

SN-219

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**Specification No. RDSO/2016/EL/Spec/0121 (Rev.0)**

**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**



**SPECIFICATION FOR WATER CLOSET  
IN ELECTRIC LOCOMOTIVES  
(WAP-7/WAG-9/9H)**

**ISSUED IN MARCH 2016**

Approved by	Signature
	आम प्रकाश 16.3.16

**RESEARCH DESIGNS AND STANDARDS ORGANISATION  
LUCKNOW-226011**

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**CHAPTER 1-GENERAL****1.0 SCOPE & OBJECT:**

This specification defines the technical details of water closet module intended for application on electric locomotives WAP-7/WAG-9/9H.

**2.0 GENERAL**

2.0.1 The locomotive application of water closets module makes the reliability and performance standard requirements of water closet very critical as its non-performance or malfunction can adversely affect the traction gear components thereby affecting the reliability of a valuable asset, the electric locomotives. Considering the riding shocks and vibrations sustained by the locomotive on run, the robustness of the water-closet system with respect to its capability to endure higher vibrations and shocks becomes all the more important.

2.0.2 The water closet module should have intermediate vacuum toilet system as one of its component. This module should consist of bowl, rinse tank, transfer tank, inlet sluice valve, outlet sluice valve, water fill valve, ejector, diverter valve, shuttle valve, pressure relief valve, rinse valve, vacuum/pressure switch, rinse tank level switch, valve open diverter control valve, inlet sluice control valve, outlet sluice control valve etc.

2.0.3 The toilet system working should comprise of:

- (a) The transfer system that handles the waste during a flush cycle.
- (b) The Rinse system that creates pressure and rinses the bowl.
- (c) The Pneumatic system containing the solenoids, cylinders and valves.
- (d) The monitoring system containing the electronic controllers and sensors.
- (e) The On-board Sewage Treatment System & drain arrangement.

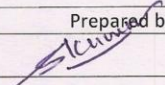


**2.1 Technical requirement:-**

2.1.1 The bowl should be made up of Stainless steel to AISI 304 and should be epoxy powder coated for improved durability.

2.1.2 The water consumption per flush event should not exceed 250 ml. The bowl should be designed to have wet-bowl feature wherein the water is added at the end of flush cycle and the amount of water (volume) added in the second cycle should be adjustable via a menu item in the Toilet Controller.

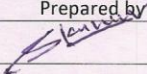


2.1.3 The Pneumatic system should provide the working force for actuating the rinse valve, rinse tank and the ejector. The central component of the Pneumatic system should be an air manifold housing Solenoid valves. It should have provision for air inlet connection, diverter valve, pressure relief valve etc., to ensure proper functioning.

2.1.4 The Pneumatic system should be equipped with filter –regulator to ensure that the air flowing through the toilet is held at a constant pressure. This is essential for efficient working of the ejector. It protects internal parts of the solenoid valves from particulates.

