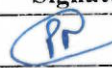
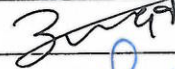
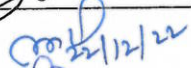
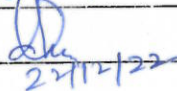


Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 1 of 13 Date: 22.12.2022
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Name	Designation	Signature	Date	Level
Pranitesh S. Ranjan	SSE / Design		22.12.2022	Prepared
Abhinav Yadav	SME / Design-III		22.12.2022	Agreed
Lalit Kishore	Dy. CME / Design	 22/12/22	22.12.2022	Reviewed
D.K.Singh	CDE	 22/12/22	22.12.2022	Approved

Amendment History

Rev.	Date	Change in Brief
1.	07.08.2020	1. Clause no. 1.4 corrected 2. Clause no. 7.8 corrected. 3. Clause no. 10.4 corrected. 4. Clause no. 10.12 corrected. 5. Clause no. 14.4 corrected.
2.	19.09.2022	Eligibility criteria (Clause no. 2) deleted.
3.	22.12.2022	Specification Revised.


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Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 2 of 13 Date: 22.12.2022
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1. PREAMBLE

- 1.1. This technical specification covers general conditions, technical and operational requirements, inspection and testing procedure for electro-pneumatic pressurized flushing system on LHB coaches of Indian Railways. This specification also covers the maintenance by Supplier during warranty or for post warranty period.
- 1.2. The flushing system has been conceived for convenient and efficient flushing: complete removal of faecal matter from the lavatory pan/commode with a minimum usage of pressurized water on a press of a button.
- 1.3. **Principal of operation of the system:** System shall be based on positive displacement type system having "piston-cylinder arrangement" type set-up for creating pressurized water supply without allowing water coming into contact with pressurized air. No other type of system shall be accepted apart from this specification.
- 1.4. Pressurised flushing would occur with the press of an electric push button. It should have colour light indicating various states of the system (GREEN: ready to flush; RED: not ready to flush).
- 1.5. All electrical, electronics and pneumatic parts of system should be shock and vibration proof and should comply with IEC 61373, category-2. The electrical & electronic components/system should also comply with EN50155 for environmental protection. The bidders should submit test reports from NABL or other accredited labs as per IEC 17025 for this testing along with their WTC for tests, for which test facilities are available at the Supplier premises.

2. SCOPE OF SUPPLY

- 2.1. Electro-Pneumatic Pressurized flushing system should be supplied with all accessories including nuts, bolts, spring washers, safety wire and clamping as per requirement for installation of the system. System interface with car body shall be clearly specified and submitted along with offer.
- 2.2. Supply, installation, and commissioning shall be in the scope of the Supplier.
- 2.3. Plumbing connection from the water tank (3/4" female pipe thread for roof water tank of 30 litre capacity/ 1" female pipe thread for overhead water tank of capacity 395ltrs/455ltrs/ as provided in the coach) to the pan/commode for the pressurized flushing system shall be in the scope of the Supplier. Water pipelines and fittings shall be of stainless steel.
- 2.4. One isolating cock (3/4" BSP) followed by one Y-strainer (3/4" BSP) in both water lines from the overhead water tank and one isolating cock (1/4" BSP with both end female threads) in the pneumatic line and one NRV (1/4" BSP) in the pneumatic line shall be provided to isolate the system for attending the faults occurred if any in the Pressurised unit or in the pneumatic/water line.
- 2.5. All pneumatic fittings shall be of stainless steel and plug and play type. Polymeric fittings shall not be permitted.


 Prepared By


 Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 3 of 13 Date: 22.12.2022
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2.6. Apart from above, all other items/activities required for installation and functioning of the system shall be under the scope of Supplier.

