

File No.RDSO-TI0LKO(OHE)/42/2020-O/o PED/TI/RDSO

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लखनऊ-226011
Government of India - Ministry of Railways
Research Designs & Standards Organisation
Manak Nagar, Lucknow - 226011



No. RDSO-TI0LKO(OHE)/42/2020-O/o PED/TI/RDSO

Date: 12.01.2023

1. The Principal Chief Electrical Engineer,
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 - ii. East Coast Railway, B-Rental Colony, Chandrahekhpur, Bhubaneswar (Orissa)-751023
 - iii. Northern Railway, Baroda House, New Delhi-110001
 - iv. North East Frontier Railway, Maligaon, Guwahati-781011
 - v. Southern Railway, Park Town, Chennai-600003
 - vi. South Central Railway, Rail Nilayam, Secunderabad-500371
 - vii. South East Central Railway, Bilaspur (Chattisgarh)-495004
 - viii. South Western Railway, DRM's office, Hubli, Bangalore -580028
 - ix. Eastern Railway, Fairlie Place, Kolkata-700001+
 - x. East Central Railway, Hajipur (Bihar)-844101
 - xi. North Central Railway, Block-A, Subedarganj, Allahabad-211033
 - xii. North Eastern Railway, Gorakhpur (UP)-220055
 - xiii. North Western Railway, Jaipur-302017
 - xiv. South Eastern Railway, Garden Reach, Kolkata-700043
 - xv. Western Railway, Churchgate, Mumbai-400020
 - xvi. West Central Railway, Jabalpur-482001
 - xvii. Konkan Railway Corporation Ltd., BelapurBhavan, Sector-11, CBD- Belapur, Navi Mumbai, Maharastra-400614.
 - xviii. Metro Railway, Kolkata, Metro Bhavan, 33/1, J L Nehru Road, Kolkata-700031.
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3. Director General, IRIEEN, Post Box 233, Nashik Road-422101
4. Chairman and Managing Director, IRCON, Room No. 505, Palika Bhawan, Sector -13, R. K. Puram, New Delhi-110066
5. Managing Director, DFCCIL, 5th Floor, Pragati Maidan, Metro Station Building Complex, New delhi-110 001
6. Chief Executive Officer, Railway Energy Management Co. Ltd, Ground Floor, Central Wing, Sector 29, Gurgaon-122001
7. Director Technical, MRVC, 2nd Floor, Churchgate, Mumbai-400020.
8. ED (Electrical), RVNL, 1st Floor, August Kranti Bhavan 'B' Block, BhikaJi Cama Place, R K Puram, New Delhi-110066
9. Chairman and Managing Director RITES LTD, Shikhar, Plot No.01, Sector 29, Gurgaon, Haryana, India-122001

Sub: Guideline for hotline cleaning of insulators

Ref: (i) RDSO's letter no. TI/GEN/MSG/TRD dated 31.10.2022

(ii) Item No 6.1 of CRB's Inspection Note No.2022/CRB/TP/13 dated 13.12.2022.

(iii) RDSO's letter no. No. RDSO-TI0LKO(OHE)/2/2020-O/o PED/TI/RDSO dated 06.01.2021

(iv) This office letter no. TI/GEN/MSG/TRD Dated 10.11.2020.

(v) RB letter No.2008/EEM/220/1 dated 27.10.2020.

(vi) Item No.31.6 and 31.12 of 31st MSG/TRD

Vide letter under reference (i) above, RDSO had circulated draft guidelines for hot line cleaning of insulators to Zonal railways and other stakeholders for comments and suggestion. Comments from SR, CR, SWR and ECoR were only received. Comments were examined and based on the further studies considering safety involved and international standards & practices, Guidelines for Hot Line Cleaning of Insulators, instruction No. TI/IN/0045 Rev.0 has been finalised and approved by the competent authority. Copy of the same is enclosed here with for ready reference and necessary action of Zonal Railways.

This issues with the approval of competent authority.

