

N15212



भारत सरकार
रेल मंत्रालय

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

अनुसंधान अभिकल्प एवं मानक संगठन

RESEARCH DESIGNS AND STANDARDS ORGANISATION
MINISTRY OF RAILWAYS

450 मिलिमीटर स्वीप वाले
110 वोल्ट ए सी एवं 140 वोल्ट ए सी
रेलवे कैरिज पंखों की विशिष्टि (पुनरीक्षित -1)
SPECIFICATION FOR 450 MM 110 V AC AND 140 V
AC RAILWAY CARRIAGE FANS

आर.डी.एस.ओ./पी.ई./एस पी ई सी/टी एन / 0050 .
2010(पुनरीक्षित -1)

RDSO SPECIFICATION NO. RDSO/PE/SPEC/TL/0050 -2010(REV-1)

S. No.	Date of amendment	Revision	Reason

अनुमोदित
APPROVED

(Signature)

कार्यकारी निदेशक/ पी एस एंड ई एम यू
ED/PS & EMU

Prepared By <i>(Signature)</i> SE/Design/Elect	Checked By <i>(Signature)</i> DSE(TL AC & System Design)
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SE/Design/Elect.

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FOREWORD :

Railway carriage fan of 450 mm sweep are being provided in EMUs and MEMUs of Indian Railways. This specification is framed outlining special design & test requirement which are different from IS 6680 to make the fan suitable for Rolling stock operation.

1.0 SCOPE

The 450 mm sweep Railway carriage fan shall consists of crashworthy guard, FRP blade deep drawn design fan body, aluminum pressure die cast motor body, aluminum die cast rotor stator, FNS Start capacitor etc.

2.0 GOVERNING SPECIFICATIONS

The 450 mm sweep Railway carriage fan shall, unless other wise specified here in, conform to the Indian Standards Specification/IEC recommendations as indicated below

In case there is any revision/amendment to these specifications/ rules, the latest version shall be applicable

Standard/ Specification	Description
IS 6680-1992 (First revision- Reaffirmed in 1999)	Specification for Railway Carriage Fans
IS 13730 (Part 8)-1996	Specification for Copper polyesterimide enamelled round winding wires
IS 13871-1992	Specification for Powder coating
IS 1709-1954	Specification for Capacitors for Electric Fan Motors
IS 617-94 grade 4600	Aluminum pressure die casting
IS 648-1980, IS 649-1983 and IS 3024-1965 with latest amendments.	Specification of Electrical steel sheets

3.0 OPERATING & SERVICE CONDITIONS

The 450 mm Railway carriage fan shall be sturdy and suitable for the following service conditions normally to be met in service.

3.1	Ambient Temperature	-4 to +55 deg C
3.2	Temperature under sun inside stalled coach	70 deg C
3.3	Train speed	200 Kmph
3.4	Humidity	Relative humidity - Maximum up to 95%

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3.5	Altitude	Max 1200 meters above sea level
3.6	Rainfall	Annual rainfall ranging between 1750 to 6250 mm
3.7	Atmosphere	i) The equipment shall be designed to work in saline atmosphere in coastal areas having continued exposure to salt laden airborne contaminants like smoke and chemical vapors and also in industrially polluted zones . Max. pH value : 8.5 Sulphate : 7 mg/liters Max. Concentration of : 6 mg/liters Chlorine Max. Conductivity : 130 micro Siemens/cm ii) Extremely dusty and arid climate /desert terrain in certain areas. The dust content in air may attain values up to 1.6 mg/m3
3.8	Vibration	The equipment, system and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified below:- (a) Maximum vertical acceleration : 3.0 g (b) Maximum lateral acceleration : 3.0 g © Maximum longitudinal acceleration : 3.0 g ('g' being the value of acceleration due to gravity)

4.0 GENERAL DESIGN AND CONSTRUCTIONAL REQUIREMENT

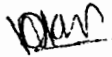
The design of fan motor and spares for 450 mm sweep fan for 140V AC/110 V AC shall be in line with IS: 6680-92 except the special features mentioned in this specification. The following special design and performance parameters are to be ensured for design of 450 mm sweep fans.

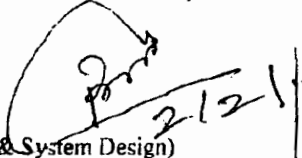
4.1 Blade :Fans shall be with FRP Blade only.

- The blade shall be made of fire retardant FRP material with injection molding process
- FRP Blade shall conform to RDSO Drawing No. RDSO/ PE/SK/TL /0123 (Rev-0) -2009 or latest.
- Blades should be procured only from RDSO approved source.