3. TECHNICAL REQUIREMENTS

- 3.1. This specification shall be read along with ICF Drawing ICF/SK3-6-3-246 Alt 'a'.
- 3.2. Electro-pneumatic panel shall be installed outside the lavatory panel (behind the attachment wall to drawing nos. MLE64129 Alt 'a' & MLE64130 Alt 'a') within the existing space available of 90mm (maximum space). Drawing no. LE63202 (latest alteration) for Indian style pan bowl interface, LS63119 (latest alteration) for Western style bowl interface, 1.10113.0.30.400.002 (latest alteration) and 1.10113.0.30.400.004 (latest alteration) for mounting & bracketing interface for FRP modular toilets, drawing no. LS10209 (latest alteration), LS10211 (latest alteration), LS10216 (latest alteration) for lavatory with SS tubular partition frame and ICF/SK3-6-3-246 alt-'a' are only for interface & references. MDTs 214 Rev 10 or latest shall be referred for FRP modular toilet. Besides above, this flushing system may be installed in the new variants for which supplier shall hold a review with concerned unit for its fitment plan. The referred drawings are only for reference, and layout of EPPFS (Electro-Pneumatic Pressurised Flushing System) or drawings may change.
- 3.3. The flushing system shall clean the bowl completely and transfer the faecal matter into the bio-toilet tank. The system shall work with a pneumatic supply at a pressure of 2 to 3 kg/cm². The maximum discharge of water in a single flush shall be 1.5 litres. Only pressurized water shall discharge in the pan/commode. There should be no possibility of mixing of air & water in the system.
- 3.4. The flushing system shall be ready to flush within 10 seconds after each use. This system shall be designed for minimum 150 flush cycles in 24 hours. The components of the system shall be designed to cater to this high usage.
- 3.5. The required electric, pneumatic, and water input shall be tapped from designated points in the coaches. The pneumatic supply shall be limited to 3.5 litres/minute/lavatory at 5 to 6 kg/cm² for the system. Supplier should specify the consumption of air in litres/minute or litres/flushing operation, along with the offer. There should be no leakage of compressed air or water.
- 3.6. A bypass or alternate flushing arrangements shall be provided by separate flush button switch, so as this system shall be remaining usable for ensuring proper flushing to transfer the faecal matter from the lavatory pan/western style bowl to bio-tank including cleanability, in case of non availability of power /air.
- 3.7. The pressurize unit should be compact and robust. The Electro-pneumatic pressurized flushing system shall be designed for a usage of minimum 150 times within 24 hours. There should be no leakage from system at 5 kg/cm² pressure & system should dispense of maximum water 1.5 litres in functional test at 3-5 kg/cm². Pneumatic pressure.


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Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 4 of 13 Date: 22.12.2022
---------------	--	--

4. OPERATING CONDITIONS

4.1. **Ambient Conditions:** The system on coaches will be subjected to the following climatic conditions

- 4.1.1. Ambient temperature: -10 °C to 55 °C
- 4.1.2. Altitude: from sea level to 2500 meters
- 4.1.3. Maximum temperature under Sun 70 °C
- 4.1.4. Relative humidity: upto 95%
- 4.1.5. The rain fall is fairly heavy.
- 4.1.6. During weather, the atmosphere is likely to be dusty.
- 4.1.7. Temperature variations can be quite high with-in range specified in the same journey or short period of time.
- 4.1.8. Coaches may operate in coastal areas with continued exposure to salt laden air
- 4.1.9. Coaches exteriors are cleaned with liquid cleaning detergents and cleaning of toilets by cleaning agents using brushes with non-metallic bristles or in automatic car washing plants. The interiors are cleaned with wet/dry wiping.

4.2. **Car-body-dynamics :** Equipment shall withstand satisfactorily the vibrations and shocks normal encountered in service as indicated below:

- 4.2.1. Maximum vertical acceleration 1.0g
- 4.2.2. Maximum longitudinal acceleration 3.0g
- 4.2.3. Maximum transverse acceleration 2.0g
- 4.2.4. The vibrations are of sine wave form and the frequency vibration is between 1 Hz to 50 Hz. The amplitude 'a' expressed in millimetres is given as a function of 'f', by equations
 $a = 25/f$ for values of 'f' from 1 Hz to 10 Hz
 $a = 250/f^2$ for values of 'f' exceeding 10Hz and up to 50 Hz.
- 4.2.5. In the direction corresponding to the longitudinal movement of the vehicle, the equipment is subjected for 2 min. to 50 Hz. Vibrations of such a value that the maximum acceleration is equal to 3g.
- 4.2.6. Coach-body displacement encountered under dynamic conditions
 - 4.2.6.1. Vertical: ±100 mm
 - 4.2.6.2. Lateral: ±55 mm
 - 4.2.6.3. Longitudinal: ±10 mm
 - 4.2.6.4. Bogie rotation about centre pivot: ±4 deg
 - 4.2.6.5. Maximum Speed of train: 160 kmph

5. SYSTEM INTERFACE AVAILABLE

5.1. Water Supply

- 5.1.1. Some LHB coaches have one roof water tank of 30 litre capacity (or as provided) is available over each toilet at a height of about 2030 mm from toilet floor. Water is pumped to this tank from under-frame mounted main water tanks. These roof water tanks are unpressurized and water flows under gravity.
- 5.1.2. Some LHB coaches have one overhead water tank of capacity of 395ltrs or 455 litres or as provided is available at about 2030 mm height. The water flows from this tank to the flushing line under gravity.


Prepared By


Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 5 of 13 Date: 22.12.2022
---------------	---	--

5.2. Pneumatic Supply

- 5.2.1. A limited quantity of air supply of around 15 litres/minute/coach can be made available connected to a feed pipe at 6 kg/cm² with provision of one 75 litre reservoir in the coach exclusively for the toilet system.
- 5.2.2. Requirement of compressed air per toilet used and per coach for the system shall not exceed the limit. The requirement shall be clearly specified in the offer documents by the Supplier.

5.3. Power Supply

- 5.3.1. 110V AC/DC supply is available in LHB AC and Non-AC coach circuits. This supply varies from 80V to 140V with 30% ripple in AC & Non-AC LHB type coaches. The equipment shall be designed to withstand $\pm 30\%$ voltage fluctuations. Any Solenoid Valve or Electronic item fitted should be able to withstand $\pm 30\%$ voltage fluctuations. The bidders should submit test reports from NABL or other accredited labs as per IEC 17025. The control system for EPPFS shall operate at 24 V DC.
- 5.3.2. Total peak power requirement per coach shall not exceed 50 watts. Requirement of power shall be clearly specified by the Supplier in its offer.
- 5.3.3. All electrical and electronics components should be shock and vibration proof and should comply with IEC 61373, category-2 and EN50155 for environmental protection.

6. DESIGN REQUIREMENTS

- 6.1. The system offered must be modular, interchangeable, and reliable. The system should be designed to meet the maintenance schedule prescribed in Annexure A.
- 6.2. All water and pneumatic lines along with their fittings shall be nominal size of 3/4" and 1/2", respectively. The Supplier shall specify the consumption of power, air and water in its offer documents.
- 6.3. The design of the flushing system shall have anti-theft and anti-corrosive measures for protection.
- 6.4. The system shall not interfere with other sub-assemblies on the coaches. To ensure this system shall be contained within the space envelope as mentioned earlier.
- 6.5. The components of specified brands only shall be used for the flushing system. To ensure this, supplier shall submit the procurement invoices of the sources during inspection or whenever demanded by Railways.
- 6.6. Coaching depots shall follow the maintenance schedule as prescribed in Annexure A.
- 6.7. Important components fitted in the flushing system must comply with the requirements as tabulated in Table-1. Deviation from recommended make wherever specified in the specification shall require approval of CDE/MCF and will be subjected to field trials to evaluate performance for 3 months on 10 coach sets (minimum) against a purchase order. Any purchase order quantity and delivery schedule specified in the purchase order should be met by the firm with the makes mentioned in this specification (except above 10 coach sets i.e. 40 number of EPPFS for trials) until the new make is approved and is included in the specification.