(अरविंद कुमार Arvind Kumar)

निदेशक/टीआई -1 Director/TI-1
Digitally Signed by Arvind
कुते महानिदेशक/टीआई For Director General/TI
Kumar

Copy for information please.

Date: 12-01-2023 13:58:18

Reason: Approved

1. Executive Director, EEM, Railway Board, Rail Bhavan, New Delhi- 110001
2. Director /Electrical, DMRC, Metro Bhawan, 8th Floor, Fire Brigade Lane, Barakhamba Road, New Delhi-110001.



भारत सरकार

रेल मंत्रालय

GOVERNMENT OF INDIA

Ministry of Railways

इंसुलेटर की हॉट लाइन सफाई के लिए दिशानिर्देश
Guidelines for hot line cleaning of insulators

निर्देश संख्या टीआई/आईएन/0045 संशोधन 0
INSTRUCTION No. TI/IN/0045 Rev.0

जनवरी January, 2023

जारी कर्ता Issued by:

कर्षण संस्थापन निदेशालय,

Traction Installation Directorate

अनुसंधान अभिकल्प एवं मानक संगठन
RESEARCH DESIGNS & STANDARDS ORGANISATION

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(केवल आधिकारिक प्रयोग के लिए For official use only)

TITLE: Guidelines for hot line cleaning of insulators.**1. BACKGROUND:**

An insulator assembly is used to provide electrical isolation between two elementary sections which are otherwise continuous. Currently conventional solid core porcelain insulators and Silicone based Composite Insulators are being used in Indian railways. Ceramic insulators are made from porcelain, whereas Composite insulators are made of silicone based composite rubber material.

The OHE insulators require regular cleaning to ensure uninterrupted traction power supply. The periodicity of cleaning varies from area to area depending upon pollution level. Where pollution is heavy, the cleaning is to be done more frequently. The cleaning is essential as the insulators are affected by dust/ smoke particles, industry/ chemicals deposits. If these deposits are not removed at regular intervals, they are liable to become hard and difficult to remove in course of time, and by reducing the insulation of the OHE greatly, lead finally to a flashover and puncture.

2. DESCRIPTION OF EXISTING PRACTICE OF CLEANING OF INSULATOR IN IR:

- 2.1** The existing practice in Indian Railways for cleaning porcelain insulators manually have been given in ACTM Vol- I (20229) with the help of ladder and tower car by taking power blocks. All insulators cleaned with dry cloth and look for any flashover marks, cracks, and chippings. Insulators which are badly chipped are replaced. Minor chippings are rendered impervious to moisture by a light coating of Araldite or similar epoxy.
- 2.2** For composite insulators, instruction no. TI/IN/0040 Rev.0 (November, 2019) for cleaning of 25 KV composite insulators has been issued by RDSO, which stipulates cleaning of composite insulators with DRY SOFT COTTON CLOTH only to remove the dust/ pollution from the insulator. No water, detergents, any solvents and abrasive materials is to be used for cleaning as use of such material leads to deterioration of electrical properties thus causing failure.
- 3.** Railway Board's Recommendations of 31st MSG (TRD) meeting held on 8th & 9th November, 2019 at Somnath in Western Railway were communicated to Zonal Railways vide RDSO's letter no TI/GEN/MSG/TRD dated 10.11.2020.
 - 3.1** As per the recommendations against item No.31.6 & 31.12 of 31st MSG (TRD) meeting held on 8th & 9th November, 2019 at Somnath, Western Railway; Central Railway (CR) and North Central Railway (NCR), being item proposing Railways were requested vide RDSO's letter no. No. RDSO-TI0LKO(OHE)/2/2020-O/o PED/TI/RDSO dated 06.01.2021 to submit the details regarding Hot line cleaning system for OHE Insulators for further study at RDSO.
 - 3.2** Southern Railway vide letter No. E.134/ET/11/OHE, dated 30.05.2022, had sent recommendations of 31st MSG (TRD) meeting to TI/RDSO. As per the recommendations against item No.31.6 & 31.12, Southern Railway has submitted the details regarding Hot line cleaning system for OHE Insulators

4. Details received from Central Railway and Southern Railway regarding Hot line cleaning system. The same has been examined and following are observed:

4.1 Central Railway and Southern Railway have proposed system for hotline cleaning where high pressure water jet is utilized for cleaning of insulators. Due to presence of triplex piston pump/high pressure pump, water path is not continuous thus increasing electrical resistivity which minimizes leakage current to a negligible level.

