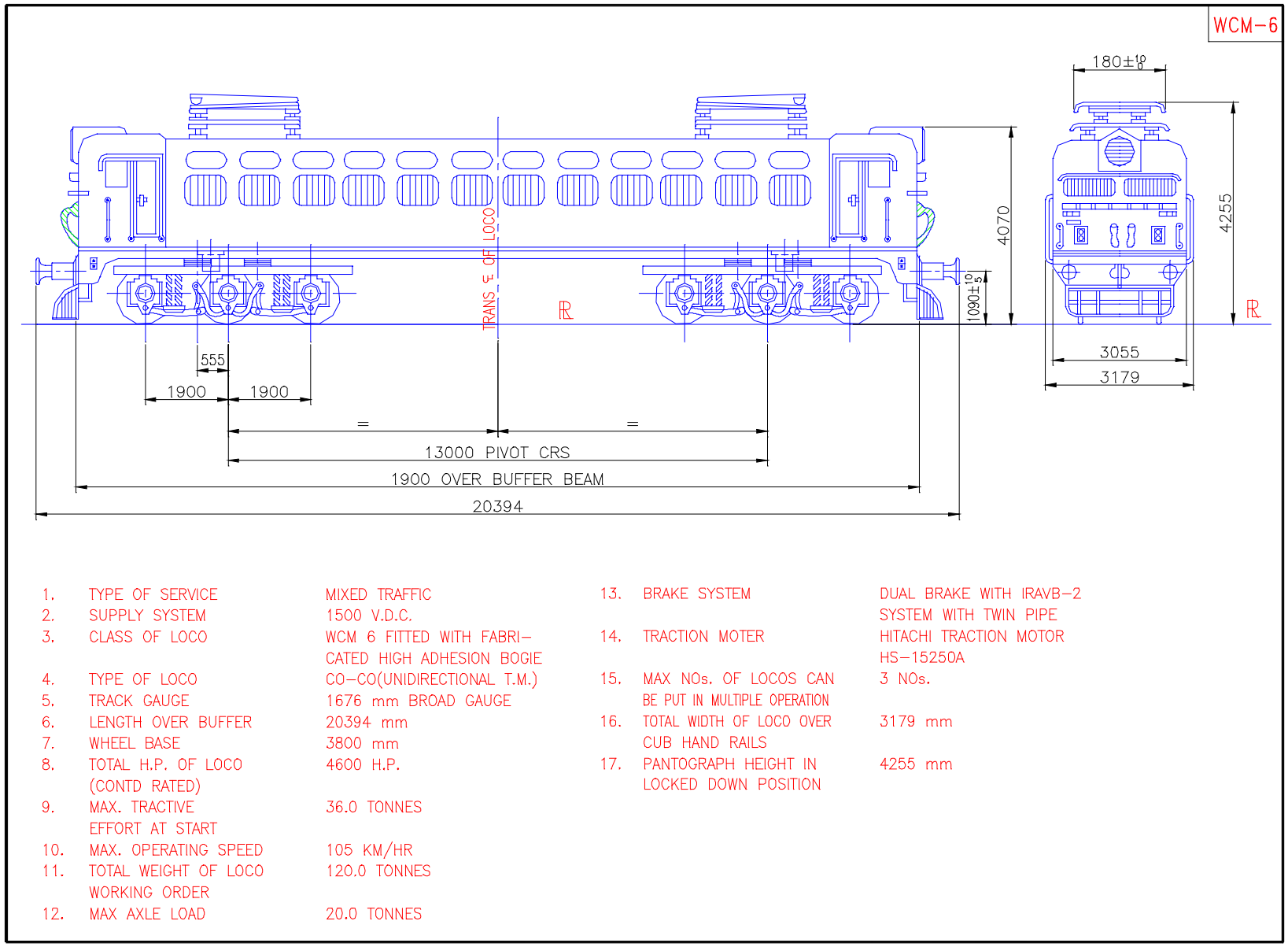
MIN. HEIGHT –

Br. Weal limit – 25 m

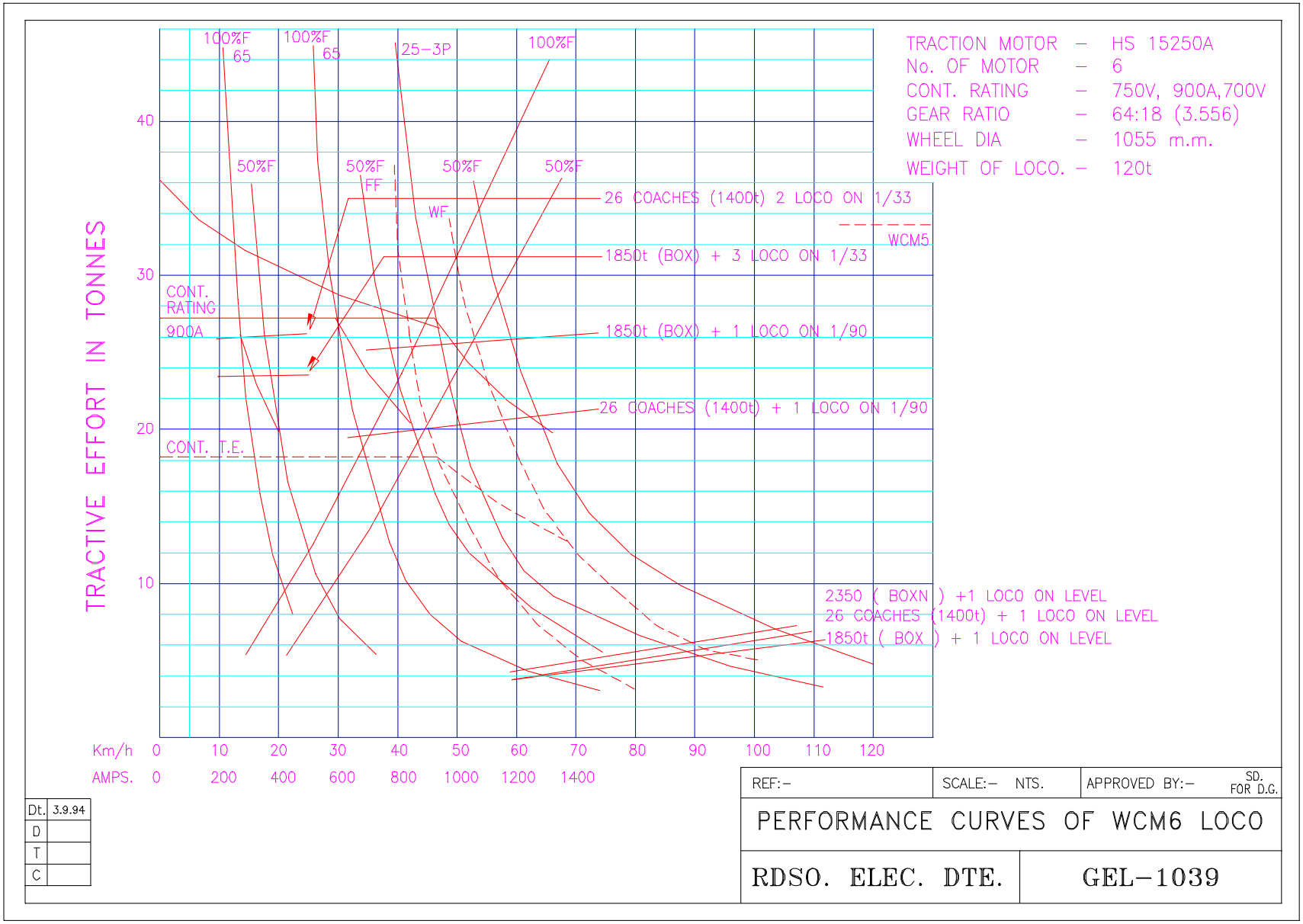
COMPRESSOR(Underslung)

MOTOR – 20.5KW, 27.5HP
415V, 43 Arp
980 RPM

AUX. COMP. 110V, d.c. blast
of REST GI Mat
180 L/min
block.



1.	TYPE OF SERVICE	MIXED TRAFFIC
2.	SUPPLY SYSTEM	1500 V.D.C.
3.	CLASS OF LOCO	WCM 6 FITTED WITH FABRI-CATED HIGH ADHESION BOGIE
4.	TYPE OF LOCO	CO-CO(UNIDIRECTIONAL T.M.)
5.	TRACK GAUGE	1676 mm BROAD GAUGE
6.	LENGTH OVER BUFFER	20394 mm
7.	WHEEL BASE	3800 mm
8.	TOTAL H.P. OF LOCO (CONTD RATED)	4600 H.P.
9.	MAX. TRACTIVE EFFORT AT START	36.0 TONNES
10.	MAX. OPERATING SPEED	105 KM/HR
11.	TOTAL WEIGHT OF LOCO WORKING ORDER	120.0 TONNES
12.	MAX AXLE LOAD	20.0 TONNES
13.	BRAKE SYSTEM	DUAL BRAKE WITH IRAVB-2 SYSTEM WITH TWIN PIPE
14.	TRACTION MOTER	HITACHI TRACTION MOTOR HS-15250A
