

Chapter 4: Upkeep and maintenance of bio-toilets

Audit Objective 3: Whether Coaching Depots and Workshops were able to ensure proper maintenance and upkeep of bio-toilets in passenger coaches?

4.1 Maintenance of bio-toilets in passenger coaches in Coaching Depots

Railway Board issued (December 2012) detailed instructions to Zonal Railways for proper, efficient/effective monitoring, operation and maintenance of bio-toilets installed in passenger coaches. A Compendium of instructions on bio-toilets was brought out by CAMTECH in April 2013. A Handbook on maintenance of bio-toilets by Coaching Depots was also brought out by CAMTECH in October 2014. RDSO also brought out Guidelines on bio-tanks for IR in May 2014.

As per the handbook, there are four variants of bio-tanks in operation in IR. Each Coaching Depot is required to maintain details of coaches fitted with different variants of bio-toilets in the proforma prescribed in the guidelines for Annual Maintenance and Operating Contract (AMOC) for bio-toilets. The performance of bio-toilets in these trains was to be monitored and monthly reports sent to Railway Board and RDSO.

For fail-safe operation of mounting brackets and safety wire ropes, Railway Board instructed (December 2012) all Zonal Railways to ensure regular/periodical inspection of welding of mounting brackets, regular/periodical inspection of safety wire ropes and ensure that fasteners for bio-tanks/safety wire ropes are intact. Railway Board also instructed Zonal Railways to maintain performance records and obtain regular passenger/staff feedback; conduct monitoring as per Trial/Test Schemes issued by RDSO; and enter into AMOC with suppliers as per RDSO instructions/guidelines.

Compliance of instructions in this regard was examined and the following was observed:

4.1.1 Upkeep of bio-toilets in Coaching Depots

As per Handbook issued by CAMTECH, bio-toilets should invariably be checked at the time of arrival of rakes in Coaching Depot for scheduled maintenance and at the time of withdrawal of rakes from Coaching Depot. It was however observed that these instructions were not followed by Vishakhapatnam Coaching Depot in ECoR.

Problem of insufficient space between two bio-tanks has not yet been addressed and consequently Coaching Depots of SR experienced difficulties in checking of vital items like inner head stock, drawbar assembly etc. during maintenance.

Carriage & Wagon supervisors and staff working in pit line have been facing inconvenience during under-gear maintenance.

The data regarding complaints received from public and deficiencies noticed by the selected Coaching Depots on arrival of the train fitted with bio toilets during the year 2016-17 was collected by Audit. It was seen that

Out of 613 trains being handled in these coaching depots, 160 trains did not have any bio-toilets fitted. In remaining 453 trains having 25080 bio-toilets (either full complement or partial), the following 199689 instances of deficiencies /complaints were noticed during 2016-17 (**Annexure 4**):

Table 11 – Data of defects/problems noticed in bio-toilets on arrival in Coaching Depots during 2016-17 (except SCR)	
Type of defect/problem	Number of instances
<i>Choking</i>	102792
<i>Foul smell</i>	16375
<i>Non- Functional</i>	11462
<i>Non-availability of dustbins</i>	21181
<i>Non-availability of mugs</i>	22899
<i>Others like ball valve failure, wire ropes etc.</i>	24980
Total	199689

It was seen that

- The number of defects/problems was highest (41111) in the Bengaluru Coaching Depot (SWR) followed by 24495 and 22521 deficiencies in Gorakhpur (NER) and Wadi Bunder (CR) Coaching Depots respectively.
- Number of complaints per bio-toilet was highest in Bengaluru Coaching Depot-SWR (98), followed by Wadi Bunder Coaching Depot (32), Rameswaram Coaching Depot-SR (28) and Gwalior Coaching Depot-NCR (17).
- Out of total 102792 instances of choking, 10098 (10 per cent) cases related to the month of March 2017, thus showing that defects/problems still remained around the average level.
- Out of 102792 cases of choking, the highest cases (34 per cent) of choking were noticed in Bengaluru Coaching Depot of SWR.
- 102792 cases of choking were noticed in 25080 bio-toilets, implying that one bio-toilet got choked four times in a year during 2016-17. During 2015-16, against 24675 numbers of bio-toilets handled by Coaching Depot, 61088 cases of choking were seen. This shows that instances of choking of bio-toilets increased during 2016-17 and needs to be addressed.