Prepared By


Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 6 of 13 Date: 22.12.2022
---------------	--	--

Table 1

SN	Name of Component	Detail Description
1.	Electric Push Button Switch	<p>The Electric push button (outer diameter 22mm) shall be minimum IP 67 compliant. It shall have a metallic body integrated with a SS mounting plate (70 mm × 70 mm × 2 mm). This push button should glow to indicate the state of the system. This push button shall be installed at the height of 1300 ± 20 mm from lavatory floor level. The push button mounting plate shall have engraved markings "PRESS FOR AUTO FLUSH" and "स्वचालित फ्लशिंग के लिए दबाएं". Sticker for working instruction and graphic symbol shall be provided above the Electric push button as per drawing no. MLE64136 and shall be approved from CDE/MCF, for the first time supply only.</p> <ul style="list-style-type: none"> • IP Rating: 67 or above • Push Button and Mounting Plate Material: Stainless Steel • LED light status: GREEN: ready to flush & RED: not ready to flush • Recommended Makes ^(Note-3): ABB/Bosch/Honeywell/Schneider/ ITC Electrical Components.
2.	Control Panel	<ul style="list-style-type: none"> • The control panel enclosure shall be IP65 rated. The panel shall be modular and plug-n-play type for easy fitment and maintenance. It shall house a MCB, SMPS, timer, solenoid valve, and other electric systems. It shall house suitably in the control panel enclosure to avoid creeping of moisture into the electronic circuit. • All electrical and pneumatic connections of the control panel shall be plug in type and shall be properly clamped. • Recommended Makes ^(Note-3) for MCB, SMPS, and Timer: ABB/ Bosch/Honeywell/Schneider/ITC Electrical Components/ Selec/ GIC
3.	Solenoid Valve	<ul style="list-style-type: none"> • All solenoid valves used must be EN 50155 compliant. Complete test report against each test mentioned in EN 50155 must be submitted. Also, it shall comply with IEC 61373, category-2 requirements. • Recommended Makes ^(Note-3): Parker/Festo/SMC/Norgren/ Janatics/ABB/Bosch/Honeywell/Schneider/ITC Electrical Components
4.	Y-Strainer	<ul style="list-style-type: none"> • A metallic strainer (¼" BSP) shall be installed in the SS water inlet line for the water pressurization system to filter, or strain, out particulates from water. • The strainer shall be placed for easy frequent cleaning. The Y branch shall be oriented downwards to avoid accumulated dirt to fall inside the system. • Recommended Makes ^(Note-3): Parker/Festo/ SMC/ Norgren/ Atam Valves/Janatics.
5.	Water Pressurization System	<ul style="list-style-type: none"> • The water pressurization system shall be a piston-cylinder arrangement. The piston-cylinder may be operated with a tandem pneumatic actuator. There should be strictly no possibility of exchange of media within the system. The water side cylinder and its internal components shall be made of stainless steel AISI 304. The pneumatic side cylinder shall be of Anodized Aluminium as per IS 1285:2002 63400 T6. Internal components of pneumatic cylinder may be of Aluminium or Stainless Steel. • All other mounting and clamping items shall be made of AISI-304. • The water pressurization system shall comply with the enclosure defined at Annexure B. • Recommended Makes for pneumatic actuator ^(Note 3): Festo/ SMC/ Norgren/ Janatics.

Prepared By

Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 7 of 13 Date: 22.12.2022
---------------	---	--