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- 2.1.5 The compressed air available in the main reservoir of the locomotives should be used to create a vacuum or pressure in the transfer tank. The pressure relief valve should be provided to prevent damage to the transfer tank in case of over pressurization. The vacuum/pressure control valve used for directing the air flow when vacuum is created for which these valves have to open /close under the direction of the toilet controller.
- 2.1.6 The system should be equipped with a monitoring system. This should monitor parameters like rinse tank level, compressed air supply, vacuum and pressure levels in the transfer tank, position of inlet and outlet sluice valve gates (open/closed) etc.
- 2.1.7 The system should have computerized processing unit to enable sequencing of various events when a flushing cycle is activated. The sequence of events should be programmed to occur within an acceptable time frame. Typical sequence can be "Standby->Flush->Evacuation->Bowl Emptying->Pressurization->Discharge->Post Rinse". The toilet should automatically return to Standby after each flush cycle is completed. The computerized processing unit should have provision for interfacing with an external micro-processing needed for interlocking the permission for usage of toilet only when the locomotive is not moving.
- 2.1.8 The manufacturer should indicate the factory settings of the vacuum set point, vacuum timeout, pressure set point etc. These values should be user settable to enable adjustment in case the same is needed by the Railways.
- 2.1.9 The System should be equipped with Sewage treatment system which should be of bacteriological type for disposing of human waste only. It should consist of a treatment tank, primary chlorinator and secondary chlorinator. The design of the treatment tank should be such that it can be mounted on the locomotive platform or engineered to fit under the platform/underframe depending upon the space availability. The mechanism of treatment should be a such that the solid waste is biologically broken down into liquid by microbes living in the treatment tank and the liquid then drains through the primary chlorinator. The effluent then flows through the secondary chlorinator that allows the chlorine enough time to reduce the coliform bacteria count to zero before being allowed to drain onto the rail bed via a drain port on the bottom or end of the tank. The discharge should be treated liquid via the drain port and carbon dioxide gas through the tank vent.
- 2.1.10 The sewage treatment tank capacity should be adequate to handle a crew size of 2 aboard 24 hours daily and should have a maximum daily flush capacity of 70 flushes. The manufacturers should finalize dimensions and fitment location of sewage treatment tank with CLW.
- 2.1.11 The water closet modular system should consist of modular cabin, door with modesty lock, LED light fixture, ventilation fan, light wiring harness, electric box, intermediate Vacuum toilet system equipped with computerized control system, fresh water tank of adequate capacity, wash basin, towel hook,

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sewage treatment tank and drainage pipes and connectors as per the requirement. The interfaces (Pneumatic and electrical) should be clearly defined in the product specification. The electrical supply shall be 110V dc nominal and should work from 70V to 125V. Power consumption of water closet module should not be more than 85 Watt. The pneumatic supply shall be provided at 6 kg/cm<sup>2</sup>. Air consumption not more than 40 litres per flush. Fresh water filling arrangement with water tank location should be provided by the manufacturers. This arrangement will be finalized by manufacturers with CLW.

2.1.12 (a) The maximum envelop size of the water closet modular cabin included with overhead tank 2000(H)X 990 (L)X 910 (W) should be as per Annexure-A (for WAP-7) & Annexure-B (for WAG-9/9H) locomotives. Hand brake, Fire extinguisher is required to be shifted for installation of the water closet module (WC). The successful tenderer should advised to submit the design documents after inspection of loco space for availability as mentioned in Annexure-A & B. Bidder is expected to study the existing layout thoroughly and suggest possible layouts of components for proper installation of the water closet module with the offer, otherwise the offer shall be treated as non-compliant and shall be evaluation. IR shall approve the most appropriate layout.

(b) The water closet module should be with a strong metal frame work to with stand normal vibration and shocks in service as indicated under service condition.

## 2.2 Works to be carried out for installation of water closet module

(a) WAP-7 (Cab-1):-

- (i) Hand brake application arrangement should be done through driver Cab (Assistant Loco Pilot Side).
- (ii) Fire extinguisher should be kept inside machine room near to Main reservoir.

(b) WAG-9/9H (Cab-1)

Fire extinguisher should be kept inside machine room near to Main reservoir.

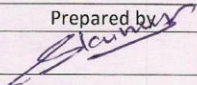


Note: Schematic arrangement is shown in Annexure- A & B.

## 3. Rating Plate

A rating plate in anodized Aluminium and chemically etched shall be providing on water-closet module door. The following particulars shall be clearly and indelibly marked on the rating plate.

- a) Manufacturer's name
- b) Manufacturer's S. No.
- c) Year and month of manufacture
- d) Weight

## 4. Approval of Design/Drawing:

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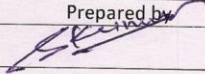


The design shall be developed as per requirement given in the specification. The detailed design shall be submitted to RDSO for scrutiny and approval before commencing the manufacturing. Here "approval" means the "approval of design features" only. The supplier's shall be responsible for performance of complete system. For any technical decision the final authority from the purchaser's side is RDSO.