15.	MAX NOs. OF LOCOS CAN BE PUT IN MULTIPLE OPERATION	3 NOs.
16.	TOTAL WIDTH OF LOCO OVER CUB HAND RAILS	3179 mm
17.	PANTOGRAPH HEIGHT IN LOCKED DOWN POSITION	4255 mm


TRACTIVE EFFORT IN TONNES
40
30
20
10
100%F
65
100%F
65
25-3P
100%F
50%F
50%F
FF
WF
50%F
50%F
26 COACHES (1400t) 2 LOCO ON 1/33
WCM5
1850t (BOX) + 3 LOCO ON 1/33
CONT.
RATING
900A
1850t (BOX) + 1 LOCO ON 1/90
26 COACHES (1400t) + 1 LOCO ON 1/90
CONT. T.E.
2350 (BOXN) +1 LOCO ON LEVEL
26 COACHES (1400t) + 1 LOCO ON LEVEL
1850t (BOX) + 1 LOCO ON LEVEL
Km/h 0 10 20 30 40 50 60 70 80 90 100 110 120
AMPS. 0 200 400 600 800 1000 1200 1400
TRACTION MOTOR – HS 15250A
No. OF MOTOR – 6
CONT. RATING – 750V, 900A,700V
GEAR RATIO – 64:18 (3.556)
WHEEL DIA – 1055 m.m.
WEIGHT OF LOCO. – 120t
REF:–
SCALE:– NTS.
APPROVED BY:– SD. FOR D.G.
PERFORMANCE CURVES OF WCM6 LOCO
RDSO. ELEC. DTE.
GEL–1039
Dt. 3.9.94
D
T
C