4.2 Guard : The crashworthy design of Fan Guard for 450 mm fan shall be as per ICF drawing no . ICF/SK/7-6-026 (Alt '0') -2010 or latest.

4.3 Fan body: The fan body will be of deep drawn design from MS sheet as per RDSO Drg. No. RDSO/PE/SK/TL/0025-2002 (Alt.3) or latest.

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4.4 **Motor Body** : The motor body shall be of aluminum pressure die casting conforming to IS:617-94 grade 4600 and having C.I. Bush at both the bearing ends.

4.5 **Mounting** : The mounting of fan to coach ceiling shall be as under :

PCD 108 mm .
No. of holes 3 at equal distance.
Hole diameter 9 mm .

4.6 **Bearing** : The ball bearings of SKF / FAG / NBC equivalent to G201 2 Z , C3 LHT23 shall only be used. Preloading wave washer shall be provided at blade side bearing seating.

4.7. **Stamping**

Laminated core shall be used in the construction of a.c. fan motors. The stampings used for laminated stator and rotor core shall be made from electrical steel sheets (See IS: 648-1980, IS: 649-1963 and IS: 3024-1965 with latest amendments).

4.8. **Stator and rotor stack length**

Stack length of rotor shall be 38 mm $\pm$ 2 mm and stator shall be of corresponding matching length.

4.9. **Exposed length of shaft**

Exposed length of shaft shall be 53 mm from motor body surface to hold insert and hub of FRP blade .

4.10 **Material for shaft**

Material for shaft shall be EN8. Test certificate of EN8 material from NABL accredited lab shall be required .

4.10. **Winding Wire**

The super enameled copper round winding wires of Class 180 conform to IS specification No.: 13730 (Part 8)-1996 shall be used for winding of motor . Test certificate of winding wire shall be submitted .

4.11 **Insulating materials** :

All the insulating materials used in the motor shall conform 155 class of insulating materials. The fan's motor shall be treated with the insulating varnish of F class with vacuum pressure impregnation process .

4.12 **Connector**

A two pin surface mounted modular terminal block of WAGO/PHONIX or any other make with prior approval of RDSO shall be provided for connecting the coach power supply to fan. This shall be supplied loose with each fan.

4.13. **Colour scheme** :

- (a) Complete fan i.e. Motor body, outer deep drawn fan body and guard shall be powder coated with silver ash metallic finish to IS 5.
- (b) Cast iron parts shall be with enamel paints while other metallic parts to be powder coated to grade "A" of IS 13871 -1992.

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(c) The colour of FRP Blade shall be same as that of Guard and motor body.

4.14 Performance parameter:-

The fans shall be suitable for working power supply obtained from inverter and it shall vary as under:-

For rated voltage 110 V AC the Voltage Range shall be 93-135 V AC , 50 Hz

For rated voltage 140 V AC the Voltage Range shall be 98-168 V AC , 50 Hz

Performance parameter of the fan shall be as under:-

SN	Parameter	Specified value
1	Minimum Air delivery	85 m3/min
2	Maximum Electrical input	65Watts
3	Minimum Service value	1.3 m3/min/Watt
4	Maximum Weight of complete fan	8.5 kg
5	Weight of blade	300+/-15 gms
6	Minimum Rated speed	1200 rpm
7	Maximum Noise level	65 dB

4.15 Noise level measurement

Noise level shall be measured on five nos. fans in noise free atmosphere using sound level meter at four places at a distance of 1350 mm and at a height to the centre of fan guard surrounding the fan as given in diagram below:



The average of these points (1,2,3,4) shall not be more than 65 dB .

5.0 TESTS

5.1 Type test:

- 5.1.1 Firm shall submit dully filled Annexure B and Annexure C of IS 6680-1992 and detailed drawings & design details to RDSO before type test. A copy of the clause by clause compliance of this specification along with internal test report on five nos. of fans as per this specification by the firm shall be submitted to RDSO. Firm shall submit Bill of material with addresses of the sub-vendors supplying raw material (such as guard, FRP blade, outer deep drawn fan body, motor body, bearing, paint, powder coating, grease, varnish, copper wire.

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insulating material, varnish etc.) to RDSO before type test . All these spare parts used shall be as per Bill of material given in Annexure 1 and shall be purchased from RDSO approved sources as per latest vendor directory of RDSO.

5.1.2 It is to be clearly understood that any changes, required to be done in the prototype or any additional tests other than specified herein are required to be conducted on the prototype unit or its components, they shall be done expeditiously.