**5. Commissioning of Water-closet module in Locomotive:**

Suppliers shall commission all or few modules in the locomotives as mutually agreed upon between purchasers and suppliers. Suppliers shall provide necessary manpower for commissioning in locomotives. However, assistance for handling, mounting, welding of structure etc. will be provided by purchasers.

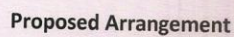
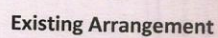
**6. Infringement of patent rights:**

Indian Railways shall not be responsible for infringement of Patent rights arising due to similar design, manufacturing process, use of components, used in design & development and any other factors, which may cause such dispute. The responsibility to settle any such issue lies with the manufacturer.

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**All Dimensions in mm**



Answer

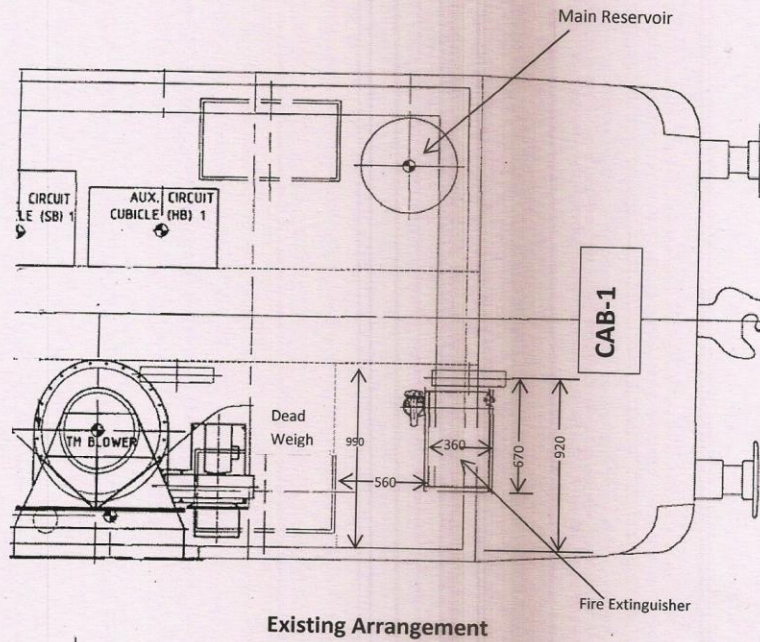
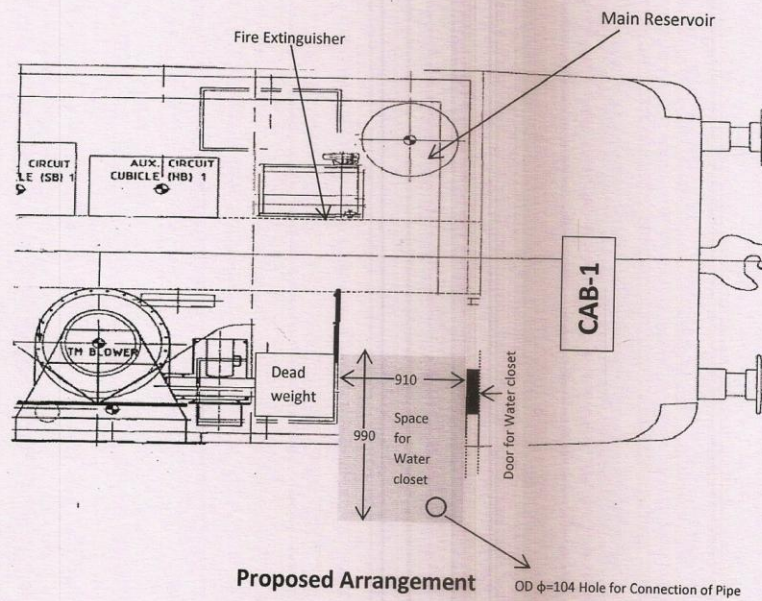
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**Annexure-B (WAG-9/9H)**

All Dimensions in mm

**Existing Arrangement****Proposed Arrangement***Skinner**22/3**22/3*