4.2 For operating the system with sufficient electrical resistivity required, the nozzle of water pump is required to be held at a predetermined distance from the live point so that negligible leakage current is encountered. The distance varies with voltage level as given in Para 6.5.2.

4.3 This system requires application of demineralized water with a resistivity greater than 100000 Ω .cm is desirable for insulator cleaning purpose.

4.4 For safety reasons, conductivity of water and leakage current is continuously required to be monitored by suitable conductivity meter & leakage current detector respectively.

4.5 The details of tools/ test instrument of hotline cleaning system sent by Central Railway are for 110 kV system being used at TATA power substation.

4.6 RDSO have done literature survey over internet to see the world wide scenario of hotline cleaning of insulators. As per details available over internet no hot line cleaning of insulator is found in practice for railway system Internationally. However, hotline cleaning is being employed for cleaning of transmission line insulators by various TRANSCOM and DISCOMS.

5. Currently four type of hot line cleaning of insulators suggested worldwide i.e. High-pressure water washing, Compressed air cleaning, CO₂ pellets and hot wiping. The details are as under:

5.1 High-pressure water washing:

High-pressure water washing utilizes a narrow stream of water with typical pressures ranging 400 psi to 1000 psi at the nozzle. Four types of nozzles are most often used with high-pressure water handheld jet, remote-control jet (pea shooter), fixed spray, and helicopter mounted. The details submitted by Central Railway employs this system.

5.2 Compressed air cleaning:

This method of cleaning insulators involves the use of compressed air and an abrasive cleaning compound. This procedure requires an air compressor capable of supplying a minimum of 0.05 m³/s at 125 psi, an air dryer, a pressure blaster, an applicator wand, adequate supply hoses, and cleaning compound.

5.3 CO₂ Pellets (Dry Ice):

CO₂ pellets are a commonly used nonabrasive component. In the CO₂ process, the pellets of frozen CO₂ strike the surface of the insulator, penetrating through the contaminant to the insulator surface. The pellet then sublimates into a gas, which blasts the contaminant from the surface. There is no abrasive action to the insulator. This is normally used to break the ice deposition on insulators.

5.4 Hot Wiping (Using a Live-Line Tool):

A procedure using hot sticks (insulated rods) and a special hammock (usually made from burlap i.e fabric used to make sacks) to clean energized insulators is used on equipment operating at voltages from 4 kV to 69 kV. The need for cleaning energized insulator depends upon the level of contamination and the risk of flashover during washing. This procedure may also be used prior to hot washing of insulators to reduce the possibility of flashover.

Some Railways have tried this process by using discharge rods for wipe cleaning of the insulators but not found very effective.

6. WORLDWIDE PRACTICES OF HOT LINE WASHING OF INSULATORS AS PER IEEE STD 957:2005:

6.1 Water quality for hot line cleaning:

- 6.1.1 Water of high resistivity or low conductivity is utilized in cleaning energized insulator.
- 6.1.2 Constant testing of the water being used is important and carried out as resistivity of water can quickly change due to change in temperature.
- 6.1.3 Water of poor resistivity, in the range of 750-ohm cm to 1000-ohm cm is purified by de-ionizing system or filtering.
- 6.1.4 Minimum water characteristic is determined based on planed operating practice and expected voltage.
- 6.1.5 A resistivity greater than 1500 ohm-cm is normally preferred.
- 6.1.6 Heavy ice accumulation on insulator can be cleaned using hot water jet spray having resistivity in order of more than 50000 ohm-cm. High water resistivity is required due to the fact that resistivity decreases by a factor of two with the increase of temperature from 25°C to 70°C.