5.1.3 Type test shall be conducted on five nos. of fans. The type tests shall be carried out by RDSO representative on prototype unit either totally or in part under the following conditions without any additional cost:

- A manufacturer undertakes to manufacture for the first time.
- An important change in design details of machines has been introduced.
- Specification is modified necessitating re-designing of equipment.
- Unsatisfactory performance reported from user Railways.
- Resumption of production after an interruption of more than two years.

5.1.4 Investigation tests are intended to obtain additional information regarding the performance of the product. They shall be specially requested either by the user or by the manufacturer.

5.1.5 RDSO may conduct surprise check on manufacturing process and quality control along with any of the tests to ensure quality of product and its conformance to RDSO specification.

5.2 Routine test:

Routine test are to be carried out on each unit to verify that the product meets the performance requirement. Proper documentation of routine tests results shall be kept and be made available to inspecting official on demand.

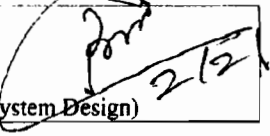
5.3 Acceptance test.

Each offered lot of supply shall be subjected to acceptance tests as per sampling plan specified in IS 2500 (Part I)-2000 AQL-1.0 and special inspection level S-4 at manufacturer's works. Acceptance test shall be witnessed by inspecting official nominated by purchaser.

5.4 Test schedule

5.4.1 Test schedule shall be as follows:

S.No	Tests	As per Clause no.	Type test	Acceptance test	Routine test
1	Visual inspection, including inspection of internal wiring	As per requirement of specification.	√	√	√
2	Dimension check of complete fan assembly and spares i.e. Guard, Blade, Motor body, Outer fan deep drawn body, stator, rotor etc.	As per relevant drawing mentioned in this specification and as per RDSO's approved drawing .	√	√	√

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3	Operating Voltage test	Clause 4.14 of this specification	√	√	√
4	Starting Voltage test	Clause 12 of IS 6680-1992	√	√	√
5	Electrical Input test (Watts)	Clause 19.8 of IS 6680-1992	√	√	√
6	Input Current test (Amp)	Clause 16.1 of IS 6680-1992	√	√	√
7	Power factor	Clause 19.5 of IS 6680-1992	√	√	√
8	Leakage test	Clause 19.6 of IS 6680-1992	√	√	X
9	Fan speed in RPM	Clause 19.9 of IS 6680-1992	√	√	√
10	Insulation Resistance test before and after High Voltage test	Clause 19.11 of IS 6680-1992	√	√	√
11	High Voltage (Di-electric) test	Clause 19.1.1 (h) of IS 6680-1992	√	√	√
12	High Operating Voltage test	Clause 19.7 of IS 6680-1992	√	√	X
14	Air delivery Test	Clause 19.2 of IS 6680-1992 and Clause 4.14 of this specification	√	√	X
15	Service value test	Clause 19.3 of IS 6680-1992 and Clause 4.14 of this specification	√	√	X
16	Temperature rise test	Clause 19.3.3 of IS 6680-1992	√	√*	X
17	Insulating material check	Clause 4.11 of this specification	√	X	X
18	Cu wire material Check	IS 13730 part 8, 1996	√	X	X
19	Weight measurement of Complete fan	Clause 4.14 of this specification	√	X	X
20	Fan blade material test	As per RDSO Drawing No. RDSO/ PE/SK/TL/0123-2009 (Rev-0) or latest	√	√	X
21	Bill of material check	As per Annexure 1	√	√	X
22	Noise level measurement	Clause 4.15 of this specification	√	√*	X

* Minimum one sample out of every lot of 500 (or less) offered for inspection.

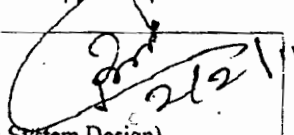
NOTE: Testing/measuring instruments shall be duly calibrated from any NABL accredited laboratory shall be furnished during type test.

5.4.2 During acceptance test following test shall be conducted on FRP blade at any CIPET lab:

- Density
- Melting point
- Glass fiber /ash content
- Flammability test

5.4.3 Revalidation/Renewal of type test

Revalidation of type test shall be done as per latest vendor approval procedure of RDSO/PUs.

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6.0 MARKING & PACKING:

The following information shall be clearly marked at a suitable place on each equipment

- a) Name and Address of the manufacturer.
- b) Year of the manufacture
- c) Serial number of Equipment
- d) Specification number
- e) Connection diagram of the equipment on the side of the cover.

