1. **Introduction:** Bio-Toilet tanks are being fitted in the Coaching stock to avoid open defecation in the track. For maintenance of bio-digesters, maintenance schedules have been prepared for Coaching Depots and POH workshops. The work content of various maintenance schedules and maintenance spares required during schedules are being given in this pamphlet to facilitate maintenance staff for doing efficient maintenance & repairs.

2. **Instructions for maintenance of Bio toilets in Coaching Depots.**

   **A. WORK TO BE CARRIED OUT DAILY / TRIP:**
   1. Attending daily routine complaints received from the users.
   2. Removal of choking from toilets on arrival of rakes with the help of choke removing gadgets only.
   3. Checking of all components of Bio-toilet system for any deficiency.
   4. Attention to Operating Mechanism of Ball valve and attention to TPE Rubber Connector.
   5. Examination of chlorinator unit for any leakage, tilting and thread missing and charging by Chlorine/Kmno4 tablets, if required.
   6. Attention to PLC if fault is noticed (if applicable).
   7. Exterior washing of bio-digester tank at washing line during maintenance.
   8. Flushing of Bio-Toilet tank till discharge of effluent comes out from pipe.

   **B. WORK TO BE CARRIED OUT MONTHLY or “A” Schedule:**
   All works of Daily Schedule above;
   1. Visual inspection of complete Toilet system including under slung equipments and mounting arrangements of Bio-Toilet system and attend if found deficient/defective.
   2. Charging of Chlorine/Kmno4 tablets and examination of Chlorinator unit every 10 days or as required depending on life of the tablet.

   **C. WORK TO BE CARRIED OUT QUARTERLY or “B” Schedule**
   All works of Daily and Monthly schedules above;
   1. Checking of following equipments/repair/replacement for proper functioning:
      - Ball Valve with operating mechanism
      - Leakage in piping, flush system, tank etc.
      - Check PLC, pneumatic valves (if applicable).
      - Charging of Bio-culture if required (based on test reports). Inoculum is supplied by certified firms/DRDE/GWL/MIBW/SECR, Nagpur).
   2. Collection of samples from tanks and transportation for nominated Govt. approved lab as per the test scheme (RDSO/2010/CG/TS-10 or any latest applicable test scheme) issued by RDSO. [The frequency of sample testing is 90 days]

   **D. WORK TO BE CARRIED OUT IN IOH SCHEDULE.**
   All works of Quarterly schedule above;
   1. Servicing of all PLCs if applicable.
   2. Testing of complete Toilet system
   3. Application of evacuation machine for removing garbage from first chamber of the bio-digester.
   4. Charging of Bio-culture (Inoculum) if required (based on test reports)
3. Instructions for POH of the Coaches fitted with Bio toilets.

1. Place the coach at maintenance workshop’s pit line, where fork lifter can be placed under the tank.
2. Mark all the tanks with their respective coach number and lavatory number.
3. Remove all the nut bolts used for fastening of safety ropes and safety ropes provided for IR-DRDE bio toilet retention tank.
4. Dismount hose clamp provided for securing of Rubber hose at Lavatory Pan.
5. Remove all the pneumatic pipes for flapper valve if any.
6. Open all the nuts and washer with the help of suitable spanner/ wrench. Atleast one bolts should remain in the holes of each mounting bracket of tank to avoid accidental dropage of tank during placement and lifting of the tank.
7. Place the arms of fork lifter below tank and lift the tank slowly about half inch. Remove remaining bolts carefully.
8. Remove all the tanks with the help of fork lifer for thorough cleaning. Tank and mounting brackets should be inspected for any damage, leakages etc.
9. Complete tank evacuation and cleaning of whole tank be ensured.
10. Attention to Ball valve linkages /clutch wire or operating mechanism.
11. Ball valve should be overhauled and PTFE seal of Ball valve should be renewed 100% during POH.
12. Rubber connector should be renewed during POH.
13. Replacement of poly grass mat with proper securing arrangement.
14. If there is any damage or leakage in the tanks or non-confirming results of effluent are reported, these tanks should be drained out at designated place, cleaned properly and tank should be rectified for the deficiency noticed.
15. If no deficiency found, It should be stored after cleaning in the racks (3-tier stacks as suggested by CAMTECH for bio toilet tanks). Racks should be placed in cool, safe area and without sunlight.
16. Ingress of water, chemicals or any other foreign object to the tank should be prevented during storage of the bio toilet tanks.
17. Then the coach should be sent to all regular stages of POH attention.
18. After completion of POH of the coaches, tanks marked with respective coach number and lavatory number should be taken out from storage rakes and restored in position.
19. Check the rubber hose used for joining of P-trap and Lavatory pan for any defects, remove all dirt, scaling and old sealant before fixing it again.
20. Reconnect pneumatic pipes for flapper valve if fitted with PLC version.
21. Nut, bolts and spring washers used for mounting bracket and securing of safety rope should be checked for wear, tear or corrosion etc. and should be replaced with same size material and grades if defective.
22. Check safety wire rope before re-mounting for any defects.
23. Ensure all the nuts and bolts used for mounting and securing of safety rope are properly tightened before dispatch of the coach.
24. NDT of J Brackets/Positive mounting bracket.
25. Tanks should be Re-filled with the required level of bacterial Inoculum before dispatch of the coach.
Work to be attended by AMOC contractor during POH

- Work to be done in the scope of AMOC by the contractor during POH is mentioned in clause no. 5.6.5 of the guidelines for AMOC.