6.2 Cleaning Equipment: Cleaning equipment generally consists of high pressure (400 to 1000 psi) generating pump mounted on road/Rail vehicle with electrical/mechanical water control mechanism including piping, hose, nozzle and water spray jets etc. Pump is powered by means of road vehicle engine itself or separate engine mounted on the road/Rail vehicle. Fiber glass coated mild steel tank or stainless steel of adequate capacity to carry the DM water for hot washing of insulator.

6.3 Type of Insulators to be cleaned:

- 6.3.1 Porcelain insulators are normally cleaned by hot line cleaning systems.
- 6.3.2 For cleaning of composite polymer insulator, manufacturers recommendations are required as high-pressure washing is not recommended for such insulators.

6.3.3 RDSO have interacted with manufacturers of composite insulators to have broad view on the methodology of cleaning of 25 kV composite insulator on Indian Railways. Based on the feedback received, RDSO have issued instruction no. TI/IN/0040 Rev.0 (November, 2019), instruction for cleaning of 25 KV composite insulators. The same is to be followed for cleaning of 25 KV composite insulators.

6.4 Cleaning of Surge Arrestors, Transformer Bushings etc:

6.4.1 Power Transformer Bushings and external enclosures of the surge arrestors are also made of porcelain. While cleaning bushings much attention and care is given being vital part of power transformers and most of its failure starts from bushing failure. Due consideration is given on the pressure and volume of cleaning water with mechanical support. Normally bushings are cleaned with low pressure water jet with fixed nozzle so as to cover entire bushing in one go.

6.4.2 For surge arrestors, energized washing may impose severe electrical stresses on the surge arrestors due to voltage imbalance and is performed under guidance of the arrester manufacturer.

6.5 Other Technical Consideration

6.5.1 Leakage Current:

As per IEEE Std 957:2005, for hotline cleaning system, leakage current is defined as the current that flows through normally nonconducting element such as hose. The parameters that influence the leakage current in the wash water stream are as follows:

- (a) Line voltage
- (b) Distance from the nozzle tip to the energized parts
- (c) Water resistivity or conductivity
- (d) Water pressure
- (e) Nozzle orifice diameter

Normally, a person feels sensation of leakage current of 1mA. Assuming that washing nozzle is properly grounded, no leakage current should flow. To ensure safety, the hotline cleaning equipment, the structure, and the person handling equipment should be at the same potential. However, in case of accidental ungrounding of the nonconducting path of washing nozzle, the leakage current should be limited to 2mA. Currents exceeding 1 or 2 mA are to be guarded against by the using water that falls within the acceptable range of conductivity or resistivity, replacing worn out nozzles and by carefully maintaining safe working distance.

6.5.2 Safe Working Distance:

Nozzle-to-conductor distance for a given line voltage and nozzle diameter is the most important parameter that influences the leakage current and the washing effectiveness of

the water stream. Washing effectiveness and the magnitude of leakage current decrease with increasing nozzle-to-conductor distance. In cases where the wash distance is limited by the tower/structure dimensions, demineralized water of minimum resistivity of 50000 ohm-cm can be used. IEEE Std 957:2005 defines the minimum nozzle to conductor distance for various line voltages. These parameters for applicable voltage range of Indian Railways are tabulated below:

Line Voltage (kV)	minimum nozzle to conductor distance (m)	Minimum water resistivity (ohm-cm)*	Minimum nozzle pressure (psi)	Maximum orifice diameter (mm)
34.5	2.44	1300	400	4.76 to 6.35
69	2.74 to 3.66	1300	400	4.76 to 6.35
115	3.05 to 3.96	1300	400	4.76 to 6.35
230	3.66 to 4.57	1300	400	4.76 to 6.35

** However, for Indian Railway application, cleaning with demineralised water having resistivity of 100000 ohm-cm or greater is recommended due to safety reasons.*

It may be noted, along with maintaining the minimum distance between nozzle and insulator being cleaned, maintaining the maximum distance is also important to maintain the high-pressure compact stream to effectively and accurately wash the contaminants away from insulators. Failure to establish a maximum distance can place the worker at risk by leading to just wetting the insulator surface thus increasing the chances of insulator flashover during hotline cleaning.