7.0 INFRINGEMENT OF PATENT RIGHTS:

Indian Railways shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, use of similar components in the design & development of this item and any other factor not mentioned herein which may cause such a dispute. The entire responsibility to settle any such disputes/matters lies with the manufacturer/supplier.

Details/design/documents given by them are not infringing any IPR and they are responsible in absolute and full measure instead of railways for any such violations. Data, specifications and other IP as generated out of interaction with railways shall not be unilaterally used without the consent of RDSO and right of Railways/RDSO on such IPs acceptable to them.

Firm has to sign an undertaking in this regard at the time of vendor approval.

8.0 CARTEL FORMATION

The firms will submit a declaration in this regard as per attached annexure - 2.

9.0 SCHEDULE OF TECHNICAL REQUIREMENT

Firms shall comply to infrastructure requirement as per Appendix 1 of Annexure H (revised in Dec 2005) of IS 6680-1997

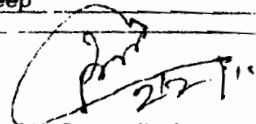
10.0 ENCLOSURES :

Annexure 1: Bill of Material

Annexure 2: Undertaking against cartel formation

Annexure 3 : Drawings

S No	Drawing No.	Description
(i)	RDSO/PE/SK/TL/0025-2002 (Alt.3) or latest.	RDSO drawing for deep drawn design fan body (MS sheet)
(ii)	RDSO/PE/SK/TL /0123 (Rev-0) or latest.	RDSO Drawing for the FRP Blade for 110 V AC & 140 V AC 450 mm FRP sweep Railway carriage Fan of Indian Railway
(iii)	ICF drawing no. ICF/SK3-7-6-026 (Alt '0')-2010 or latest.	Drawing for Crashworthy Fan Guard for 450 mm sweep

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ANNEXURE -1

Bill of material

SN	PART	REFERENCE	APPROVED SOURCE
1	FRP blade	As per RDSO Drawing No. RDSO/ PE/SK/TL/0123 (Rev-0) or latest	M/s Paras Plastic Mumbai M/s Qumex Mould , Kolkata Or any other source with prior approval of RDSO
2	Cu winding wire	IS 13730 part 8 , 1996	RDSO approved source
3	Insulating material	F class	RDSO approved source
4	Varnish for V P I	Temperature index 180 degree C	H 71 / FT 1052 of M/s Elantas Beck India Ltd. Or any other source with prior approval of RDSO
5	Bearing	6201 ZZ . C3 LHT23	SKF/FAG/NBC Or any other source with prior approval of RDSO
6	Capacitor	IS:1709-1984	Specification for Capacitors for Electric Fan Motors
7	Connector	Two pin surface mounted modular terminal block	WAGO/PHONIX or any other with prior approval of RDSO

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ANNEXURE -2**UNDERTAKING AGAINST CARTEL FORMATION**

We hereby, give an undertaking that as a Registered Vendor for manufacture and supply of 110 Volts AC/140 Volts AC. 450 mm sweep Railway carriage Fan will not be a part of a cartel with other vendors and will be quoting competitive rates in the tenders invited by the Indian Railway/PUs.

Weare aware of the fact that the Registering Authority i.e. RDSO may de-list the name of our firm from the Master List of Approved Vendors if complain' is received about such cartel formation from any of the Railways/Production Units.

Seal and Signature
(Authorised signatory of the firm)

Date :

Place .

Seal .