- 34841 cases (33.89 per cent) out of 102792 cases of choking were noticed in Bengaluru Coaching Depot (SWR) alone handling 418 (1.6 per cent) out of 25080 bio-toilets maintained by selected Coaching Depots, implying that one bio-toilet got choked 83 times in a year.
- Out of 24980 cases of ball valve and wire rope failure etc., 8945 (36 per cent) were noticed in Wadi Bunder (CR) Coaching Depot followed by 5036 cases (20 per cent) in SBC (SWR) Coaching Depot.

The large number of defects/problems was an area of concern, which is required to be addressed by the railways on priority basis.

On the issue of large number of bio-toilets being choked up and trains running with bio-toilets in bypassed condition for several trips, Ministry during Exit Conference stated (July 2017) that this was being dealt promptly by the concerned Coaching depots. The choking problem was due to misuse of bio-toilets by the passengers. Stainless steel dustbins in bio-toilets were prone to theft. All out efforts were being made to fit anti pilferage devices to minimize the cases of theft. Regular passenger awareness drives were being conducted to sensitize the passengers and cases of choking were now reduced and at present focus was on providing 'S' trap bio-toilets.

4.1.2 Non-award of AMOC/non-commencement of work despite award of AMOC for maintenance of bio-toilets

Railway Board advised¹ (December 2012) all CMEs to enter into AMOC with suppliers for proper and efficient monitoring, operation and maintenance of IR-DRDO bio-toilets. Review of records of 32 selected Coaching Depots of 16 Zonal Railways revealed that:

- AMOC was yet to be awarded in 12 Coaching Depots (Sorting Yard, Liluah (ER), Dhanbad (ECR), Vishakhapatnam (ECoR), New Delhi and Lucknow (NR), Allahabad (NCR), Bikaner (NWR), Santragachi and Tatanagar (SER), Indore and Porbandar (WR) and Jabalpur (WCR) and maintenance of bio-toilets was being done departmentally at these Depots.
- In three Coaching Depots Rajendranagar (ECR), Srikhetra-Puri (ECoR) and Guwahati Kamakhya (NFR), Nodal Officers to liaise with AMOC contractors had not been nominated despite AMOC contracts having been awarded and work commenced by the contractors at these depots.

Regarding the issue of non-award of Annual Maintenance and Operation Contract Ministry during Exit Conference agreed (July 2017) to look into the matter and initiate action.

¹ Letter No. 2009/Dev. Cell/ICCI/1 Vol.-IV dated 24/12/2012

4.1.3 Non-compliance of Guidelines regarding testing of effluents from bio-toilets in Coaching Depots

The compendium on IR-DRDO bio-toilets prescribed the testing schedules for effluents from bio-toilets. Accordingly, Coaching Depots have to ensure the under mentioned tests once in 90 days:

<i>S. no</i>	<i>Nature of Test</i>	<i>Place of testing</i>
1.	pH value Test	Coaching Depot
2.	Total Solids (TS) Test	Coaching Depot
3.	Total Dissolved Solids Test (TDS)	Coaching Depot
4.	Total Volatile Solids (TVS)	Coaching Depot
5.	Chemical Oxygen Demand (COD) Test	Government approved Lab/DRDE
6.	Fecal Coli Forms Count	Government approved Lab/DRDE

As per Handbook on bio-toilets, records for monitoring and testing should be kept in Coaching Depots in the format prescribed². DRDE, Gwalior clarified (22 April 2015) that if parameters of any bio-toilet tank were not matching with the defined levels, testing of the diseased tank should be made two more times at an interval of 15 days. If test parameters were beyond the permissible limits, even after three consecutive testing of the effluents then recharging of 60 liters of inoculum should be ensured.

However, it was observed these instructions had not been followed in two Coaching Depots viz. Dhanbad Coaching Depot (ECR) and New Delhi (NR), as tests for effluent and bacteria culture were not carried out at all. Further, records in respect of samples sent for testing and results thereof were not maintained as required in five Coaching Depots at Dhanbad (ECR), Vishakhapatnam (ECoR), New Delhi (NR), Secunderabad (SCR) and Jabalpur (WCR). Testing equipment like pH meters, magnetic stirrers and stirrer bars, electronic weighing balances, Pippettes, Silica crucibles, hot air oven etc. had been provided only in 10 Coaching Depots of five Zonal Railways (ER, NCR, NWR, SR and SER).

