ENCLOSURES :
DRG. NOS.: CLW/ES/3/SK-1/0016/B~~B~~C
CLW/ES/3/SK-2/0016/B~~B~~C

TECHNICAL SPECIFICATION FOR

SURGE ARRESTER

FOR 3-PHASE ELECTRIC LOCOMOTIVES.

SPECIFICATION NO : CLW/ES/3/0016

ISSUE DATE: 14.11.1996

ISSUED BY:

DY. CHIEF ELECTRICAL ENGINEER/D-II
CHITTARANJAN LOCOMOTIVE WORKS
P.O. CHITTARANJAN– 713331
DIST.-BARDHAMAN (WEST), WEST BENGAL (INDIA)

PREPARED BY	CHECKED BY	APPROVED BY
JE/SSE-Design	AEE/SEE-Design	Dy.CEE/D-II

ALTERATION RECORD SHEET

Alteration No.	Date	Page No.	Reason	Authority
A	25-01-2018	5, 5A	- Incorporation of direct molded silicone type Polymer Insulator in addition with Porcelain Insulator. - List of Tests revised and given in page 5A superseding the page 5.	Sd/-
B	05-06-2018	5A	- Deletion of Power Frequency Voltage test (Dry) from routine test schedule. - Incorporation of standard (EN 45545-2) for Fire & Smoke behavior test for polymer insulator only.	Sd/-
C	--	4,5	-Revision of “Climate and Environment Conditions” in clause no. 2. -Revision of Creepage distance and E (min.) distance in clause no. 4.	--

Note: Specifications have been digitized and all alterations have been incorporated.

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SPECIFICATION FOR SURGE ARRESTOR FOR THREE PHASE ELECTRIC LOCOMOTIVES

TABLE OF CONTENTS

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SPECIFICATION FOR SURGE ARRESTOR FOR 3-PHASE ELECTRIC LOCOMOTIVES

1. SCOPE:-

This specification applies to Surge Arrester for Three Phase electric locomotive for 25KV AC 50 Hz System.

2. CLIMATE AND ENVIRONMENT CONDITIONS:

- ~~Maximum atmospheric temperatures : Under Sun : 70°C~~
  ~~: In Shade : 50°C~~
- ~~Humidity : 100% saturation during rainy season.~~
- ~~Reference Site condition:~~

~~1) Ambient Temp. : Max. 47°C and min. 0°C~~
~~2) Humidity : 60%.~~
~~3) Altitude : 160 m above mean sea level.~~
~~4) Rainfall : Very heavy in certain areas. The locomotive will be designed to permit it's running at 10 km/hr in flood water level of 102 mm above rail level.~~

- ~~Atmosphere during hot weather : Extremely dusty and desert terrain in certain areas.~~
- ~~Coastal areas : Locomotive and equipment will be designed to work in coastal areas in humid and salt laden atmosphere.~~
- ~~Vibration : The equipment, sub-system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in corresponding IEC publications unless otherwise prescribed.~~

Atmospheric temperature	i. Maximum temperature of metallic surface under the sun: 75°C. ii. Minimum temperature: - 10°C (Also snowfall in certain areas during winter season.
Humidity	100% saturation during rainy season.

Reference site Conditions	i. Ambient temperature: 50 °C. ii. Humidity: 100%. iii. Altitude: 1776 m above mean sea level.
Rainfall	Very heavy in certain areas
Atmospheric Conditions	Extremely dusty and desert terrain in certain areas. The dust content in air may reach a high value of 1.6 mg / m^3. In many iron ore and coal mine areas, the dust concentration is very high affecting the filter & air ventilation system.
Coastal area	Humid & salt laden atmosphere with maximum pH value of8.5, sulphate of 7 mg per liter, maximum concentration of chlorine 6 mg per liters and maximum conductivity of 130micro siemens/cm
Vibration	The equipment, system and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified in IEC 61373.
Wind speed	High wind speed in certain areas, with wind pressure reaching 150 kg/m3.

3. STANDARD: As per IEC – 60077, IEC – 60099-4, IS – 3070**.**

4. TECHNICAL DATA: -

i) Max. Cont. Voltage U_C (rms) : 33 KV.
ii) Rated Voltage (rms) : 41.3 kV
iii) Rated discharge current (peak value) : 10 kA
iv) Impulse withstand current (peak value) : 100 kA
v) Residual Voltage U_P with wave-Form at discharge current of