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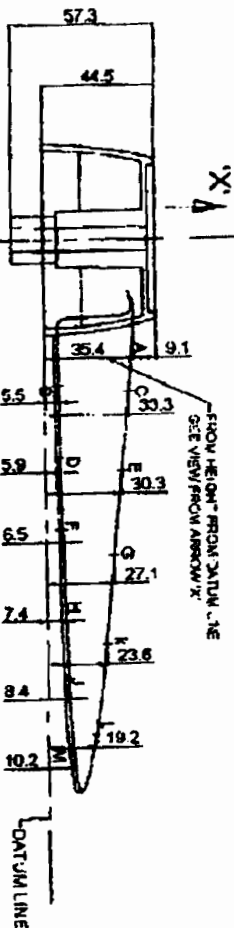
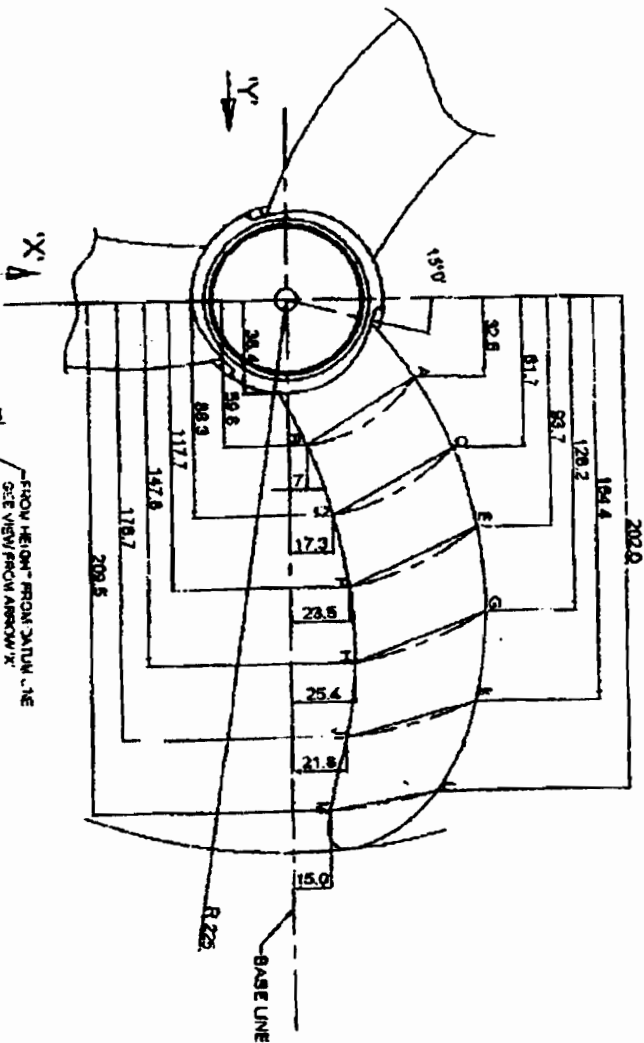
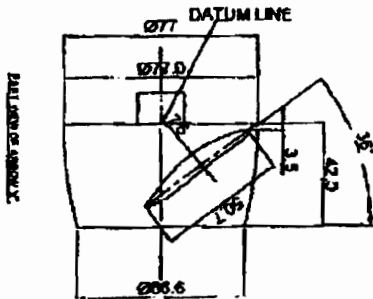
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DISTRIBUTION

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2	CENTRAL RAILWAY, II FLOOR PARCEL OFFICE, CST MUMBAI - 400 001.
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14	NORTH WESTERN RAILWAY, JAIPUR - 302006
15	WEST CENTRAL RAILWAY, JABALPUR - 482001
16	EAST COAST RAILWAY, BHUVNESHWAR, ORRISA - 751016
17	KONKAN RAILWAY, BELAPUR BHAVAN, SECTOR-11, BELAPUR, MUMBAI - 400614
18	Metro Railway, 33/1 J.L. Nehru road, Kolkata- 700071
19	Integral coach factory, Perambur, Chennai - 600038
20	Rail Coach Factory, Kapurthala (Punjab) - 144 602
CHIEF WORKS MANAGER:	
1	Malunga Workshop, Centra Railway, Mumbai 400 019.
2	Lituan Workshop, Eastern Railway, Howrah
3	C&W Workshop, Northern Railway, Alambagh, Lucknow-226 05
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6	Carriage Workshop, Southern Railway, Perambur, Ayanavaram, Chennai - 600023.
7	SCR, Lallagudda Workshop, Lallagudda, Secunderabad - 500017
8	Carriage Workshop, Western Railway, Lower Parel, Mumbai-400013
9	CRWS, W. C. Railway, Nisatpura Bhopal-462010
10	Carriage Workshop NW Rly, Ajmer - 305001
11	Carriage Repair Workshop, Gadag Road, SWR, Hubli - 580 020
12	Carriage Workshop, S.W. Railway Mysore Vishwanath.
13	Carriage Workshop, SE Rly., Kharagpur - 721301
14	New Bongaigaon, Railway Workshop Dantel, Dist. Bongaigaon, Assam-783380
15	Carriage and Wagon Workshop, N. C. Rly., Jhansi - 248003
16	Carriage and Wagon Workshop, WC Rly., Kota - 324002
17	Carriage and Wagon Workshop, Eastern Rly., Liliha - 711204
18	Carriage and Wagon Workshop, W. Rly., Pratap Nagar, Vadodara - 390004
19	Carriage and Wagon Workshop, N Rly., Amritsar - 143001
20	Central Workshop, Goldenrock, S. Rly., Trichi - 620004
OTHERS:	
1	Director, IRIEEN, Nasik Road (Maharashtra). - 422101
2	Senior Professor (Elect.), Railway Staff College, Lalbaug, Vadodara. - 390004
3	Director, IRCAMTECH Maharajpur, Gwalior - 474 020.