WCM 6

HAULAGE CAPACITY OF WCM 6 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.56 (18:64) T.M. HS-15250A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	BOGIE WAGONS (BOX)	LEVEL	← ABOVE 6000 →						5345	3755	2655			ABOVE 6000
		1/500	5005	5005	5005	5005	5005	3830	2645	1930	1410			5505
		1/200	3470	3470	3470	3470	3010	2105	1470	1080	795			3470
		1/150	2955	2955	2955	2910	2390	1675	1165	855	625			2955
		1/100	2270	2270	2240	2230	1670	1170	810	590	425			2270
		1/50	1155	1145	1135	1030	845	580	390	270	185			1315
	BOGIE WAGONS (BOXN)	LEVEL	← ABOVE 6000 →						5630	3875	2700			ABOVE 6000
		1/500	5840	5840	5840	5840	5800	3970	2715	1965	1420			5840
		1/200	3850	3850	3850	3785	3080	2150	1490	1090	800			3850
		1/150	3235	3235	3235	2975	2435	1700	1180	865	630			3235
		1/100	2350	2315	2280	2065	1695	1180	815	595	430			2465
		1/50	1165	1155	1145	1040	850	580	390	270	185			1435
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →											ABOVE 1500
		1/500	← ABOVE 1500 →								1120			-DO-
		1/200	← ABOVE 1500 →						1385	950	690			-DO-
		1/150	← ABOVE 1500 →						1060	770	555			-DO-
		1/100	← ABOVE 1500 →					1100	755	545	390			-DO-
		1/50	1155	1135	1120	1015	825	560	375	260	175			1435

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

25 KV AC
ELECTRIC LOCOMOTIVES (M.G.)



YAM 1

CONT. RAIL P.S. 1620
B-B TYPE YAM 1 ELECTRIC LOCOMOTIVE
1000 mm GAUGE

YAM1

B–B TYPE YAM1 CLASS ELECTRIC LOCOMOTIVE
1000 mm Gauge

Eighteen of these locos were ordered on Mitsubishi (Japan) and the first of these has been put into service in 1965. The locos are built for mixed traffic operation. The continuous rail horse–power is 1620 p.s. at 34.5 km/hr.

The locomotive is powered by two bogie mounted forced ventilated type DC traction motors permanently grouped in parallel. The speed control is achieved by a LT tap changer provided on the transformer secondary.

These locomotives utilise silicon rectifier for conversion of AC power into DC.
Compressed air brakes for the loco and vacuum brake for the trains are provided.

PROCUREMENT PARTICULARS

Contracts		BUILDER	Year put in line	I. R. Loco Numbers	Particular Spec. No.	As Made drawing set	Total No. Ordered.	Remarks
Number	Date							
RE/RS/37/1/GEN/1	5.3.63	Mitsubishi	1965	21904–21923	EL.141.61R	YAM1	18+2	

Jan.69

MAIN PARTICULARS OF YAM1 LOCO

YAM 1

GENERAL

SYSTEM OF CURRENT – A.C.
LINE VOLTAGE – 25000V
WEIGHT IN W.O. – 52t
ADHESIVE WEIGH – 52t
MAX. AXLE LOAD 13t
MIN. AXLE LOAD –
1 HR. RATING:–
P.S. – 1740
T.E.– 13600kg
SPEED – 33.8km/h
CONTINUOUS RATING–
P.S. – 1630
T.E. – 12500kg
SPEED – 34.5kmph
MAX. T.E. – 19500kg
MAX. SPEED – 80kmph
WHEEL DIA – NEW 865 mm
HALF WORN 830 mm
FULL WORN 795 mm

BOGIE

DRIVE ARGT. INTERNAL– EXTERNAL GEAR COUPLING TYPE WN,MONOMOTOR SYSTEM CONSISTING OF TRANSMISSION GEAR UNIT AND REDUCTION GEAR UNIT

BRAKES

LOCO – AIR,Hand
TRAIN – VACCUM

SANDING

NO. OF BOXES – 8
CAPACITY EACH – 50 1

PANTOGRAPH –

NOS – 2
MAKE – FAIVELEY
TYPE – AM12

TRANSFORMER

MAKE – MITSUBISHI
TYPE – SHELL SUB
NUMBER – ONE
WT.COMPLETE 3900 kg
COOLING OIL
KVA: PR. 1800 SECONDARY. 1690
TAPS ON L.T.– 25 NOTCHES

VOLTS:	H.T. 22.5KV	L.T. 2x1637
AMPS	H.T. 1.56.7	L.T. 1295

INSULATION–

RECTIFIER

MAKE – SECHERON
TYPE – A268 (EXCITRON)
NUMBERS– 4
RATING:
CONTINUOUS 1HR 510A 1250V
INTERMITTENT 1MIN–

TRACTION MOTORS

MAKE – ACEC,ALSTHOM,AEG SIEMENS
TYPE – M.G.1420
NUMBER – 2
INSULATION CLASS H
SUSPENSION– FULLY SUSPENDED
VENTILATION – FORCED AIR
WT. COMPLETE – 5600 kg
1 HR RATING F.F.– 1120KW, 1250V, 960A
CONTINUOUS RATING F.F.– 1080KW, 1250V, 920A, 630RPM
TEMP.RISE(°C) – ARM FIELD
(By Resistance) 120 140

COIL RESISTANCE:–

ARMATURE – 0.023
MAIN POLE – 0.024
INTERPOLE – 0.0125

AIR GAP:–
MAIN POLE 6.5 mm
INTERPOLE 5 mm

BUSHES :–
NO. OF HOLDERS – 6
BRUSH PER HOLDER – 3
SIZE (LxWxH) – 44x18x55
MIN. HEIGHT– 24 mm
MOTOR GROUPING:–
P – 1,2
GEAR RATIO – 1:3.95