6.5.3 Water Resistivity:

It is also an important factor affecting amount of leakage current. Water should be obtained from clean water source and must not contain any chemical, salt or any type of detergent. Resistivity of water depends on water quality. Water of high resistivity greater than 1500 ohm-cm is widely used in hotline cleaning of insulators. Demineralized water of 100000 ohm-cm or greater resistivity is recommended. Water resistivity decreases with increase of water temperature. India being the country of varying weather cycle, hence it is of utmost important that water resistivity is continuously measured specially in summer seasons. To prevent this, water circulating pumps are given rest and not continuously operated. Further, non-temperature compensation type Portable resistivity meters can be utilized for time-to-time measurement of water resistivity though it is not fail safe in extreme hot weather conditions of Indian sub-continent. It is hence preferable that constant resistivity measurement system (non-temperature compensated) should be in built in the hotline

cleaning system for continuous monitoring of the washing water resistivity while hotline cleaning system is in operation to prevent accidental use of high resistivity water.

6.5.4 Grounding:

Road or Rail Vehicle containing hot line washing system should be properly grounded during hotline cleaning operation to prevent building up of dangerously high voltage charges. Also it should be ensured that no human contact is made with the vehicle to avoid establishing a parallel ground through a person's body.

Adherence of the requirements stated in the preceding subclauses will limit the leakage current to safe limits. Additional protection is provided by placing the washing gun operator in an equipotential zone by bonding and grounding appropriately. Refer to IEEE Std 1048-2003 for additional details related to grounding and IEEE Std 957:2005 for hotline cleaning of the insulators.

7. LIMITATION OF LIVE LINE CLEANING IN INDIAN RAILWAY:

- 7.1 Normally, hotline washing systems employ washing system with all accessories like DM water tank, pump etc. mounted on Road vehicle. Such system in Indian Railway can only be utilized in the sections which are accessible by Road.
- 7.2 For sections, where road approach is not possible, dedicated cleaning tower cars equipped with hotline cleaning system with all accessories like DM water tank, pump etc. shall be required this would eliminate the requirement of power block and shall minimize the duration of Traffic block required for cleaning of insulators.
- 7.3 For hot line washing, the resistivity of water should be greater than 1500 ohm-cm to avoid increased leakage current which is dangerous to human safety. Where de-mineralized water jet at very high pressure (400 to 1000 psi) is used, the resistivity of de-mineralized water should be more than 100000 ohm cm.

8. SAFETY ASPECTS:

Following safety measures need to be ensured during Hot line cleaning:

- 8.1 In general, live line working condition, there is risk of electrocution of worker due to flow of current from the live equipment through the worker.
- 8.2 Safety kit materials such as ground mat, rubber shoes, rubber gloves, rain clothes etc. are must for the nozzle operator and should be ensured to avoid getting wet and to prevent electric shock from live voltage.
- 8.3 Safe working distance shall be maintained in accordance to subclause 6.5.2 of this guideline.