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DSF(TI - AC & System Design) *2/2/11*



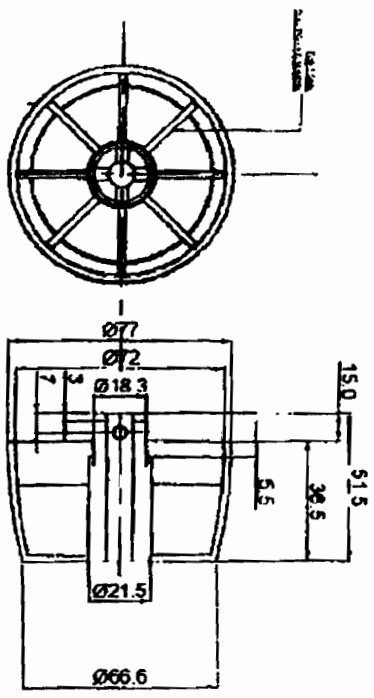
NOTES:

1. REFER SHEET NO 2 FOR DETAILS OF PROFILE MATERIAL OF BLADE LEAF
2. BLADE MATERIAL SHALL BE POLYIMIDE 0.3MM OF THE RETARDANT USE VOLTAGE OF 1000V OR 8 VOLT
3. BLADE ANGLE SHALL BE MEASURED BY ANGLE PROTRACTOR AT DIFFERENT SECTION OF PROFILE OF BLADE & DIMENSION SHALL BE MEASURED BY VERNIER CALIPER
4. NAME OF BLADE MANUFACTURER SHALL BE ENGRAVED ON BLADE & GP NO BATCH NO DATE & OTHER SUCH DATA SHALL BE SCREEN PRINTED PERMANENTLY
5. WEIGHT OF BLADE SHALL BE 3000mg +/- 150mg
6. SALICIN OF THE BLADE SHALL BE 8% MAX.

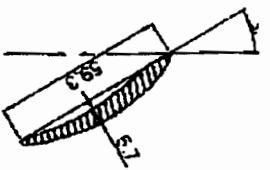
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REF: EL 55.1					
		DRAWING FOR THE FRP BLADE FOR 110VOLT DC			
		BAC 450mm SWEEP RAILWAY CARriage FAN			
		OF MIDIAN RAILWAY			