AUXILIARIES

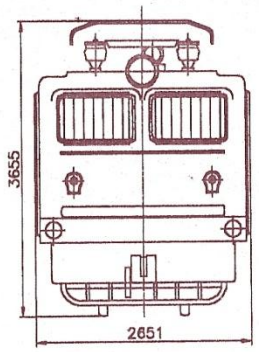
HEAD LIGHT – 32 V,250 W
BATTERY – NI–CD, 72 CELLS. 60AH, (8HR. RATE)
ARNO CONVERTER
TYPE AV 5044
RATING
120 KVA,0.9 PF,380 V,1500 RPM
WEIGHT 800 kg
AUX.GEN. 2.86KW,110V,2700RPM
WEIGHT 110 kg
COMPRESSOR (1 SET):–
MAKE – OERLIKON
TYPE – 2A–115
CAPACITY – 10001/min, (7KG/CM)
MOTOR – AC,11HP,380V, 15.5A, 2860RPM
EXHAUSTER (2 SETS) :–
MAKE – OERLIKON
TYPE – 1A480P+153C4/2
CAPACITY – 3180/6340 1/m
MOTOR – AC,6/12HP,380V 1460/2860 RPM
T.M.BLOWER (2 SETS):–
CAPACITY– 204m/m,280mmWG
MOTOR – AC,30HP,380V, 2870RPM
AUX.COMP.
CAPACITY– 70 1/m,7kg/cm
MOTOR– 0.8CV,100V,1500RPM

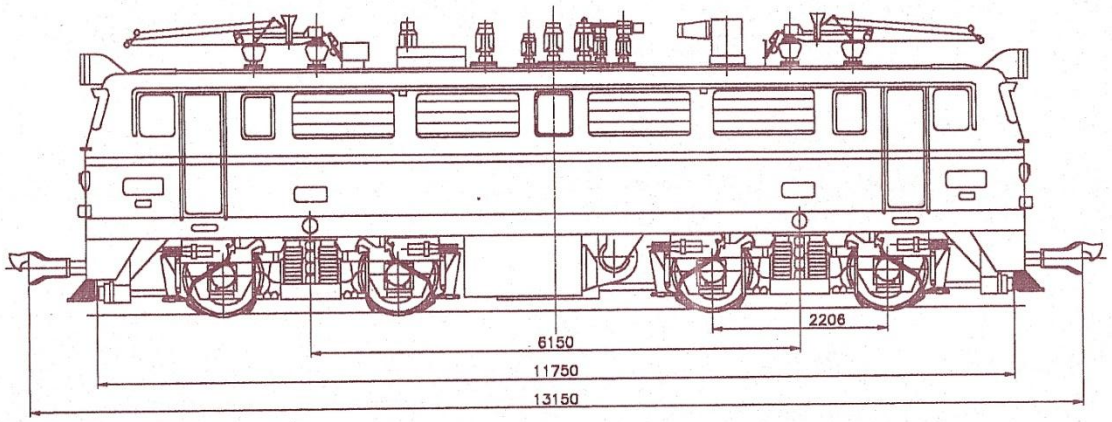
TRANS.OIL PUMP (1SET)
CAPACITY– 630 1/m,11mm WG
MOTOR– AC,3.8HP,380V,2865RPM (10+20 LOCOS GROUP)
TRANS.OIL COOLER BLOWER(1SET)
CAPACITY– 370 m/m
MOTOR– AC,26KW,380V,36A, 1460RPM
EXCITRON BLOWER (4SETS)
CAPACITY– 56m/m,29mm WG
MOTOR– AC,380V,3.4A,1440RPM
SMOOTHING REACTOR BLOWER
CAPACITY– 75m/m,68mm WG
MOTOR– AC,1.6HP,380V,2850RPM

PROTECTIVE DEVICES

DEADMAN CONTROL– NO
SLIP CONTROL– YES
MAIN O/L RELAY– YES
MOTOR O/L RELAY– YES
O/V RELAY –
NO CURRENT RELAY– NO
EARTH FAULT RELAY – YES
OVER SPEED TRIP NO
LOW PR.GOV.–
VAC.CON.GOV.– NO
BRAKE CYL C/O VALVE –
E.A.V. –