4.1.4 Improper handling of bacteria in Coaching Depots

The Compendium on IR-DRDO bio-toilets for IR, elaborates the procedure for handling of bacteria inoculum, it prescribes that inoculum be stored in sealed containers and the stock of container be used within a period of two days after opening. If it is used after a week time it should be used after counting Most Probable Number (MPN). It was observed that

- In seven³Coaching Depots, bacteria inoculum had not been stored in

² Para of the Handbook

³Rajendranagar and Dhanbad (ECR),Lucknow (NR),Allahabad (NCR), Gorakhpur (NER), Jaipur and Bikaner (NWR)

containers with lids.

- In 13⁴ Coaching Depots inoculum had not been utilized within its shelf life of two to three months.
- In six⁵ Coaching Depots, inoculum was utilized a week after opening of the containers without counting MPN, raising doubts about efficacy of the bacteria being used.
- In 11⁶ Coaching Depots, the quality of inoculum being used could not be ensured, as proper storage facilities were not available for the containers. In Carriage Workshop, Lower Parel, 3,600 litres (18 drums) of anaerobic bacteria procured at a cost of ₹68,400 in May 2016 had not been consumed and the same was still lying in the workshop. Since the shelf life of bacteria is three to four months, the same should have been utilized by August-September 2016.



Fig 5: Stock of anaerobic Bacteria lying at Lower Parel Workshop unused, even after its shelf life expired

4.1.5 Utilization of Cleaning Agents

Railway Board directed (December 2012) Zonal Railways to ensure use of proper and prescribed cleaning agents to avoid any adverse effect on bacteria in bio-tanks and have spares/consumables as per the holding of coaches with bio-toilets.

As per monthly schedule of work, examination of the chlorinator of bio-toilets and charging with chlorine tablets was to be done. In addition to charging chlorine, various locations of bio-toilets were required to be cleaned regularly. Different cleaning agents are used for cleaning different areas/parts such as PVC flooring, ceramic toilet fittings, commode pans/wall protectors, glass cleaning, laminated plastic sheets, berth Rexene, painted surfaces, stainless steel, etc. TASKI products of Johnson Diversey are one of the recommended cleaning agents. Other recommended agents are Harpic/ Retoil/ Domex products of Eco Lab/Collin/Lizol. Further, the Compendium on IR-DRDO bio-toilets for IR, recommends use of $KMnO_4$ tablets in place of Chlorine tablets considering cost effectiveness as well as durability.

⁴Pune (CR), Sealdah (ER), Vishakhapatnam and Srikhetra (ECoR), Lucknow Jn (NER), Jaipur and Bikaner (NWR), Basin Bridge (SR), Santraganchi (SER), Bilaspur (SECR), Indore and Porbandar (WR) and Jabalpur (WCR)

⁵Pune (CR), Lucknow Jn. (NER), Guwahati -Kamakhya (NFR), Jaipur and Bikaner (NWR) and Jabalpur (WCR)

⁶ Lucknow (NR), Gwalior and Allahabad (NCR), Jaipur and Bikaner (NWR), Hyderabad (SCR), Bilaspur and Durg (SECR), Indore and Porbandar (WR) and Jabalpur (WCR)

It was observed that KM_nO_4 tablets were not being used in any of the 32 Coaching Depots, instead Chlorine tablets continued to be used at these Coaching Depots.

Ministry during Exit Conference stated (July 2017) that $KMNO_4$ tablets which were more effective and less expensive as compared to chlorine tablets, were under development by DRDE.

4.1.6 Checks to be carried out during POH

Guidelines issued by CAMTECH in the Compendium on IR-DRDO bio-toilets maintenance (issued in April 2013) prescribe checks to be carried out during POH viz. flapper/slider/ball valve, leakage in piping, flush system, pneumatics, valves, pressurizer, PLC, pneumatic valves, ball valves etc., charging of bio-culture if required (based on test reports), testing of complete toilet system, drawing and delivering of samples as per requirement to Government Accredited Laboratories and dismantling of retention tank for inspection and thorough cleaning. This was required to be done in one tank of each variant to check general condition, thereafter, based on its condition all tanks were to be removed and thoroughly cleaned. In WR, it was observed that checks as detailed above were not being carried out in the two selected carriage workshops.

Thus, there is an urgent need to operationalize Annual Maintenance and Operations Contracts and effectively monitor working and maintenance of bio-toilets fitted in passenger coaches by the Coaching Depots. Evacuation systems should be made available in order to maintain the bio-toilets received in the Coaching Depots. The problems of choking and foul smell needed to be addressed through proper maintenance of bio-toilets in Coaching Depots, especially in Coaching Depots at Bengaluru with higher number of instances. Checks prescribed to be carried out on bio-toilets during POH should also be exercised for their smooth operation in trains.