6.	Angle seat piston valve	<ul style="list-style-type: none"> This can be pneumatically-controlled type or spring-loaded type. Material of the valve shall be stainless steel as per AISI-304 or black painted brass. Its size shall be for 3/4" port size. This shall be fitted at the outlet of water pressurizer cylinder. Recommended Makes^(Note-3): Parker/Festo/SMC/Norgren/ Janatics
7.	Air Filter Regulator Lubricator (FRL) Unit	<ul style="list-style-type: none"> A metal body air FRL unit shall be used to condition the pneumatic supply. This shall be housed suitably in the control panel enclosure to avoid creeping of moisture into the electronic circuit. Pressure regulator shall be fixed at 3 kg/cm². The suitable lubricant and its frequency of top-up shall be specified by the Supplier. This shall be followed by coaching depots as per the maintenance schedule prescribed in Annexure A. Recommended Makes^(Note-3): Parker/Festo/SMC/Norgren/ Janatics
8.	Non-Return Valve (NRV)	<ul style="list-style-type: none"> Non-return valve shall be fitted at the inlet of the water pressurizer cylinder. Its size shall be for 3/4" port size. Recommended Makes^(Note-3): Parker/Festo/SMC/Norgren/Janatics
9.	Manual Push-Button Flush Valve	<ul style="list-style-type: none"> A manual push-button flush valve shall be provided for manual flushing. It shall have a metallic body integrated with a SS mounting plate (70 mm × 70 mm × 2 mm). Recommended Makes^(Note-3): Jaquar/Hindware/Somany/Janatics
10.	Pneumatic Fittings & Tubings	<ul style="list-style-type: none"> All pneumatic fittings used in the system shall be metal body with metallic collar of plug-n-play type. Pneumatic tubing material shall be of nylon as per DIN 74324. Pneumatic tubing material shall be covered with SS sleeves and shall be properly clamped. Recommended Makes^(Note-3): Parker/Festo/SMC/Norgren/Janatics
11.	Water Pipe & Fitting	<ul style="list-style-type: none"> Water pipe, clamp, fasteners, mounting bracket, bolts with split pin, nuts (nyloc type) must be of stainless steel. Flexible water pipe shall be thermoplastic material as per IS: 12585-88, type-2. Flexible water pipes shall be covered with SS sleeves and shall be properly clamped.
12.	Safety wire	<ul style="list-style-type: none"> Stainless steel safety wire (IS 2266 Grade 1570; 4mm nominal dia 6x7 steel) shall be provided at both ends of the water pressurization system to prevent fall in case of clamp failure.
13.	Electric wire	<ul style="list-style-type: none"> Electric cable used in this system shall be as per RDSO specification ELRS/SPEC/ELC/0019 with latest revision. All electrical connections must be sturdy plug and play connections and shall be properly clamped.

Note:

- For all electrical & electronic items:** All electrical/electronic equipment and enclosures shall be IP 65 rated or better. All electrical/ electronic components used in the system shall be IEC 61373, Category-2 and EN 50155 compliant. All electric/electronic items should be able to withstand ± 30% voltage fluctuations. The Supplier shall submit the test reports from NABL or other accredited labs as per IEC 17025 for compliance.
- Mechanical & Pneumatic items:** All mechanical and pneumatic components shall comply with IEC 61373, Category-2 requirements. The Supplier shall submit the test reports from NABL or other accredited labs as per IEC 17025 for compliance.
- Deviation from recommended make shall require approval of CDE/MCF and will be subjected to field trials to evaluate performance for 3 months on 10 coach sets (minimum) (detailed in clause 6.7).

7. MARKING

7.1. Each component of the system shall be permanently marked for traceability (laser marking, engraving, or riveted metal label) with the following details:

- 7.1.1. Manufacture's name
- 7.1.2. Batch No.
- 7.1.3. Year of manufacture etc.


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Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 8 of 13 Date: 22.12.2022
---------------	---	--

8. PACKING

8.1. The supplier shall be responsible for the proper and adequate packing of the system to prevent damage in transportation, handling, and storage. List of all items supplied to be tabled in details with every package with description of item, quantity, manufacturer name, model number and year of manufacturing.

9. TESTING AND APPROVAL OF PROTOTYPE: The first time supply shall require prototype approval from CDE/MCF. Prototype shall be inspected as per following.

9.1. Four prototype samples of Electro-Pneumatic Pressurized flushing system shall be submitted to MCF for inspection. Prototype shall be fitted in one coach (two Indian styles and two western style lavatories) for fitment and functional approval. The Supplier must incorporate any changes noticed during the prototype inspection without any additional cost. Bulk supply shall commence only after the approval of the prototype. Regular supplies are to be made as per approved prototype only.

