

## TANK WAGON -- REPAIR AND MAINTENANCE



Sr. No.	Consignment	Code
1.	Petroleum & highly inflammable products	TP, TK, BTPN
2.	Raw petroleum products (Black Oil)	TL
3.	Vegetable oils	TV
4.	Bitumen	TB
5.	Molasses	TM
6.	Petroleum gases (LPG)	TPGL, BTPGLN
7.	Others	TAL, TCS

Tank wagons form a special class of non-pooled rolling stock. They are classified according to the product carried by the tank and its design as follows:

### **CLASSIFICATION OF TANK WAGONS:**

1. Tanks as pressure vessels
2. Tanks for corrosive liquids.
3. Tanks for petrol and other highly inflammable products.
4. Tanks for middle distillates of petroleum and other products.

**DESIGN FEATURE:**

The design of the under frame of 4 wheeler and 8 wheelers wagon is generally similar to that of other IRS wagons except that a pair of saddles is provided on the under frame at each end for mounting the barrel. The barrel is cylindrical vessel generally fabricated out of low carbon structure steel to IS 2062 Fe 410 Cu W. The barrel is placed longitudinally on the under frame and secured by means of rivets to the saddle. The saddle is welded on under frame at each end.

**BARREL MOUNTING**

S. N.	MOUNTINGS/ FITTINGS	FUNCTIONS
1.	Safety Valve	The safety valve is provided to prevent building up of excess pressure inside the barrel. It is fitted on the barrel either on the diaphragm plate inside the dome or on a separate opening on the barrel. This is provided on highly inflammable liquid such as petrol., aviation sprit .etc.
2.	Relief valve	It is a spring loaded valve fitted on the barrel on tanks for corrosive liquids. Its main function is to release built up pressure, if it exceeds the working pressure limit.
3.	Safety vent	This consists of frangible disc (lead or any approved material not affected by loading), which ruptures at specified pressure. It is an additional safety fitting to safeguard against the failure of the relief valve. When the built up pressure exceed the working pressure of the relief valve and the latter fails to function for any reason the frangible disc of this safety vent ruptures to release the pressure.
4.	Compressed air valve	It is provided on tank from which the contents are unloaded by compressed air. Its main function is to control the rate of discharge by controlling the rate of air admission.
5.	Vapour Extractor Cock	Its function is to extract vapour from the tank while filling.
6.	Master Valve	It is a gravity discharge valve fitted with a hand wheel in the dome for manual operation.
7.	Bottom Discharge Valve	BG-4 wheeler Bottom discharge valve are provided with the single bottom discharge valve situated underneath the master valve while on BG/MG -8 wheeler stock two bottom discharge valve are fitted one on either side and connected with the master valve through a 'T' pipe. The main function of the valve is to control the flow of the contents and also to serve as an additional safety stock in case the master valve fails or breaks. The bottom discharge valve opening are also provided with blank flanges to be used with 2mm compressed asbestos fiber jointing material to serve as further check on accidental leakage of contents

The periodicity of POH is given below:

SN	Type of wagons	For 1 <sup>st</sup> POH	For subsequent POH
1	4 wheeler tank wagons except those listed below	4 years	3-1/2 years
2	Tanks for liquid chlorine and hydro chloric acid	2 years	2 years
3	Tanks for liquid ammonia	2-1/2 years	2-1/2 years
4	Tanks for petroleum gas	4 years	4 years
5	BTPN	6 years	6 years

The total life of tank wagons is 45 years.

**Steam cleaning for pressure vessels, petroleum and other highly inflammable products:**

Tanks as pressure vessels, tanks for petroleum, other highly inflammable products, vegetable oils, bitumen, coal tar and molasses are cleaned by steam. The tanks requiring steam cleaning should be placed as near the steam supply line as possible and protected against any movement. The berthing siding should be completely isolated from all other traffic. In case of pressure vessels, it should be ensured that all the gas has been discharged to the atmosphere.

After ensuring that the tank barrel is no longer under pressure, the following sequence should be followed:

Remove the manhole cover together with manhole housing, valves etc. and leave the tank exposed to atmosphere for 24 hours. Entry of staff in the tank barrel should be

strictly prohibited and signs with suitable legends displayed at a reasonable distances away from the tanks to be steam cleaned. Insert pipe through manhole and steam the interior of barrel for 12 hours. In order that the tank barrel is thoroughly steamed from inside, the steam pipe should be provided with a “T” connection at its lower end and so directed as to blow steam towards both ends. Remove condensed steam collected in the tank barrel and keep the barrel exposed to atmosphere for another 24 hours.

The following are the tests that should be conducted to ensure the tanks are free from contamination gases of the contents.

### **AMMONIA TANK BARREL:**

Fill the tank barrel with water. Collect a specimen of the water in a clean glass bottle. Test the specimen of the water with red litmus paper. If the colour of the litmus paper turns into blue, it indicates that the barrel is still having the gases of ammonia and requires steam cleaning.

### **NESSLER’S TEST:**

Test the specimen of the water with a mixture of potassium mercuric iodide and potassium hydroxide. If the colour of the mixture turns into brown, it indicates that the barrel is still having the gases of ammonia and requires steam cleaning.