4. In order to overcome the problems of Bio-Toilets, RDSO has issued improved designs -

1. **Flush Valve**: Flush valve to be provided as per RDSO Spec. No. 2008/CG/05 which is capable to discharge measured quantity of water (1.5 ltr & 2.5 ltr.) on each flush.
   - Drawing for measured quantity discharge flush valve having dual flushing arrangement has been developed by ICF. Drawing No. ICF/STD-6-3-106

2. **Ball Valve**: The loss of water curtain is either due to defective seal or rough surface finish of ball. Drawings upgraded –
   - i. 5 inch ball valve to RDSO drawing no. CG-11089 alt.2
   - ii. 4 inch ball valve to RDSO drawing no. CG-14097

3. **Foul smell in Toilet Room**
   - Railway Board has also expressed his concern to deal with the bad smell from toilet –
   - 1. Ensure full flushing during primary maintenance.
   - 2. Ensure dry toilet floor when rake is berthed at platform.
   - 3. Use of deodorant/Air freshener in toilets.
   - 4. Availability of effective air freshener in toilets.
   - 5. Induced draft ventilation system.
   - 6. Ensure good supervision of OBHS staff

4. **Rubber Hose Connector**
   - Drawings applicable for hose connector has been upgraded with required parameters and TPE material –
   - i. 5 inch interface dia of P-Trap is CG-14070 alt-1
   - ii. 4 inch interface dia of P-Trap is CG-14094 alt-2

5. **Ball valve opening/closing mechanism**

Drawing No. MI006591 “a” for clutch wire mechanism issued by RCF has been reviewed.

6. **P-Trap**: Drawing applicable for P-Trap has been upgraded for investment casting-
   - i. Drawing for 150 mm interface dia is CG-11085 alt-3
   - ii. Drawing for 100 mm interface dia is CG-14055 alt-2

7. **100 mm dia Pan outlet**
   - Drawing No. CG-14100 for 100 mm lavatory pan has been issued to ICF & RCF for implementation.

8. **Introduction of S-Trap**: S-Trap arrangement has been evolved to eliminate the problems.
   - RDSO Drg. No. CG-16008 made as optional item to RDSO drawing No. CG-14053 in place of P-Trap and Ball valve.

9. **Other issues related to General Maintenance**
   - i. Use of reputed make hardware for mounting of Bio digester: i.e. Unbrako, TVS or LPS for ensuring safety during run and may be replaced with new one during IOH and POH.

5. **Retro-fitment Procedure of S-Trap to RDSO Drawing No. CG-16008 in the Toilets fitted with IR-DRDO Bio-Toilets to the design CG-14053.**

RDSO has issued drawing no. CG-14053 with P-Trap, Ball valve and ball valve opening/closing mechanism. For adoption of S-Trap in lieu of P-Trap, following procedure shall be adopted.
1. Remove opening/closing mechanism fitted with ball valve from both ends.
2. Dismount clamps and hose connector between lavatory pan & P-trap. Dismount all bolts used for mounting of Tank on under frame & lower the tank with the help of lister or fork lifter.
3. Dismount the hose clamp, hose connector, p-Trap & ball valve from tank including hardware used for mounting.
4. For retro-fitment of S-Trap design in existing design of IR-DRDO Bio-Toilets to the Drg. No. CG-14053, following shall be arranged –
   I. For 100 mm lavatory pan outlet coaches all items of drawing CG-160084 except item-11,12
   II. For 150 mm lavatory pan outlet coaches all items of drawing No. CG-16008 except item-1 & 2.
5. Check the outlet of existing lavatory pan for any damage/any other surface defects. Prepare the surface of neck of laboratory pan for fitment of rubber seal.
6. Insert rubber seal items no. 2 (for 100mm outlet laboratory pan) or items no. 12 (for 150 mm outlet lavatory pan) on outlet of existing lavatory pan
7. Align the S-trap item no1(for 100mm outlet lavatory pan) or 11 (for 150mm outlet pan) and insert S-Trap on rubber seal provide on Lavatory Pan.
8. Mount/fit the bio digester tank with the help of specified fastener and safety wire rope to the procedure already defined and issued.
9. Check the location, position of supporting bracket for resting of S-Trap on top plate
10. Weld all studs of size M10 & fit the supporting bracket.