- 8.4 Water of high resistivity or low conductivity should be utilized in cleaning energized insulator. In general, warm water has a lower resistivity than cold water. The initial stream should be directed away from the energized equipment until the warm water of lower resistivity is cleared from the hose pipes.
- 8.5 **Continuous Measurement of resistivity of water:** As resistivity can quickly change due to change in temperature. Resistivity of water and leakage current is continuously required to be monitored by suitable non-temperature compensation type resistivity meter & leakage current detector respectively. Suitable interlock with Audio Alarm to restrict the flow of water in case of water resistivity falling below minimum threshold or leakage current going above threshold level shall also be provided in hotline cleaning system as a safety measure.
- 8.6 Road or Rail Vehicle containing hot line washing system should be properly grounded during hotline cleaning operation. No person should be allowed to touch the vehicle while hotline cleaning is in process.
- 8.7 A display board containing Danger sign and symbol should be displayed on Road or Rail Vehicle containing hot line washing system, when in operation.
- 8.8 The nozzle should be grounded properly with the common earthing system of the metallic structure on which the insulator being cleaned is fixed.
- 8.9 It should be ensured that washing gun operator is in an equipotential zone by bonding and grounding nozzle appropriately to whatever the operator is standing on.
- 8.10 Grounding cable used should be as per cable details mentioned in the RDSO specification No. ETI/OHE/51 (9/87) with latest amendments.
- 8.11 Hotline cleaning of insulators to be preferably done through outsource. Person employed for hotline cleaning should be trained and certified by reputed training institutes like Hot Line Training Centre (HLTC), National Power Training Institute (NPTI), Ministry of Power, Government of India, Bengaluru. Railway officials associated with the work of hotline cleaning of insulators shall also be provided similar training and certification.
- 8.12 Hot line cleaning is to be done only during bright sunny day and should not be carried out during rainy, cloudy and night conditions.
- 8.13 **Safety Gears and Equipment:** the operating personnel should wear prescribed protective gears vis-à-vis safety helmet, tinted UV protected eye glasses, safety shoes and any other safety equipment as prescribed from time to time during Live Line washing.
- 8.14 The following standards with latest revision should be used for safety items.
- (a) Gloves—ASTM D 120 and IEC 60903:2014
 - (b) Sleeves—ASTM D 1051 and IEC 60984:2014
 - (c) Protectors for rubber insulating gloves—ASTM F 696

8.15 Water of high resistivity greater than 1500 ohm-cm is widely used in hotline cleaning of insulators. Demineralized water of 100000 ohm-cm or greater resistivity shall be used and can be obtained from demineralizing plants.

For Indian Railway application, cleaning with demineralized water having resistivity of 100000 ohm-cm or greater is recommended due to safety reasons

9. RECOMMENDATIONS:

9.1 RDSO have explored the matter and it is found that on line cleaning of insulators is being carried out by other utility normally through outsource. These sources use demineralized water (DM) for cleaning of insulator. DM is carried on dedicated road vehicle and insulator cleaning is done online with the facilities available on vehicle. The vehicle and accessories are insulated with working voltage.

9.2 In Indian Railway's system, some of the locations are not approachable by road vehicle. Hence this system may not be feasible at all locations over IR. If such cleaning is considered to be done by using Tower Cars, dedicated tower cars equipped with hotline cleaning system with all accessories like DM water tank, pump, hose pipes, spray gun etc. needs to be developed to cover all section of the IR. Alternatively, due to limitation of space available in tower cars, following arrangement can also be considered by Zonal Railways as per feasibility and requirement:

9.2.1 Hot line cleaning system with all accessories like DM water tank, pump, hose pipes, spray gun etc. commissioned on a wagon can be hauled by tower car for undertaking hot line cleaning of insulators.

9.2.2 Road vehicle containing hot line cleaning system can be loaded on Ro-Ro Wagon and be hauled by existing tower wagon to facilitate hotline cleaning in remote areas not approachable by Road. Special precautions to be taken to prevent any miss happening during brake operation and in section with high gradients and sharp curves due to probable offloading of water in onboard DM water tank.

9.3 Hot line cleaning of insulators may be considered for the insulators of transmission lines owned by the Railways, Traction Sub stations, switching station, Main line, Yard lines, sidings where the area is approachable by road vehicle.

9.4 Due care is required for cleaning of Power Transformer Bushings and external enclosures of the surge arrestors due to reasons explained in Clause 6.4 of this guideline.

9.5 Hotline cleaning of insulators to be preferably done through outsource. Person employed for hotline cleaning should be trained and certified by reputed training institutes like Hot Line Training Centre (HLTC), National Power Training Institute (NPTI), Ministry of Power, Government of India, Bengaluru. Railway officials associated with the work of hotline cleaning of insulators shall also be provided similar training and certification.

9.6 It should be ensured that hot line system is equipped with suitable non-temperature compensation type resistivity meter & leakage current detector for online monitoring of cleaning water resistivity and leakage current respectively. Suitable interlock with Audio Alarm to restrict the flow of water in case of water resistivity falling below minimum threshold level or leakage current going above threshold level shall also be ensured in hotline cleaning system as a safety measure.