9.2. The Supplier has to submit system drawings with sufficient details to evaluate the system design. Sticker for working instruction and graphic symbol as per drawing no. MLE64136 shall be approved from CDE/MCF, for the first time supply only.

9.3. The Supplier has to submit all test certificates as prescribed in this specification.

9.4. Procurement of raw material shall be done from the authorized sources only. The Supplier has to submit proof of procurement of raw material from the OEM or from his authorized distributor by submitting invoice etc at the time of inspection or whenever required by Railways.

9.5. Life Cycle Test

The Supplier shall enclose a certificate from an NABL or ISO/IEC 17025 accredited laboratory or labs authorised for this testing or testing at manufacturer's premises (witnessed by Railway representative) for satisfactory operation of the system for 1.5 lakh cycles as per test scheme detailed in Annexure C. The validity of this test shall be two years from the date of issue of test certificate.

9.6. The Supplier has to submit complete maintenance manuals including troubleshooting and dismantling instructions in paper and electronic form. Supplier has to meet the maintenance schedule of the system.

9.7. The Supplier has to submit a list of spare parts in details used in this system with manufacturer name, model number, and cost (format prescribed in Annexure D).

9.8. Performance monitoring of the coaches fitted with electro-pneumatic pressurised flushing system shall be done in actual train service based on reports of ZRs on CMM portal, as detailed below:

9.8.1. Proper and leak free connection in the complete system including air, water pipe lines and interface piping up from roof water tank to water Pressurization cylinder.

9.8.2. Proper working of system including all assemblies, subassemblies and components fitted in this system and indications to achieve designated quality of performance.

9.8.3. Proper functioning of the complete system including clean-ability.

9.8.4. Maximum discharge of water during a flush shall be 1.5 litres. Pressurized water alone should discharge through the spray tube around the pan/commode.

9.8.5. Checking of full tightness of plug in type electric and pneumatic connections.

9.8.6. Physical condition of material like rusting, damage and surface cracks.

9.8.7. Details of alteration/maintenance requirement with coach number date and time.

9.9. If a Supplier upgrades any components/sub-system in the system, approval shall be required from CDE/MCF before its implementation.


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Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 9 of 13 Date: 22.12.2022
---------------	---	--

10. SPARE PARTS

- 10.1. The Supplier shall provide a list of spares with its offer to be kept with IR for ensuring smooth operations and maintenance during warranty.
- 10.2. The Supplier shall ensure the availability of spare parts or replacement parts of the supplied system for a period of at least 10 years. List of spares and its cost shall be submitted along with the offer for tender (format prescribed in Annexure D) . This shall be irrespective of the fact whether the vendor/supplier or his sub vendor/(s) have stopped manufacturing of the equipment/(s) to the design supplied to Indian Railways.

11. WARRANTY

- 11.1. Supplier shall guarantee that the Electro-Pneumatic Pressurised Flushing System would continue to conform to the description and quality as aforesaid, for a period of 30 months after their delivery or 24 months from the date of placement in service whichever shall be sooner or as per latest IRS conditions. This warranty shall survive notwithstanding the fact that the Electro-Pneumatic Pressurised Flushing System may have been inspected, accepted and payment made by the purchaser. During warranty, the Supplier shall rectify the equipment by replacing or repairing components at his cost without affecting the service of the coach attached to the train, however warranty is applicable on manufacturing defects. Warranty period would get extended on pro-rata basis if warranty replacements/repairs is not provided within 5 days of notice. If Supplier fails to provide warranty in 5 days of notice. Railway reserves the right to cancel balance contract.

12. INSTALLATION AND COMMISSIONING

- 12.1. The mounting and installation of Electro-Pneumatic Pressurised Flushing System on the designated coach/coaches shall be carried out by the vendor/supplier at consignee's premises or the place decided by the consignee/purchaser/Indian Railway.
- 12.2. The Electro-Pneumatic Pressurised Flushing System installed and commissioned shall be checked by the vendor/supplier for proper functionality and performance.
- 12.3. The vendor/supplier shall follow all the safety measures and precautions at the time of installation & commissioning of Electro-Pneumatic Pressurised Flushing System at the site.