Wave 1/5 µS		Wave 8/20 µS				Wave 30/60 µS	
10 kA U_P (peak) KV	20 kA U_P (peak) KV	5 kA U_P (peak) KV	10 kA U_P (peak) KV	20 kA U_P (peak) KV	40 kA U_P (peak) KV	1 kA U_P (peak) KV	3 kA U_P (peak) KV
104.7	118.5	91.2	95.3	105.0	114.6	81.9	87.5

vi) Creepage distance (total) (see Drg. No. CLW/ES/3/SK-2/0016) : ~~972 mm~~ 1050 mm (min)
vii) Protected against rain (see Drg. No. CLW/ES/3/SK-2/0016)
a) 45° : 553 mm

b) 90° : 292 mm
viii) Flashover Distance : 475 mm
ix) Minimum clearance
(see Drg. No. CLW/ES/3/SK-2/0016)
E (min.) : ~~332 mm~~ 352 mm
F (Min.) : 440 mm
x) IEC recommendations : Class 3
xi) Quantity per loco : 2
xii) Place : Roof
xiii) Weight (Approx.) : 36 Kg.

5. DESIGN AND CONSTRUCTIONAL DETAILS:

The active part of surge arrester shall consist of metal-oxide resistors connected in series, with a highly non-liner characteristics, integrated in a porcelain/direct molded silicone housing (polymer) insulator. At the service voltage a predominantly capacitive current of only a few milli ampere flows. When the voltage rises, the resistors begin to conduct without delay and limit any further rise in voltage at the terminals. When the overvoltage wave decreases, the arrester immediately reverts to the non-conducting or only slightly conducting state.

The housing of the surge arrester is composed of a single piece insulator with a glazed surface. The end flange of insulator section, which are made of a corrosion resistant MS/ aluminum alloy, are provided with vents.

The equipment shall be supplied by the manufacturer with all the accessories.

6. TEST PROCEDURES:

The equipment shall be tested according to IEC: 60099-4/1991 & IEC: 60099-4/ 1998, IS: 3070 Pt. III (1993) unless otherwise prescribed, to prove the general quality of design and its conformity with the specifications. Consistency type test of every 5 years interval as per bellow mentioned list: -

TEST PROCEDURE FOR SURGE ARRESTER			
SL. NO.	**TEST**	**TYPE TEST**	**ROUTINE TEST**
1.	**POWER FREQUENCY REFERENCE VOLTAGE TEST**	**YES**	**YES**
2.	**INSULATION WITHSTAND TEST ON THE HOUSING OF ARRESTER** (A) LIGHTNING IMPULSE VOLTAGE TEST (250 KVP-15 IMPULSE)	**YES**	**NIL**

	(B) POWER FREQUENCY VOLTAGE TEST (DRY) TEST VOLTAGE (DRY); 130 KV (RMS)	**YES**	**NIL**
	(C) POWER FREQUENCY VOLTAGE TEST (WET) TEST VOLTAGE (WET): 110 KV (RMS)	**YES**	**NIL**
3.	**RESIDUAL VOLTAGE TESTS:** (A) STEEP CURRENT IMPULSE RESIDUAL VOLTAGE TEST	**YES**	**NIL**
	(B) LIGHTNING IMPULSE RESIDUAL VOLTAGE TEST (MAX. 115 KV PEAK)	**YES**	**YES**
	(C) SWITCHING IMPULSE RESIDUAL VOLTAGE TEST	**YES**	**NIL**
4.	**LONG DURATION CURRENT IMPULSE WITHSTAND TEST**	**YES**	**NIL**
5.	**SWITCHING SURGE OPERATING DUTY TEST**	**YES**	**NIL**
6.	**POWER FREQUENCY VOLTAGE VERSUS TIME CURVE**	**YES**	**NIL**
7.	**PRESSURE RELIEF TEST**	**YES**	**NIL**
8.	**PARTIAL DISCHARGE TEST (< 10 PC)**	**YES**	**YES**
9.	**INSULATION RESISTANCE MEASUREMENT (> 100 G OHM)**	**YES**	**YES**
10.	**LEAKAGE CURRENT MEASUREMENT(> 1 mA FOR 33/34 KV MCVO)**	**YES**	**YES**
11.	**SHOCK AND VIBRATION TEST**	**YES**	**NIL**
12.	**FIRE AND SMOKE BEHAVIOR TEST FOR POLYMER (EN45545-2) ONLY**	**YES**	**NIL**
13.	**TEMPERATURE CYCLE TEST ON PORCELAIN HOUSING ONLY**	**YES**	**NIL**
14.	**POROSITY TEST ON PORCELAIN COMPONENTS ONLY**	**YES**	**NIL**
15.	**GENERAL** (I) CHECKING DIMENSIONS WITH DRAWING. (II) SUITABILITY OF MOUNTING ARRANGEMENT. (III) SUITABILITY OF FLEXIBLE CONNECTION AND JOINTS.	**YES**	**YES**

DOCUMENTS TO BE SUPPLIED BY THE TENDERER :

The tenderer shall interalia furnish the following along with the quotation:

i. (i) Clause wise comments on the specification and test programme.
ii. (ii) Detailed drawings.
iii. (iii) Past experience with supporting papers (if any.)
iv. (iv) Past test reports, (if any.)
v.

7. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER :

The following documents shall be supplied by the supplier as part of contract:

i. (i) Type test reports.

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ii. (ii) Routine test reports along with each set.
iii. (iii) Maintenance manual.
iv. (iv) Detailed drawings.

8. QUALITY ASSURANCE:

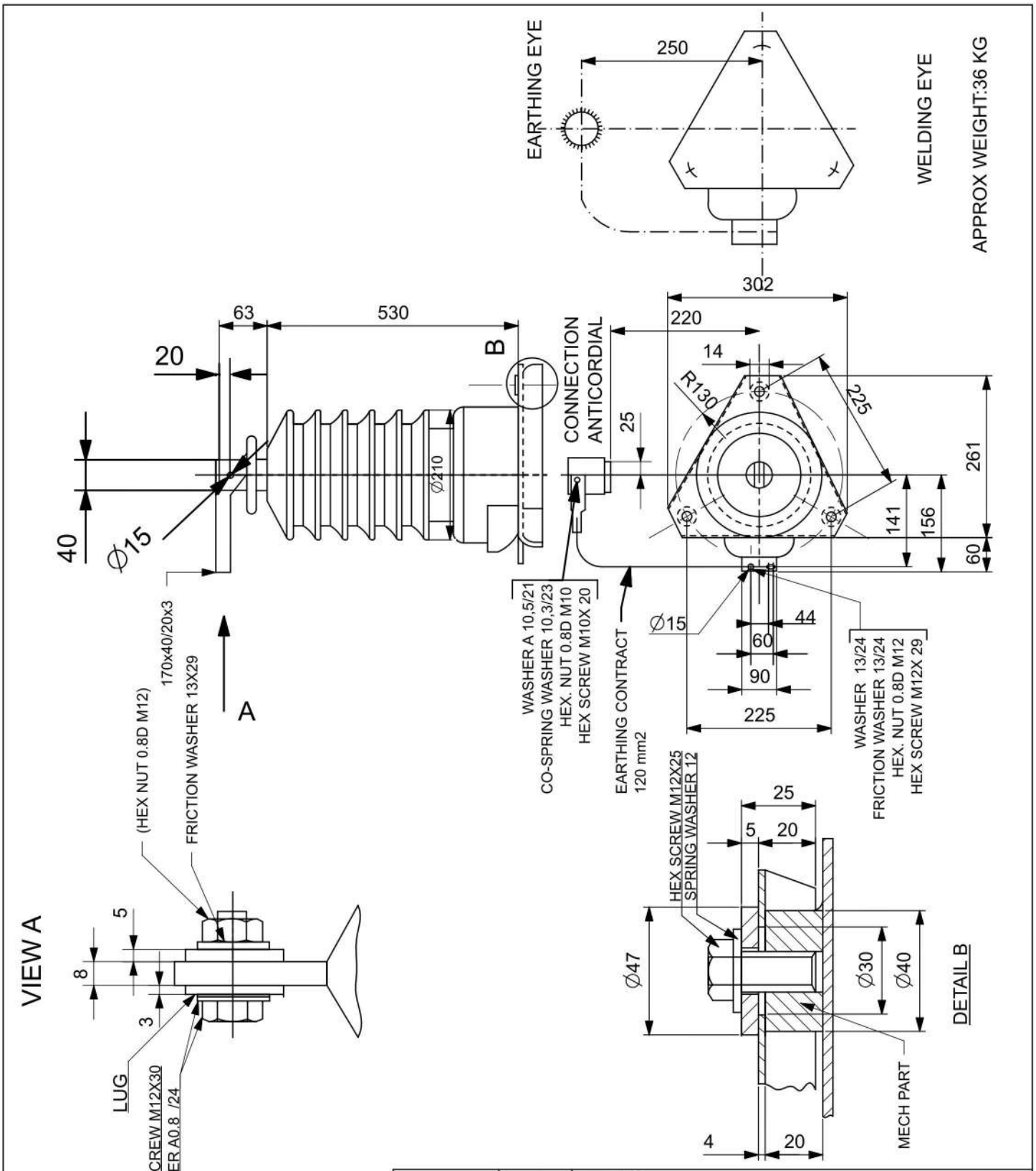
Quality assurance should be as per ISO 9000.

9. REFERENCE:

Type : ABB/ MNA 33.
Supplier : ABB Hochspannungsstechnik AG,
Division AR,
Jurastrasse 45/Postfech
5430 wettingen,
Switzerland.

Schematic Position : 9

Note: The tenderer shall embossed the name of the firm, ratings, max. rated voltage, months and year of manufacture, sl.no. on the equipment.