ROSOPE/8/17/0123-2008

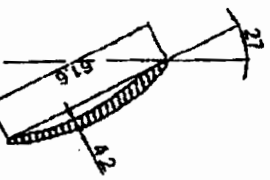
SHEET 1 OF 1



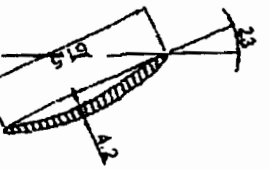
SECTION P-Q



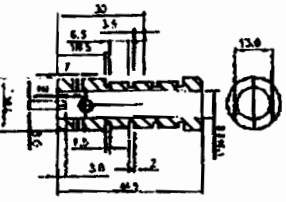
SECTION A-B



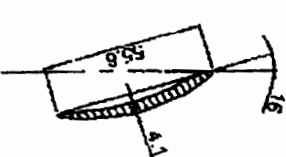
SECTION C-D



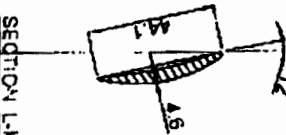
SECTION E-F



SECTION G-H



SECTION I-J



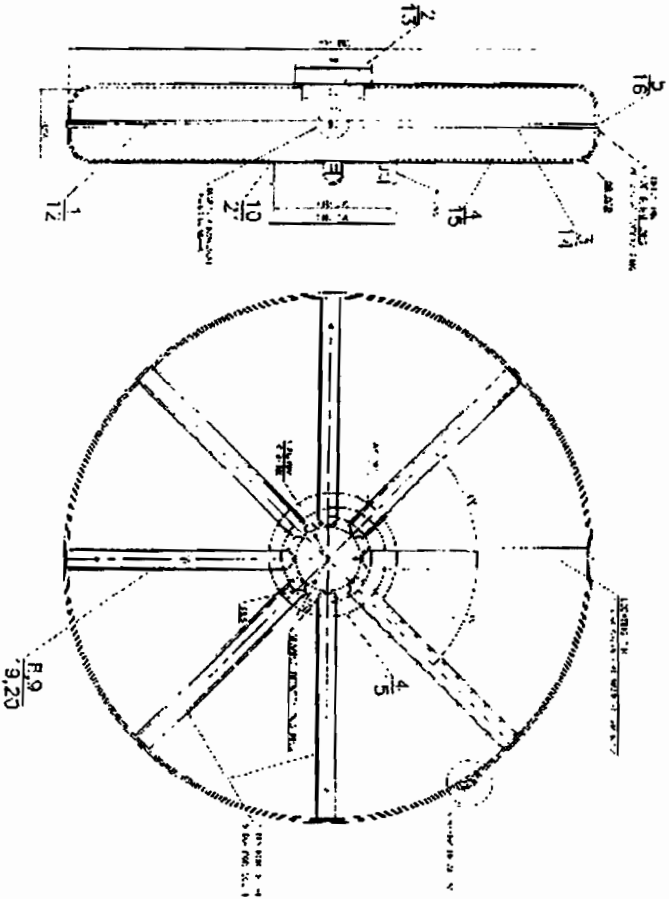
SECTION K-L

DETAIL OF ALUMINUM INSERT

NOTE: THE ALUMINUM INSERT IS TO BE USED IN THE ROOT OF THE BLADE. THE INSERT IS TO BE USED IN THE ROOT OF THE BLADE. THE INSERT IS TO BE USED IN THE ROOT OF THE BLADE.

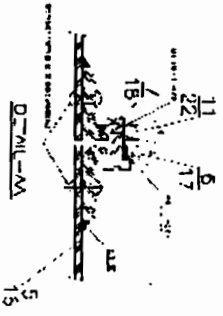
PROPERTIES OF MATERIAL OF BLADE			
NO.	PROPERTIES	RECOMMENDED VALUE	METHOD OF TEST AS PER
1	DENSITY	1680-1700 Kg/m ³	ISO 1183
2	MELTING POINT	MIN 220 DEGREE C	ISO 1183-2-3
3	GLASS TRANSITION	51.50%	ISO 345-1-1
4	THERMAL STABILITY TEST	V.O CLASS	UL94
5	HEAT DEFLECTION TEMPERATURE (HDT) DEGREE C	MINIMUM 185	ISO 75-1, 2, 3 (ASTM D645)
6	TENSILE STRENGTH AT 23 DEGREE C	MINIMUM 20 KMPA	ISO 180-1U
7	BRITTLE MODULUS	MIN 8000 MPa	ISO 27-1, 2
8	TENSILE STRENGTH AT BREAK	MIN 1200 MPa	ISO 27-1, 2
9	TENSILE STRAIN AT BREAK	MIN 1.5%	ISO 27-1, 2
10	FLEXURAL STRENGTH	MIN 1800 MPa	ISO 178

REF NO	PART NO	DESCRIPTION	DETAILED DRG NO	NO. COACH	DATE SPEC
REF: EL. 6.3.1					
DRAWING FOR THE FRP BLADE FOR 110 VOLTS DCBAC 450mm SWEEP RAILWAY CARRIAGE FAN OF INDIAN RAILWAY					
RDSO/PE/SKT/L0123-2006					
SHEET 10 OF 10					