6. Maintenance Spares required in Coaching Depots and Workshops

1. Ball valve unit : 5% in workshops
2. PTFE seal : 20% in Coaching Depots and 100% in workshops
3. Rubber connector :20% in Coaching Depots and 100% in workshops
4. Poly-grass mat :100% in workshops
5. SS Safety W/Rope:5% in Coaching depots & Workshops
6. S-Trap unit : 2% in workshops
7. J-Brackets : 2% in workshops
8. M-16 size bolts : 05% in Coaching Depots and 100% in workshops (reputed make only)
9. Chlorinator Unit : 01% in Coaching Depots and 2% in workshops
10. Chlorine Jacket : 01% in Coaching Depots and 2% in workshops
11. Colonized Rubber: 100% in workshops
12. Clutch wire unit : 1% in workshop
13. Chlorine Tablets : As per requirement
15. Foot pedal : 1% in workshops
16. Dustbins : 10% in Chg. Depots & 20% in workshops
17. SS Clamp : 02% in Chg. Depots & 10% in workshops

7. Checking of following components for proper functioning of Bio-Toilets:

1. Operation of Ball valve
2. Leakage in piping, flush system, tank, valves, PLC, pneumatic valves, ball valves etc.
3. In case of failure of lab sample, samples to be taken 2 more times at an interval of 15 days. If sample failing frequently even after 3 consecutive testings, recharging of 60 lts. Inoculum should be ensured in tank. Inoculum is supplied by certified firms/DRDE/GWL or MIBW/SECRly/NGP.

8. **Lavatory and lavatory fittings:**

   **Following items to be checked during various maintenance schedules of ICF design coaches and LHB coaches**
   
   1. Check lavatory hinge door for proper function
   2. Examine lavatory door latches/ tower bolts for proper function
   3. Examine push cock, flush valve for proper functioning.
   4. Check and attend leakage in pipes, fittings and shower roses in lavatory
   5. Clean drain grills and drain holes in bath room and wash basin if found choked.
   6. Check and replace damaged/ missing mirrors/shelves/soap dishes.
   7. Examine squatting pans and foot rest for damages.
   8. Intensive cleaning of lavatory pans and commode with recommended cleaning agents.
   10. Availability of Dust bin with disposable polythene bag.

9. **Useful maintenance Tools for Bio-Toilets:**

   2. Ball valve by-passing tool
   3. Garbage picking tongs

   4. Passenger awareness stickers on toilet door inside the toilet.
   5. Only prescribed cleaning agents be used for cleaning of Bio-toilets.
   6. Toilet shall be sprayed with good deodorant with pleasant fragrance.
   7. Dedicated trained staff in bio-toilet should only be deployed for maintenance.
   8. Sufficient flushing of water to be ensured in each toilet.
   9. Lab samples to be collected timely and parameters should be recorded.

10. **Review of Effluent Discharge Parameters of Bio-Toilets**

    During review meeting held at DRDE/GWL on 06.07.2018, testing parameter has been revised & taken three parameter instead of six and target values are same as under-

<table>
<thead>
<tr>
<th>SN</th>
<th>Parameters</th>
<th>Revised Target Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>6.0 – 9.0</td>
</tr>
<tr>
<td>2</td>
<td>Chemical Oxygen Demand(COD) (mgo2/L or PPM)</td>
<td>&lt; 1800</td>
</tr>
<tr>
<td>3</td>
<td>Fecal Coliforms(FC) count (CFU/100ml)</td>
<td>&lt; 10’</td>
</tr>
</tbody>
</table>
If a sample from a given Bio-Toilet fails to comply with the above revised target in respect of at least three parameters, effluent quality should be tested for 3 months with sampling at monthly interval. If all the three consecutive samplings do not comply to the revised target values, the corrective remedial measures should be taken by Zonal Railways.

11. Instructions for Rake Maintenance Supervisors:

1. Visual inspection of complete toilets system including under slung equipments and record in std. Proforma.
2. Toilet chute to be cleared in bio-toilets if there is chocking in P-Trap/S-Trap.
3. Timely collection and transportation of sample as per testing scheme issued by RDSO.
4. Checking the toilets system for any defect/deficiency in each trip.
5. Charging of chlorine/KMNO4 tablets and examination of chlorinator as per testing scheme.
6. Checking of functioning of Ball valve.
8. Corrosion of J-Brackets

DISCLAIMER

THE INFORMATION GIVEN IN THIS PAMPHLET DOES NOT SUPERSEDE ANY EXISTING PROVISIONS LAID DOWN IN RDSO AND RLY. BOARD’S INSTRUCTIONS. THIS DOCUMENT IS NOT STATUTORY AND INSTRUCTIONS GIVEN IN IT ARE FOR THE PURPOSE OF GUIDANCE ONLY. IF AT ANY POINT CONTRADICTION IS OBSERVED, RLY. BOARD/RDSO’S GUIDELINES OR ZONAL RLY.’S INSTRUCTIONS MAY BE FOLLOWED.

The information given in this pamphlet is only for guidance. If you have any suggestion or comment, please write to:

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CAMTECH/2017/M/GWL/Bio-Toilet/Maintenance-Spares/1.0