परिवर्तन संख्या ALT.NO.	प्राधिकार AUTHY	वर्णन DESCRIPTION	दिनांकित आद्यक्षर DATED INITIAL

सतह – रुक्षता का मान भा. मा. 3073 / अ. मा. सं. 1302
SURFACE ROUGHNESS VALUE TO IS:3073 / ISO:1302

अनिर्दिष्ट सह्य – सीमा भा. मा. : 2102 / अ. मा. सं. : 2768
UNSPECIFIED TOLEARANCE TO IS : 2102 / ISO : 2768

धातु–वेल्डन चिन्ह भा. मा. : 813 / अ. मा. सं. :2553
WELDING SYMBOLS TO IS:813 / ISO:2553

TOL. CLS.

पदांक GRADE NO.	सं1 N1	सं2 N2	सं3 N3	सं4 N4	सं5 N5	सं6 N6	सं7 N7	सं8 N8	सं9 N9	सं10 N10	सं11 N11	सं12 N12
Rz	0.16-0.3	0.5-0.7	0.9-1.1	1.5-2.0	2.5-3.8	5.0-6.3	9.0-12	16-25	30-40	50-63	75-100	160-250
Ra μm	0.025	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.3	12.5	25	50
चिन्ह SYMBOL												

अभिकल्पित DGN	
जाँचा व.अ.अ. CHD SSE	
सशीक्षित स.वि.अ. / व.वि.अ. REVIEWED AEE / SEE	
अनुमोदित उ.मु.वि.अ. APPROVED DYCEE	
दिनांक DATE	
रैखिक अनुपात SCALE	N.T.S
संदर्भ / REF. ALT.-	

चित्तरंजन रेलइंजन कारखाना
CHITTARANJAN LOCOMOTIVE WORKS, INDIA

पदार्थ MAT'L	प्रति भार कि. ग्रा. WT. EACH IN KG
विशिष्टि SPECN	

वर्णन DESCRIPTION: **SURGE ARRESTER**

आरेखण संख्या DRAWING NO.: **CLW/ES/3/SK-1/0016/C**

परिवर्तन संख्या ALTERATION. NO. | पर्ण SHEET 0F | A4

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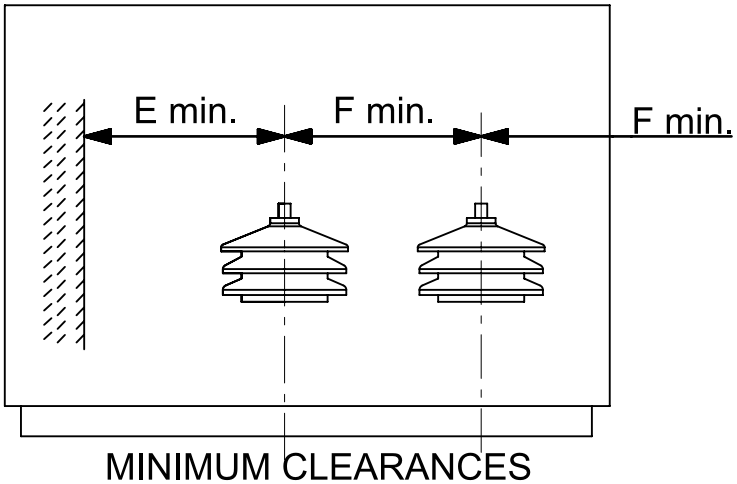

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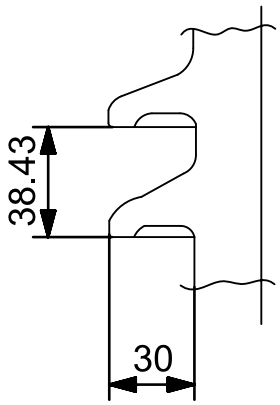
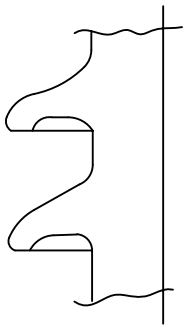


SHAPE OF THE SHEDS OF THE PORCELAIN INSULATORS.



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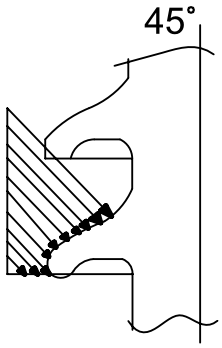

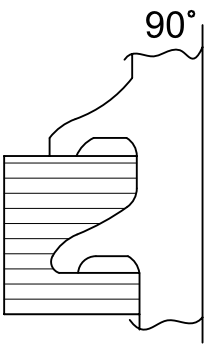

PROTECTED AGAINST RAIN

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परिवर्तन संख्या ALTERATION. NO. | पर्ण SHEET OF | A4

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