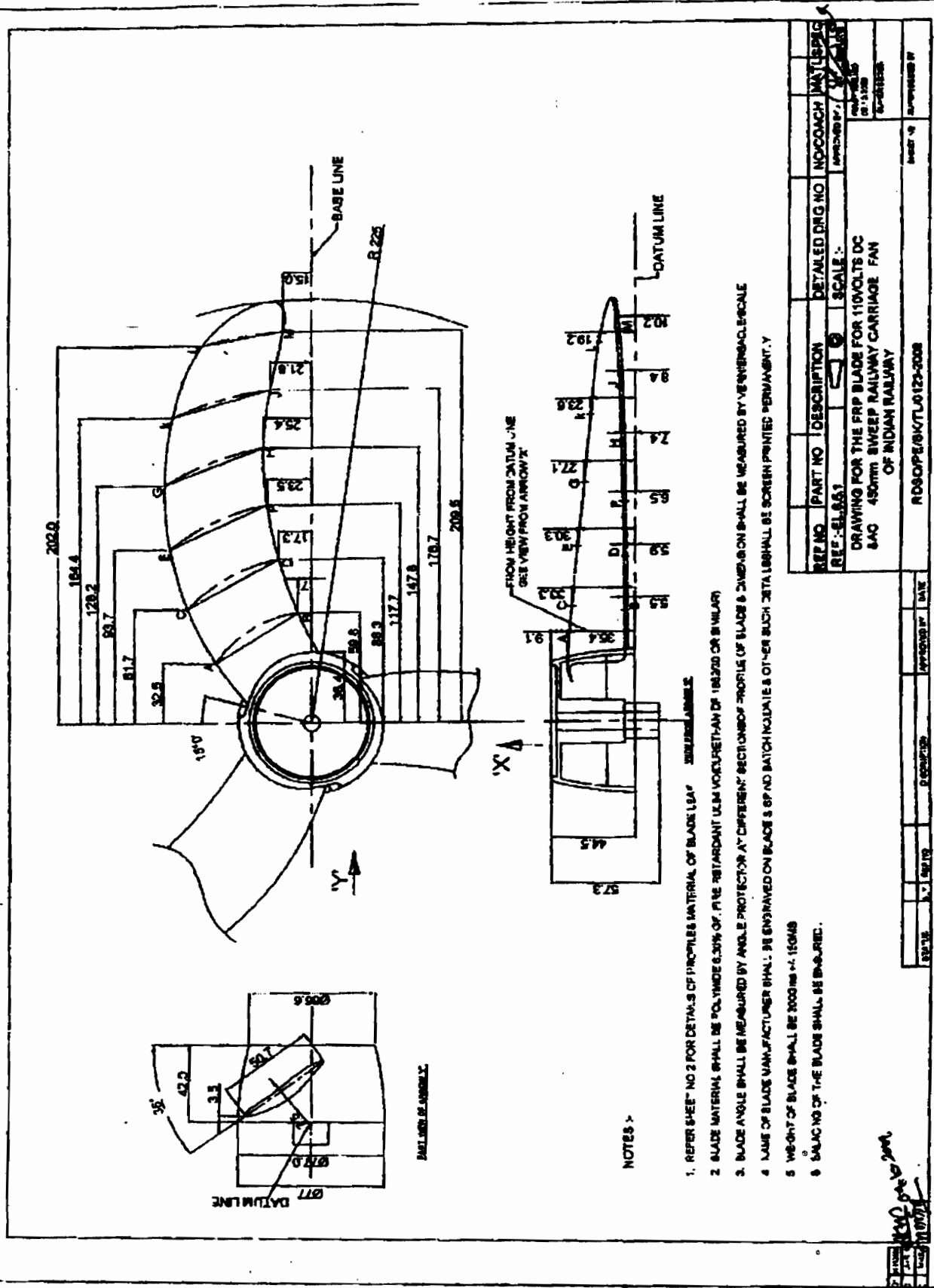


NOTE

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
2. ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED.
3. ALL DIMENSIONS ARE TO CENTER UNLESS OTHERWISE SPECIFIED.



CRASH WORTHY FAN GUARD FOR 450AMP SWEEP			
ITEM	DESCRIPTION	QTY	REMARKS
1	GUARD HOUSING	1	
2	GUARD HOUSING	1	
3	GUARD HOUSING	1	
4	GUARD HOUSING	1	
5	GUARD HOUSING	1	
6	GUARD HOUSING	1	
7	GUARD HOUSING	1	
8	GUARD HOUSING	1	
9	GUARD HOUSING	1	
10	GUARD HOUSING	1	
11	GUARD HOUSING	1	
12	GUARD HOUSING	1	
13	GUARD HOUSING	1	
14	GUARD HOUSING	1	
15	GUARD HOUSING	1	
16	GUARD HOUSING	1	
17	GUARD HOUSING	1	
18	GUARD HOUSING	1	



NOTES >

1. REFER SHEET NO 2 FOR DETAILS OF PROFILES MATERIAL OF BLADE LEAF
2. BLADE MATERIAL SHALL BE POLYIMIDE 6.30% OF FIVE RETARDANT UHM VOLTETHAN OF 180200 OR SIMILAR
3. BLADE ANGLE SHALL BE MEASURED BY ANGLE PROTECTOR AT DIFFERENT SECTIONS OF PROFILE OF BLADE & DIMENSION SHALL BE MEASURED BY VERNIER CALIPER
4. NAME OF BLADE MANUFACTURER SHALL BE ENGRAVED ON BLADES & IF NO BATCH NO. IN BLADES OTHER SUCH DATA SHALL BE SCREEN PRINTED PERMANENTLY
5. WEIGHT OF BLADE SHALL BE 2000ms $\pm$ 150ms
6. BALANCE NO OF THE BLADE SHALL BE ENGRAVED.