4.2 Joint Inspection of trains, fitted with bio-toilets and passenger feedback

Joint Inspection was conducted with Railway Officials on-board 33 Trains of 16 Zonal Railways, to assess the functioning of bio-toilets fitted in coaches. Overall, 1,788 bio-toilets installed in 688 coaches were inspected during October 2016 to January 2017. It was observed that,

- Out of the 1,788 bio-toilets, 94 bio-toilets were non-functional at the time of joint inspection. The number of such non-functional bio-toilets on various Zonal Railways ranged between one (Train No. 22443, Kanpur Central-Bandra Terminus Superfast Express (NCR)) and 28 (Train No. 12863, Howrah-Yeshwantpur Express (SER)).

- As per instructions⁷, stainless steel dust bins of standard design were to be provided in lavatories of coaches fitted with bio-toilets to dissuade people from dumping non-biodegradable waste in bio-toilets. During joint inspection, it was observed that dustbins were not available in 377 out of 1,788 bio-toilets jointly inspected. The number of such toilets in which dustbins were not available ranged between 1 (Train No. 12180, Agra Cantt-Lucknow Superfast Intercity Express (NCR) and 73 (Train No. 15636, Guwahati-Okha Express (NFR)). 39 bio-toilets which did not have dust-bins were found in a choked condition due to dumping of non-biodegradable waste into the toilets. On the issue of non-availability of dustbins raised during Exit Conference in WR, it was clarified that Stainless Steel dustbins are prone to theft, and these are often found missing during inspection.



Fig 6: Water Bottles were used by Passengers and kept on window in Train No. 82652 (SWR)

Fig 7: Choked Bio-toilet in Train No. 19270 (WR)



Fig 8: Choked bio-toilet in Train No 22443/44 (NCR)

Fig 9: Choked and unclean bio- toilet in Train No. 19270 (WR)

- In SWR, due to non-availability of water mugs in non-AC coach fitted with bio-toilets, passengers were forced to carry water bottles as an alternative. This possibly could have resulted in dumping of water bottles in bio-toilets and the resultant choking.
- Foul smell was found emanating from 223 bio-toilets inspected, indicating problem with the flushing system/inadequate water supply in the toilets and deficiency in maintenance of toilets. In ECoR, maximum number of cases

⁷RDSO-Lucknow letter No. MC/CB/LF dated 12/09/2013

(24) of foul smell were noticed in Train No. 18495, Rameswaram - Bhubaneswar Weekly Express.

- Spill over of faecal matter outside the bio-tanks due to leakage from the connector hose was noticed in 21 cases.
- Lack of awareness about bio-toilets provided in the train was observed amongst some passengers in general coaches.

Feedback on bio-toilets was obtained from 825 passengers of 33 selected trains of 16 Zonal Railway which were jointly inspected with Railway officials. It was found that

- Overall 80 *per cent* of the passengers were aware about bio-toilets provided in the coaches. On NFR, 64 *per cent* passengers were not aware about the provision of bio-toilets in coaches.
- Overall 83 *per cent* passengers felt positive change regarding bio-toilets as compared to conventional toilets.
- Overall 82 *per cent* passengers were satisfied about adequacy of water supply in the bio-toilets. However, on ECoR, 51 *per cent* passengers opined that water supply in bio-toilets was inadequate.
- Overall 23 *per cent* passengers had encountered choked bio-toilets during their journey while 44 *per cent* passengers complained about foul smell emanating from the bio-toilets. Only in case of NCR this percentage was higher i.e. 56 *per cent*.
- 76 *per cent* passengers had observed availability of dustbins inside bio-toilets, while 74 *per cent* had seen and read instructions displayed on the walls/doors regarding use of bio-toilets.
- Overall 89 *per cent* passengers felt that bio-toilets in passenger coaches would enhance cleanliness level at Stations and on Tracks.

During a special drive conducted by Zonal Railways in May 2015, 54,648 bio-toilets in 18,033 coaches were checked (some coaches were checked more than once). Of these, more than 10,000 bio-toilets (18 *per cent*) were either found defective or foul smell emanating was reported. Choking of toilet pan / 'P' trap, leakage from joints, foul smell emanating, non-functioning of ball-valve and ball valve in open position were the major problems, reported to Railway Board consequent upon Special Drive conducted by most of the Zonal Railways.