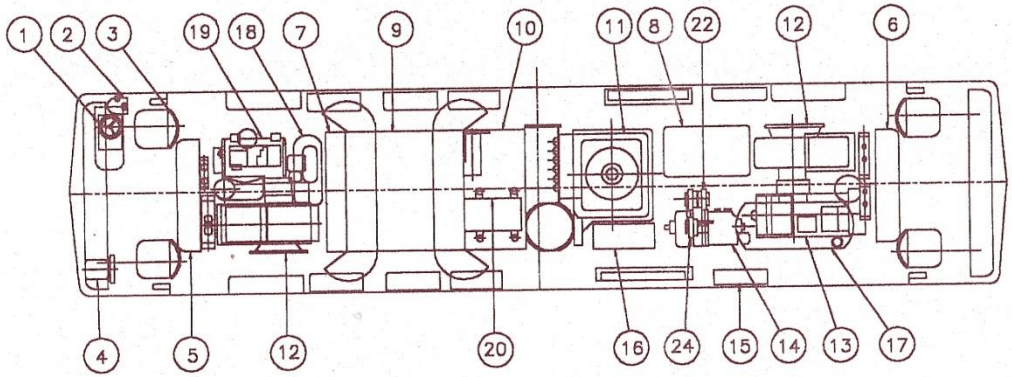
YAM1





ITEM NO. DESCRIPTION

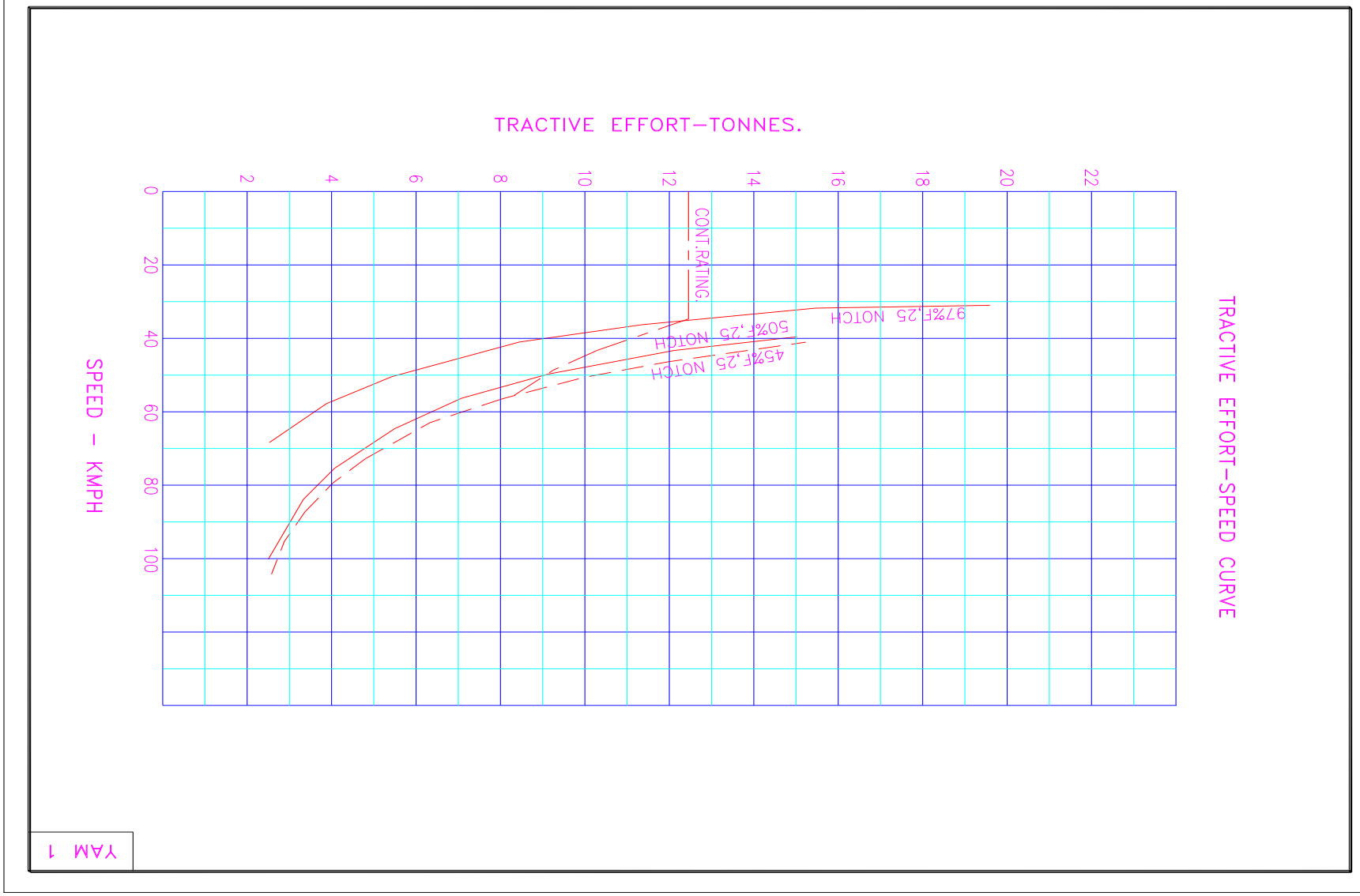
1. MASTER CONTROLLER
2. BRAKE VALVE
3. SEAT
4. HAND BRAKE
5. NO. 1 CONTROL CABINET
6. NO. 2 CONTROL CABINET
7. NO. 1 CONTROL BLOCK
8. NO. 2 CONTROL BLOCK
9. SILICON RECTIFIER BOX
10. TAP-CHANGER BOX
11. MAIN TRANSFORMER
12. T.M. BLOWER
13. EXHAUSTERS
14. AIR COMPRESSOR
15. BATTERY
16. BRAKE EQUIPMENT BLOCK
17. MAIN RESERVOIR
18. EMERGENCY RESERVOIR
19. MOTOR GENERATOR
20. RESISTOR FOR TRANSFER SWITCH
21. REACTOR FOR COMP. MOTOR
22. REACTOR FOR EXH. MOTOR