13. TRAINING

- 13.1. The Supplier shall arrange free of cost training to Indian Railways personnel involving in operation, maintenance and trouble shooting of Electro-Pneumatic Pressurised Flushing System. The venue and period of training should be mutually agreed between supplier/vendor and purchaser/consignee/Indian Railways.


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Agreed By

Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 10 of 13 Date: 22.12.2022
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Annexure A

Maintenance schedule of flushing system at coaching depots and workshops by user Railways

S.N.	Activities	Trip / Weekly	Monthly	Six Monthly	SS1	SS2	SS3
1.	Activate the push button and check the correct functionality of flushing.	X					
2.	Check & ensure the connectivity of input power supply.	X					
3.	Check & ensure the Control panel is closed & firmly mounted.	X					
4.	Check and ensure the electric wires are intact & tied with cable tie properly clamped.	X					
5.	Check & ensure the push button and its mounting plate is firm.	X					
6.	Check & ensure the illumination light of push button is working.	X					
7.	Check & ensure the AFRL (Air Filter Regulator Lubricator) Unit input and output air connections are correct and in order; AFRL lubricant to be topped up as per requirement.	X					
8.	Check & ensure solenoid valve and air connections are correct and in order.	X					
9.	Check for moisture inside control panel; Control panel must be free of moisture to save electronic and electrical components.	X					
10.	Check & ensure Pressurizer Unit (cylinder) is firmly mounted and all hardware is properly tight.		X				
11.	Check the rusting of major parts. If rusted severely, replace the part.			X			
12.	Check & ensure the water inlet and outlet connections are correct & in order.	X					
13.	Check & ensure the Y-water strainer of coach is not choked, if choked clean it and tight properly for its functioning.		X	X			
14.	Check & ensure the Hose pipes are not worn out or squeezed (pinched) at bends. If found worn out or squeezed (pinched) at bends, replace the hose.		X				
15.	Check & ensure the silencer of cylinder middle cover & solenoid valves are not choked.		X	X			
16.	Check the condition of NRVs & if found choked clean it or replace it, if severely corroded.		X	X	X	X	X
17.	Check & ensure the functionality of the angle seat piston valve. If found not working, Overhaul the component & replace the parts if necessary.		X	X	X	X	X
18.	Check & ensure the functionality of the pressurizer unit. If found not working, Cylinder needs to be opened and check the scaling level for operation of Piston. Overhaul the component & replace the parts. While reinstallation, new nyloc nuts to be used.		X	X	X	X	X
19.	Check & ensure water discharge from the pan/commode bowls is satisfactory. If not, then perforated holes of spray ring in the pan/commode bowl assembly to be cleaned with metal brush & pressurized water jet.		X	X	X	X	X
20.	Drain the mixture of AFRL (Air Filter Regulator Lubricator) Units.	X					
21.	AFRL (Air Filter Regulator Lubricator) unit to be replaced					X	
22.	Pneumatic tubes to be replaced.					X	
23.	Replace Angle seat piston valve, if required.					X	
24.	Ensure availability of passenger notification near the push button.		X				
25.	Check & ensure the functionality of the Manual push-button flush valve and confirm manual flushing is working fine.	X					

Note: Repair and maintenance of EPPFS on IR coaches shall be done by trained staff only. The Supplier shall provide training as mandated in clause 13 of this specification. The warranty related complaints may be registered CMM portal with complete details (Coach Number, Lavatory No., Name of the supplier, Name of non-functional item, and Symptoms in brief).