9.7 For Indian Railway application, cleaning with demineralized water having resistivity of 100000 ohm-cm or greater is recommended due to safety reasons

9.8 An indicative specification for a typical hot line cleaning system is attached as Annexure-I. Zonal Railways are advised to take help of this during procurement/calling tenders as per site requirement.

10. REFERENCES:

- ACTM Vol- I
- RDSO letter No. TI/OHE/INSCOM/GEN, dated 02.11.2019 for Composite insulators, instruction no.TI/IN/0040 Rev.0 (November, 2019) for cleaning of 25 KV composite insulators
- RDSO's letter no TI/GEN/MSG/TRD dated 10.11.2020 for communication of Railway Board's Recommendations of 31st MSG (TRD) meeting held on 8th & 9th November, 2019 at Somnath in Western Railway.
- Southern Railway Letter No. E.134/ET/11/OHE, dated 30.05.2022, for recommendations of 31st MSG (TRD) meeting to TI/RDSO.
- Central Railway Letter No. L.574.TRD.MSG 31ST, dated 21.01.2021
- IEEE 957 -2005 guide for cleaning of insulator.
- RDSO specification No. ETI/OHE/51 (9/87) for Specification for Discharge/ earthing pole assembly for 25kV ac traction.
- SWR letter No. SWR/EL/T-601/RDSO, Date: 03.11.2022.
- SR letter No. /E.220/Policy (e-file 28834), Date: 07.11.2022.
- CR letter No.L.547.TRD.MI.IN, Dated: 10.11.2022
- ECoR letter No. ECoR/EL/TRD/443/56, Date: 09.11.2022

Annexure-I

Indicative Technical Specification for a typical Hotline cleaning system for Insulators

SN	Description	Parameter Specification, Capacity, Range	Remarks		
1.	Water Pump:	High pressure water pump (Triplex type) Maximum pressure 1800 psi. Suitable pressure measurement device shall be provided with Pump	---		
2.	Nozzle to generate water jet pressure of 400 to 1000 psi	Variable Orifice sizes (from 4.76 mm to 6.35 mm) Material: Brass or aluminum bodies with steel, stainless steel, ceramic, or metal compounded tips. The nozzle is to be attached to a handheld wash gun.	---		
3.	Water tank	Stainless steel tank with minimum 2000 Ltrs capacity	---		
4.	Hose pipe & Reel	High pressure (Minimum 2000 psi) steel reinforced R1/R2 hose pipe with suitable reel with manual rotating arrangement	---		
5.	Cleaning Water	Demineralized water with minimum resistivity 100000 ohm-cm	---		
6.	Resistivity meter	Non-compensating type, panel mounted resistivity meter to measure resistivity of cleaning water in the range of 0 to 1 megaohm cm.	These items to be integrated on the hot line cleaning system control panel.		
7.	Leakage current detector	Rang 0 to 5 mA			
8.	Safety interlock	Suitable safety interlock with Audio Alarm to be provided to restrict flow of water in case of resistivity falling below minimum threshold value.			
9.	Distance/Nozzle pressure	<ul style="list-style-type: none"> • Minimum nozzle to conductor distance: 2.74 to 3.66 meter • Minimum nozzle pressure: 400 psi • Minimum DM water resistivity: 100000 ohm-cm • Maximum orifice diameter : 4.76 to 6.35 mm 	---		
10.	Grounding Cable	As per cable details mentioned in the RDSO specification No. ETI/OHE/51 (9/87) with latest amendments.	---		
11.	Safety Accessories	SN	Safety Item	Standards	---
		(a)	Gloves	ASTM D 120 and IEC 60903:2014	
		(b)	Sleeves	ASTM D 1051 and IEC 60984:2014	
		(c)	Protectors for rubber insulating gloves	ASTM F 696	

Note: Zonal Railways are advised to take help of this indicative specification for framing of tender specification for procurement/calling tenders for works as per site requirement.