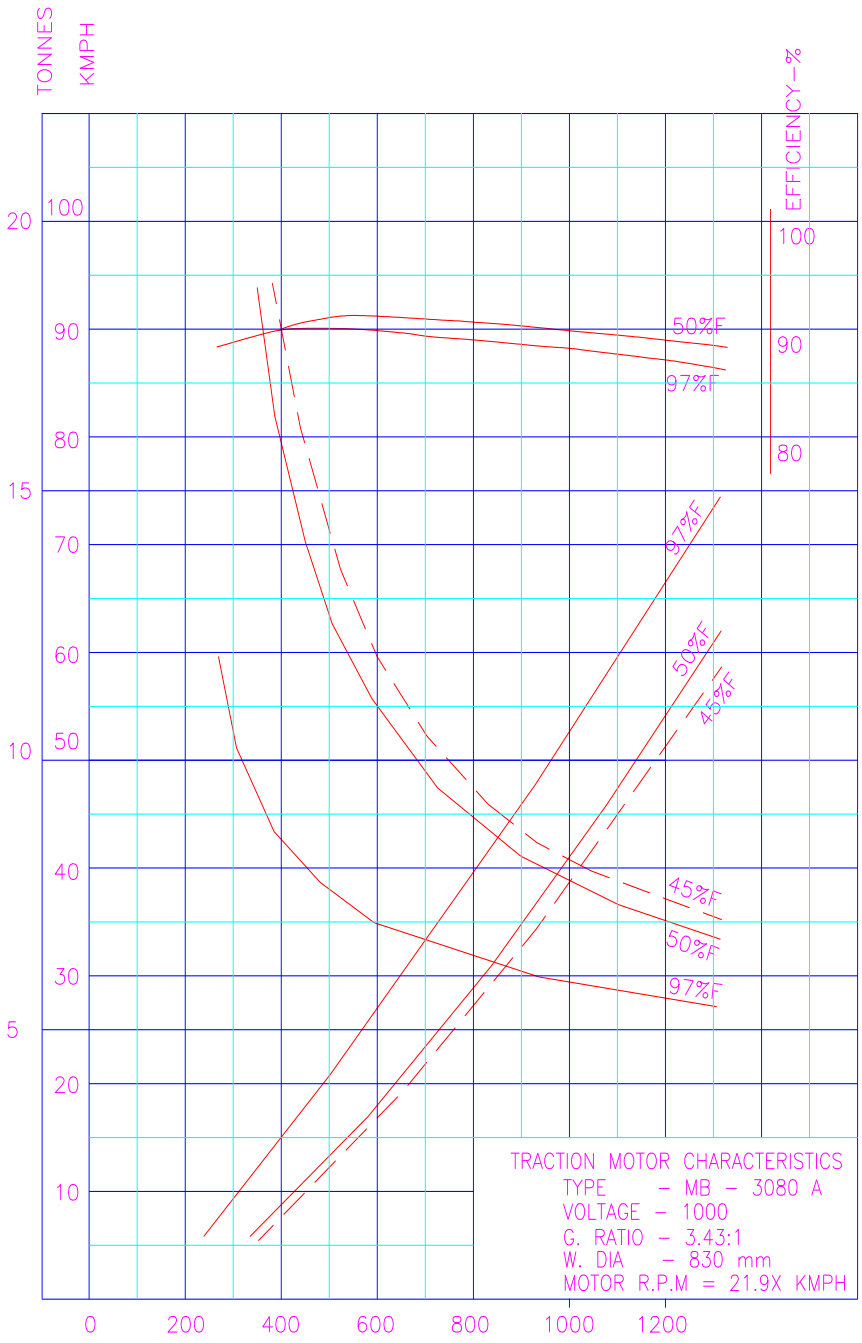


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2	----

SHEET NO. 1/3

MARCH 69


TRACTIVE EFFORT—TONNES.
2
4
6
8
10
12
14
16
18
20
22
0
20
40
60
80
100
SPEED – KMPH
CONT.RATING.
97%F.25 NOTCH
50%F.25 NOTCH
45%F.25 NOTCH
TRACTIVE EFFORT—SPEED CURVE
YAM 1


TONNES
KMPH
EFFICIENCY – %
20
15
10
5
100
90
80
70
60
50
40
30
20
10
100
90
80
50%F
97%F
97%F
50%F
45%F
45%F
50%F
97%F
TRACTION MOTOR CHARACTERISTICS
TYPE – MB – 3080 A
VOLTAGE – 1000
G. RATIO – 3.43:1
W. DIA – 830 mm
MOTOR R.P.M = 21.9X KMPH
0
200
400
600
800
1000
1200
CURRENT – AMPS

YAM 1

YAM 1

HAULAGE CAPACITY OF YAM 1 LOCOMOTIVE

(WITHOUT ACCELERATION RESERVE)

G.R. 1:3.43 (.....) T.M. MB-3080-A

SERVICE		GRADE	TONNES AT KMPH (TANGENT TRACK)											START
			20	30	40	50	60	70	80	90	100	110	120	
GOODS SERVICE	4 WHEELER WAGONS	LEVEL	← ABOVE 2000 →				1875	1090						ABOVE 2000
		1/500	← ABOVE 2000 →			1700	1190	730						-DO-
		1/200	1730	1660	1370	1050	755	475						-DO-
		1/150	1390	1340	1115	865	620							1775
		1/100	990	975	810	630	455							1270
		1/50	515	508	425									
	BOGIE WAGONS (BOX)	LEVEL	2430	2430	2430	2430	2430	1560						2430
		1/500	1910	1910	1910	1910	1460	1000						1910
		1/200	1460	1460	1460	1160	850	555						1460
		1/150	1100	1100	1100	940	680	450						1100
		1/100	1010	995	845	670	490							900
		1/50	520	515	440									645
PASSENGER SERVICE	ICF COACH	LEVEL	← ABOVE 1500 →						1250					ABOVE 1500
		1/500	← ABOVE 1500 →				1325	1000	515					-DO-
		1/200	← ABOVE 1500 →			1220	760	580	420					-DO-
		1/150	ABOVE 1500	1490	1220	980	695	470	340					-DO-
		1/100	1060	1040	860	690	425	330	240					1330
		1/50	535	530	455	350	210	160	110					750

Dt	20.12.93
D	L.K.MISRA
T	
C	R.C.AGARWAL

भारत सरकार **GOVERNMENT OF INDIA**
रेल मंत्रालय **MINISTRY OF RAILWAYS**
(रेलवे बोर्ड **RAILWAY BOARD**)