4.3 Training on maintenance and operation of bio-toilets

Keeping in view the large-scale proliferation of bio-toilets, Railway Board directed (May 2013) Zonal Railways that extensive/ exhaustive training on bio-toilets should be imparted to all trainee Staff/Officers at National Academy of

Indian Railway(NAIR), Vadodara and Indian Railway Institute of Mechanical and Electrical Engineering(IRIMEE), Jamalpur, as the training was crucial for efficient operation and maintenance of bio-toilets. It was also advised that extensive and exhaustive training in Supervisory Training Centre (STC) /Basic Training Centre (BTC) be imparted to all Field Staff, including Railway Supervisors, OBHS Staff, Cleaning Staff and Train Attendants. Further, Railway Board directed (October 2013) Zonal Railways that an Expert Officer be designated and trained in each Zone. He would travel across the zone and share knowledge with those who were responsible for maintenance and upkeep of bio-toilets. The details of staff trained in maintenance of bio-toilets during the period of review were as follows:

Table 13 - Details of training imparted to staff in Coaching Depots handling bio-toilets							
Zonal Railway	Total staff in Coaching Depots		Staff trained in maintenance of bio-toilets		Percentage of trained Supervisory Staff	Percentage of trained non-Supervisory Staff	Whether Expert officer nominated?
	Supervisory	Non-supervisory	Supervisory	Non-supervisory			
A	B	C	D	E	F	G	H
CR	449	2306	110	758	24.49	32.87	Y
ECoR	98	1352	24	25	24.49	1.85	Y
ECR	148	1462	63	9	42.57	0.62	Y
ER	362	3925	179	1085	49.45	27.64	N
NCR	226	2192	77	508	34.07	23.17	Y
NFR	116	1367	11	5	9.48	0.37	N
NER	133	1710	80	769	60.15	44.97	Y
NR	658	6750	361	2277	54.86	33.73	Y
NWR	157	934	20	84	12.74	8.99	N
SR	434	5058	86	2299	19.82	45.45	Y
SCR	293	2901	96	384	32.76	13.23	Y
SER	212	2362	51	81	24.06	3.43	N
SECR	81	715	37	25	45.67	3.49	N
SWR	201	1445	40	99	19.90	6.85	Y
WR	607	2692	278	233	45.79	8.65	Y
WCR	112	1005	57	220	50.89	21.89	N
Total	4287	38176	1570	8861	36.62	23.21	

As can be seen from the above,

- Only 36.62 *per cent* Supervisory and 23.21 *per cent* non-Supervisory staff were trained in maintenance of bio-toilets, since the issue of orders for imparting training.
- Non-Supervisory staff was responsible for maintenance of bio-toilets in the Coaching Depots. In ECR and NFR, less than one *per cent* of the non-Supervisory Staff had been given training. In ECoR, NWR, SER, SECR SWR and WR, less than 10 *per cent* of non-Supervisory staff was trained.

- ER, NFR, NWR, SER, SECR and WCR were yet to nominate an Expert Officer as per the directions of Railway Board.
- Where Expert Officers were nominated, they had not been sent for training to the nominated training institutes.

There is an urgent need to trains more number of non-Supervisory staff, who can effectively handle maintenance and upkeep of bio-toilets fitted in passenger coaches.

Ministry during Exit Conference assured (July 2017) to look into the matter regarding training of staff.

4.4 Public Awareness Initiatives

Railway Board directed (March 2016) Zonal Railways to take up vigorous Public Awareness Drive through frequent announcements, running captions and playing short clippings regarding bio-toilets on display boards/LED screen at Railway Stations, distribution of stickers /pamphlets among passengers, providing stickers inside/outside coaches fitted with bio-toilets and advertisements in local/National Newspapers etc. JWG in their meetings also have been emphasizing the need to take steps for creating public awareness through various means.

It was observed (September 2016), that while stickers were found pasted inside/outside the coaches fitted with bio-toilets, none of the Zonal Railway except SR conducted any specific Passenger Awareness Drive to educate the public by distributing pamphlets, making announcements or arranging display on display boards/LED screens. SR arranged for two awareness drives each in Basin Bridge Coaching Depot and Rameswaram Coaching Depot during 2015-16 and 2016-17.

Thus, effective steps needed to be taken to make passengers aware about the working and usage of bio-toilets, which would go a long way in ensuring proper upkeep and maintenance of bio-toilets. If railways highlighted the issue of elimination of manual scavenging through use of bio-toilets while conducting Public Awareness drives, the same would be more effective.