### **CHLORINE TANK WAGONS:**

Fill the tank barrel with water. Collect a specimen of the water in a clean glass bottle. Test the specimen of the water with red litmus paper. If there is any bleaching effect on the litmus paper, it indicates that the barrel is still having the gases of chlorine and requires steam cleaning.

**LPG TANK WAGONS:**

Fill fresh water in a clean bottle. A string is to be attached to the bottom of the bottle. Lower the bottle through the manhole up to the bottom of the tank and tilt the bottle. Allow the water to flow out and let the gas get into the bottle. Wait for 5 minutes and lift the bottle and close the mouth immediately after withdrawing. Take it away from the tank. Bring a lighted matchstick near the mouth of the bottle after opening it. If there is no flame it is free from injurious gas. But in case it gives out a flame, the tank should again be steam cleaned again.

**Procedure for steam cleaning of bitumen and molasses tank wagons:**

Close the manhole cover and open bottom discharge valve. Pass steam through the air inlet valve for sufficient time till the bitumen melts and drains away through the water discharge valve. The bitumen should be collected in containers and not drained out on the floor. Open the manhole cover to see whether the tank is completely cleaned from inside. In case any residue is left behind the above procedure should be repeated. Remove heating arrangement i.e., heating pipe, internal pipe, etc, from the tank. Clean inside surface of the heating pipe by scrapping the carbon layer with wire brush or other suitable process. Blow in air under pressure from one end. The outer surface of the heating pipe should be cleaned with kerosene oil.

**Procedure for cleaning of tanks for corrosive liquids:****HYDROCHLORIC ACID TANKS:**

Open the manhole and the washout cover and start cleaning the barrel with water. Initially the water coming out of the washout opening will show excessive acidity, which will turn blue litmus paper into red. The washing should be continued till blue litmus paper shows no change. Then close the wash out cover, fill the tank with water. Collect a sample of the water in a bottle. Test the sample of water with blue litmus paper. If the colour is changing to red, it indicates that the tank is still having traces of acid and requires cleaning.

### **SULPHURIC ACID TANKS:**

Wash the Sulphuric acid tank barrels with ½ % to 1% solution of sodium phosphate commercial or half percent solution of soda ash so as to neutralize the sulphuric acid. The washing should be done as soon as it is received in workshops. Since concentrated sulphuric acid absorbs moisture when left open to moist air, the acid will be diluted with time. It is to be remembered that diluted sulphuric acid is highly corrosive and attacks the tank barrel more vigorously.

Collect a sample of water in a bottle. Test with blue litmus paper. If the colour of the paper changes into red, it indicates that tank is having still traces of acid and requires cleaning again. After cleaning allow the tank for drying.

**Caution:** As addition of water to sulphuric acid will produce intense heat, resulting in splashing of steam, the solution of commercial sodium phosphate should be added or spread gradually and with care.

### **CAUSTIC SODA TANKS:**

Wash the barrels with hot water. Freedom from alkalinity can be easily ascertained by litmus test (if red Litmus changes to blue, there are still traces of alkalinity). After it is free from alkalinity, water should be drained and barrel dried before inspection and repairs

### **Checks to be carried out by the C&W Engineers before the tank wagon is certified for loading:**

**Master Valve:** Leakage of master valve should be checked while keeping the bottom discharged valve in open.

**Bottom discharge Valve:** Proper functioning and fluid tightness of the bottom discharge Valve should be ensured.

**Blank flange:** The blank flange of the correct thickness made out of steel plate and with a gasket of proper material between the blank flange and bottom discharge valve flange should be tightened by six bolts and nuts.

**Tank barrel:** Tanks with cracks on barrels should be marked sick.

**Leaky Tank barrels:**

The leakage of tank barrels may be caused due to the following reasons. Mechanical injury to the valve face and /or valve seat as a result of foreign material, particularly nuts and bolts finding their way inside the tank wagon, valves seat not properly secured to the stool by proper interference fits and malfunctioning of master valve.

**Precautions in the case of leakage from the loaded tank wagons:**

**CHLORINE & AMMONIA tanks;**

Chlorine and ammonia gases are poisonous and have a characteristic pungent odour, which gives warning of their presence in the atmosphere before dangerous concentrations are attained. In the case of chlorine, the greenish yellow colour of the gas makes it visible when high concentrations are present. In the case of ammonia, if sufficient concentration of the gas is present in the atmosphere, it will irritate the eyes and the respiratory system.

As such, in the event of leakage, all present in the vicinity should be warned to keep on the windward side of the tank.

**HIGHLY INFLAMMABLE GAS tanks;**

All the flames or fires near it should be extinguished or removed. Smoking should not be allowed. Spectators should be kept away. Only battery operated torches or incandescent electric lights with gas proof sockets should be used. Oil lanterns or signal lamps used for signalling must be kept away. The steam engine available if any should be moved away from the site. The leaky tank wagon should be removed as quickly as possible to an open area, where the escaping gas will be less hazardous. Earth should be spread over any surface on which the LPG has leaked out in liquid form. Call the company concerned for further attention.

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