No. 2016/ Elect(TRS)/ 412/ 1 **Date:4th Apr 2016**

GENERAL MANAGER (ELECT. / OPTG.)
CR, ER, ECR, ECoR , NR, NCR, SR, SCR, SER, SECR, SWR, WR & WCR

SUB: ELECTRIC LOCO HOLDING TARGET FOR APRIL 2016

S. N.	Description	CR	ER	ECR	ECoR	NR	NCR	SR	SCR	SER	SECR	WR	WCR	Total
1	Holding as on 01.03.2016	616	250	391	336	385	416	446	585	593	215	375	594	5202
2	Comm. In March 2016	2		2	4	1	2	4	2	1	1	2	2	23
3a	Condemned in March 2016													0
3b	Condemned upto March 2016	5	2	5	9			15	7	4	3	3	15	68
4	Transferred during Month													
5	**Net Holding as on 01-04-2016**	618	250	393	340	386	418	450	587	594	216	377	596	5225
6a	Accident damaged	1		1		1				2			1	6
6b	Overaged condemnation			2	3		1				2			8
6c	RDSO,TRIALS/Misc.					7								7
6d	Locos in GRS													0
6e	Locos in inferior services	6				2	3	3					4	18
6	**Sum**	7	0	3	3	10	4	3	0	2	2	0	5	39
7	**EFFECTIVE ON LINE (5-6)**	611	250	390	337	376	414	447	587	592	214	377	591	5186
8a	Major Repair target	10% for Conventional locos & 5% for 3-Phase HHP locos												
8b	Number	50.1	24.1	32.3	32.4	31.2	41.2	42.4	50.3	55.7	18.1	35.0	54.8	467.3
8	**Available for use (7- 8b)**	561	226	357.8	305	345	373	405	537	536	196	342	536	4719
9	Passenger links	130	133	74	35	198	40	212	125	117	33	143	141	1381
10a	**Available for Freight (8 - 9)**	431	93	274	270	147	333	193	412	419	163	199	395	3328
10b	Minor repair 10% for Conventional / 5% for 3-Phase HHP locos	31.0	9.3	20.9	25.7	14.7	33.1	19.3	35.7	38.6	13.6	19.5	36.8	298.2
10	**Net Freight TARGET (10a - 10)**	399.9	83.7	252.6	244.0	132.2	299.7	173.4	376.0	380.7	149.3	179.5	358.4	3029.3
12	**Under Transit / Commissioning**													
	WAG9	31670, 31749, 31750, 31752			31708, 31722, 31753	31673, 31721, 31711, 31656,	31747, 31720, 31696,			31705, 31706, 31709	31707	30099, 30093,		
	WAG7													
	WAP4/WAP5/WAP7		30457, 30455			30097, 30098, 30100, 30454, 30461,						30464, 30459,	30460, 30462	
	Sum	4	2	0	3	9	3	0	0	3	1	4	2	31
13	**Accidt./ Fire damaged locos**													
	WAM4/WAP4/WAP5/WAP7			22753										
	WAG5/WAG7/WAG9	31413				24637				23619, 23147			23457	
	Sum	1	0	1	0	1	0	0	0	2	0	0	1	6
14	**Loco under condemnation**													
	WAG5/WAG7/WAM4/WAP4			21283, 21286	26000, 26001, 26012		20601				21209, 21213			
	Sum	0	0	2	3	0	1	0	0	0	2	0	0	8

Locos Commisioned in 2015-16 upto 31.03.2016 (Ex. CLW)						
Type of loco	WAP4	WAG7	WAP7	WAP5	WAG9	Total
Production Programme '15-16'	20	30	55	30	145	280
Out turn in March 2016	0	0	10	1	14	25
Out turn upto March 2016	30	35	58	17	140	280
Commisioned in March 2016	0	0	8	0	15	23
Commisioned upto March 2016	39	41	41	9	129	259

(Sumit Bhatnagar)
Dir. Elect. Engg. (RS)
Railway Board

Copy to :
PPS/ML, PPS/MT, AM(L), AM(T), AM(Plg.), EDEE (RS), Sr. EDSE/RDSO
EDTT(M), ED(E&R), EDEE(Dev.), ED (Chg.), DTT(G), EMERGENCY CELL, Elect. Control.

SHEDWISE / TYPEWISE ELECTRIC LOCO HOLDING AS ON 01-04-2016

RAILWAY	SHED	Sanctioned Capacity	WAM4	WAP1	WAP4	WAP5	WAP7	WAG5 A/B	WAG5 HA/HB	WAG6	WAG7	WAG9	WAG9H	WCAM2	WCAM3	WCAG1	WCM6 (AC)	TOTAL
CENTRAL (CSTM)	BSL	150	14		43			150										207
	AQ	175					15				54	89	53					211
	KYN (AC+DC	100									50	1	62 *1	20	53 4#	12	2 2#	200
	SUM	**425**	**14**	**0**	**43**	**0**	**15**	**150**	**0**	**0**	**104**	**90**	**115**	**20**	**53**	**12**	**2**	**618**
EASTERN (CCC)	ASN	100	8					29	68		35							140
	HWH	100			91		19											110
	SUM	**200**	**8**	**0**	**91**	**0**	**19**	**29**	**68**	**0**	**35**	**0**	**0**	**0**	**0**	**0**	**0**	**250**
EAST CENTRAL (HJP)	MGS	150	18 2 ^		68 1*						113							199
	GMO	120									59	77	58					194
	SUM	**270**	**18**	**0**	**68**	**0**	**0**	**0**	**0**	**0**	**172**	**77**	**58**	**0**	**0**	**0**	**0**	**393**
EAST COAST (BBS)	WAT	175	10		21			105		11 3^	26		27					200
	ANGL	150									140							140
	SUM	**325**	**10**	**0**	**21**	**0**	**0**	**105**	**0**	**11**	**166**	**0**	**27**	**0**	**0**	**0**	**0**	**340**
NORTHERN (NDLS)	GZB	150	1 1#	31 1@	47 3 @	44 3@	78											201
	LDH	150	1 1#		10						157 1*		5					173
	KJGY**										12							12
	SUM	**300**	**2**	**31**	**57**	**44**	**78**	**0**	**0**	**0**	**169**	**0**	**5**	**0**	**0**	**0**	**0**	**386**
NORTH CENTRAL (ALD)	JHS	150	1 1 ^						117		90							208
	CNB	150	3 3#		48						155		4					210
	SUM	**300**	**4**	**0**	**48**	**0**	**0**	**0**	**117**	**0**	**245**	**0**	**4**	**0**	**0**	**0**	**0**	**418**
SOUTHERN (MAS)	AJJ	150	8 3#	33	5				89		39							174
	ED	175			118						83							201
	RPM	100			28		47											75
	SUM	**425**	**8**	**33**	**151**	**0**	**47**	**0**	**89**	**0**	**122**	**0**	**0**	**0**	**0**	**0**	**0**	**450**
SOUTH CENTRAL (SC)	BZA	175	5		28			43			143							219
	LGD	150			40		54					73	42					209
	KZJ	100									159							159
	SUM	**425**	**5**	**0**	**68**	**0**	**54**	**43**	**0**	**0**	**302**	**73**	**42**	**0**	**0**	**0**	**0**	**587**
SOUTH EASTERN (GRC)	TATA	120	21					35			85	2	68					211
	BNDM	175							2 2*		200							202
	BKSC	100						31			70							101
	SRC	50			80													80
	SUM	**445**	**21**	**0**	**80**	**0**	**0**	**66**	**2**	**0**	**355**	**2**	**68**	**0**	**0**	**0**	**0**	**594**
SOUTH EAST CENTRAL (BSP)	BIA	175	18 2^				11	13			118		56					216
	SUM	**175**	**18**	**0**	**0**	**0**	**11**	**13**	**0**	**0**	**118**	**0**	**56**	**0**	**0**	**0**	**0**	**216**
WESTERN (CCG)	BRC	150			72	46		38	36				8					200
	BL	100	3						106		68							177
	SUM	**250**	**3**	**0**	**72**	**46**	**0**	**38**	**142**	**0**	**68**	**0**	**8**	**0**	**0**	**0**	**0**	**377**
WEST CENTRAL (JBP)	TKD	175	18				29	79			29	30	29					214
	ET	175	20 4#		75			99 1*										194
	NKJ	175							114		74							188
	SUM	**525**	**38**	**0**	**75**	**0**	**29**	**178**	**114**	**0**	**103**	**30**	**29**	**0**	**0**	**0**	**0**	**596**
GRAND TOTAL		**4065**	**149**	**64**	**774**	**90**	**253**	**622**	**532**	**11**	**1959**	**272**	**412**	**20**	**53**	**12**	**2**	**5225**
Accidental repair	*				1			1	2		1		1					6
Overaged Condemnation	^	5								3								8
Trials/RDSO/Misc.	@			1	3	3												7
GRS	$																	0
Inferior service	#	12													4		2	18
Effective on line			**132**	**63**	**770**	**87**	**253**	**621**	**530**	**11**	**1958**	**272**	**411**	**20**	**49**	**12**	**0**	**5186**