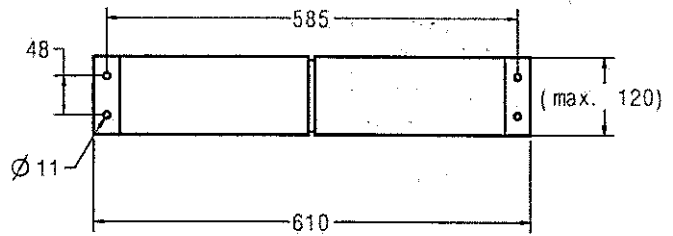
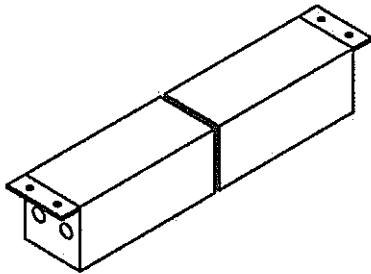
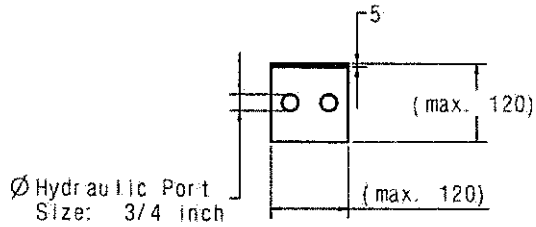
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Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 11 of 13 Date: 22.12.2022
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Annexure B

Enclosure for water pressurizing system



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Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 12 of 13 Date: 22.12.2022
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Annexure C

Test scheme of Electro Pneumatic Pressurised Flushing System for 1.5 lakh cycles

Testing facility requirement

1. Test bench with a suitable height for mounting the Electro Pneumatic flushing system.
2. Availability of continuous air supply with pressure 6 kg/cm² for testing with optimum working pressure (3 kg/cm²) & minimum working pressure 2 kg/cm² to conduct 1.5 lakh cycles of operations.
3. Availability of continuous power supply of 110V DC to conduct 1.5 lakh cycles of operations.
4. Availability of continuous water supply to conduct minimum 1.5 lakh flushes. It is recommended to recycle the water as much as possible.

Test scheme

1. Provide the list of all items/components (with identity) available in the EPPFS to be subjected to 1.5 lakh cycles of continuous trouble free operations.
2. An electronic counter to be attached to the system to count the number of flush cycles.
3. Conduct testing of 1 lakh cycles at optimum working pressure (3 kg/cm²) & remaining 50,000 cycles at minimum working pressure 2 kg/cm².
4. Maintain the records of testing (number of cycles with date and time).
5. System fault log shall be recorded every day. Every event of failure of power, air, or water supply shall be recorded and test can be resumed after the recovery of sufficient power or air or water.
6. In case of system failure due to the fault of any component, the test shall be repeated from the beginning after the remedial action. Records shall be maintained for all such events and informed to MCF in real-time through emails (CDEMCFRBL@GMAIL.COM).
7. Frequency of test cycle shall be 3-6 cycles per minute.
8. Major components to be checked and their status (functional/not-functional) to be recorded every 25000 cycles (with videos and photographs) as prescribed below.

Sl. No.	Item	25x10 ³	50 x10 ³		
1	Electric Push Button Switch					
2	SMPS					
3	Timer					
4	Solenoid Valve					
5	Y-Strainer					
6	Water Pressurization System (Piston, Piston ring, Cylinder wall)					
7	Angle seat piston valve					
8	Air Filter Regulator Lubricator (AFRL) unit					
9	Non-Return Valve (NRV)					
10	Manual Push-Button Flush Valve					
11	Pneumatic Fittings & Tubings					
12	Water Pipe & Fitting					
13	Electric wire					
14	Volume of water discharge (ml)					
15	Air leakage from system (Yes/No)					
16	Water leakage from system (Yes/No)					
17	Temperature of Water Pressurization System (pneumatic side) (°C)					
18	Ambient temperature (°C)					
19	Check the creeping of moisture into the electronic circuit inside control panel					

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Specification	Schedule of Technical Requirements for Electro-Pneumatic Pressurised Flushing System for LHB coaches	MMDTS 19027 Rev-3 Page 13 of 13 Date: 22.12.2022
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Annexure D

Format to submit list of spare parts for maintenance

Sl. No.	Description of component	Manufacturer	Model Number	Offer Cost (in rupees)
1.				
2.				
3.				


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