** Shed under commsioning.

* 3-Phase locos & Sheds.

IR ELECTRIC LOCO FLEET				
AC				4113
AC/DC				85
3-Phase				1027
IGBT	337	GTO	690	
Grand Total				5225

Overall Dimensions at a Glance

Traction	Class	Wheel arrang.	Wheel Dia. (mm)	Overall dimension			Horse Power	Maxi. Starting Tractive Effort (t)	Maxi. Speed (km/h)	Axle load (t)
				L	W	H				
Elec AC	WAM1	Not in use								
Elec AC	WAM2	Not in use								
Elec AC	WAG1	Not in use								
Elec AC	WAG2	Not in use								
Elec AC	WAG3	Not in use								
Elec AC	WAG4	Not in use								
Elec AC	WAG5 A/B/C	Co-Co	1092	19974	3055	4165	3850	33.5	105	19.8
Elec AC	WAG5H	Co-Co	1092	19974	3055	4165	3850	37.8	80	21.0
Elec AC	WAG6A	Bo-Bo-Bo	1092	20600	3184	4170	6280	46.0	100	20.5
Elec AC	WAG6B	Bo-Bo-Bo	1140	20600	3184	4235	6050	45.0	100	20.5
Elec AC	WAG6C	Co-Co	1140	20600	3184	4235	6050	45.0	100	20.5
Elec AC	WAG7	Co-Co	1092	20394	3179	4185	5000	44.0	100	20.5
Elec AC	WAG9	Co-Co	1092	20562	3152	4255	6120	46.89	100	20.5
Elec AC	WAG9H	Co-Co	1092	20562	3152	4255	6120	50.97	90	22.0
Elec AC	WAM4	Co-Co	1092	19974	3055	4165	3640	33.84	110	18.8
Elec AC	WAP1	Co-Co	1092	18794	3179	4235	3800	22.4	130	18.8
Elec AC	WAP3	Co-Co	1092	18794	3179	4235	3800	22.4	130	18.8
Elec AC	WAP4	Co-Co	1092	18794	3179	4235	5050	30.8	140	19.0
Elec AC	WAP5	Bo-Bo	1092	18162	3144	4255	5442	26.3	160	19.5
Elec AC	WAP6	Co-Co	1092	18794	3179	4235	5060	30.8	105	19.0
Elec AC	WAP7	Co-Co	1092	20562	3152	4255	6120	32.9	130	20.5
Elec AC-DC	WCAG1	Co-Co	1092	20980	3050	4237.5	AC5000 DC4600	AC-43.65 DC-30.0	80	21.3
Elec AC-DC	WCAM1	Co-Co	1092	20950	3055	4162	AC3640 DC2930	AC-33.84 DC-28.2	105	18.8
Elec AC-DC	WCAP1	Co-Co	1092	20950	3055	4162	AC3640 DC2930	AC-33.84 DC-28.2	105	18.8
Elec AC-DC	WCAM2	Co-Co	1092	20980	3050	4230	AC4715 DC2916	AC-33.4 DC-26.0	120	18.8
Elec AC-DC	WCAM3	Co-Co	1092	20980	3050	4237.5	AC5000 DC4600	AC-40.2 DC-26.8	105	20.2
Elec DC	WCG2*	Co-Co	1092	19974	3055	4238	4200	35.6	90	22.0
Elec DC	WCM6*	Co-Co	1092	20394	3179	4255	4600	36.0	100	20.0

Contribution of following officers and staff of Electrical Loco Directorate is appreciable for the publication of this Electric Loco Data Book in time:-

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