

Use Of Re-circulating Toilets On Railway Carriages

Introduction

This paper describes the experience gained on the Taieri Gorge Railway (TGR) in installing and using electrically operated re-circulating chemical toilets in railway carriages. The TGR operates daily tourist trains (4 – 6 hour journey time) plus charter and excursion trains on an irregular basis.

The system used is not perfect but is relatively simple and copes with most situations.

The principle is to use a caravan type re-circulating chemical toilet. When it fills (or after each trip) it is discharged into a holding tank mounted on the carriage underframe. This holding tank needs to be emptied at regular intervals. If the holding tank is allowed to overflow treated liquid will siphon through the overflow pipe onto the track. This overflow was originally intended for regular use to allow discharge of treated liquid while retaining solids. Because of concerns with discharging onto the track this siphon now only functions in emergency and may be omitted if other means can be devised for preventing the tank being overflowed.

When the overflow is used, siphoning will continue until the liquid level falls below the bottom of the siphon pipe. An internal screen prevents any solids reaching the pipe (although on the odd high usage car some paper may get through).

At intervals the tank needs to be emptied by a toilet tank cleaning firm.

Advantages

Relatively cheap to install.

Most of the installation can be done in house.

Disadvantages

Doesn't handle high throughput well.

Toilets require servicing by staff after about 4 – 5 hours (more frequently on booze cruises).

Doesn't handle paper towels.

Requires frequent emptying of the holding tank on high usage trains.

Description

The plan and photographs below show the techniques used.

Toilet

- The toilet used is the Electramagic Model 80 available from Lewis Gray Ltd in Auckland. These are available in several different voltage models. In addition to the toilet a closet flange (to take the outlet through the floor) and an additional outlet slide valve (for the holding tank outlet) are required.
- The floor under the toilet may need to be raised to get enough clearance for the outlet pipe over transoms, bogies etc.
- TGR uses a 12 volt automatic charger and sealed battery (12 volt, 24 Ah) to supply both the toilet and the water pump used to fill the toilet and feed the hand basin. (The same power supply also powers the emergency lighting system.) The valve to the toilet is one requiring a hex key to operate to stop passengers playing. (Likewise the basin taps are press operated.)
- Be careful if using copper pipes for the plumbing, some caravan type pumps hammer badly with rigid pipes. (TGR use Flojet pumps with a low pressure switch and they are bad for this.) Mesh reinforced plastic hose on both inlet and outlet of the pump survives well and cushions any hammering.

Tank

- This is constructed using 17 mm tanalised ply, which is then fibreglassed inside and out. As you can see from the photographs all the fittings and mounting bolts for the brackets and outlet valve are fitted before fibreglassing.

- The tank is mounted on angle iron which is then bolted to short sections of channel which, in turn, are bolted to the underframe. Using the intermediate channel sections makes it easier to fit or remove the tank (especially if it is full because of blockage).
- The dimensions given may need to be altered to fit different carriage types.
- Do not mount the tank directly under the toilet (eg on centre toilet compartment cars) as a smell flows back up the pipe into the car.
- Likewise if the pipe between toilet and tank breaks or comes adrift a noticeable smell develops in the toilet compartment.
- If there is a problem on high usage cars with paper getting through the screen the bottom of the internal siphon pipe can be raised.
- Sloping of the tank bottom towards the outlet may improve emptying but has not yet been tried at the TGR.

Use

- In use the toilet is filled with water to the minimum mark and AquaKem toilet chemical (also available from Lewis Gray) added.
- The liquid level in the toilet is monitored during train journeys and drained and refilled when full. This is about 4 – 5 hours on normal trips, more frequently when alcohol is consumed in large quantities.
- When the holding tank nears full it is emptied by a toilet tank cleaning firm. This varies from every 2 weeks for the daily tourist train to a month or more for the less frequently used cars.

Other Notes

- Don't let the passengers put paper towels down the toilets (some cultures are fond of doing this) as the screens in the tanks quickly clog up. If roller towels are unacceptable, hot air hand dryers may be an option if the train power supply is big enough.
- TGR have used the same tank construction techniques for water tanks, but not for drinking water. (A special coating is required internally for storing drinking water in fibreglass tanks.)
- Staff assisting with emptying the holding tanks should be inoculated for hepatitis.

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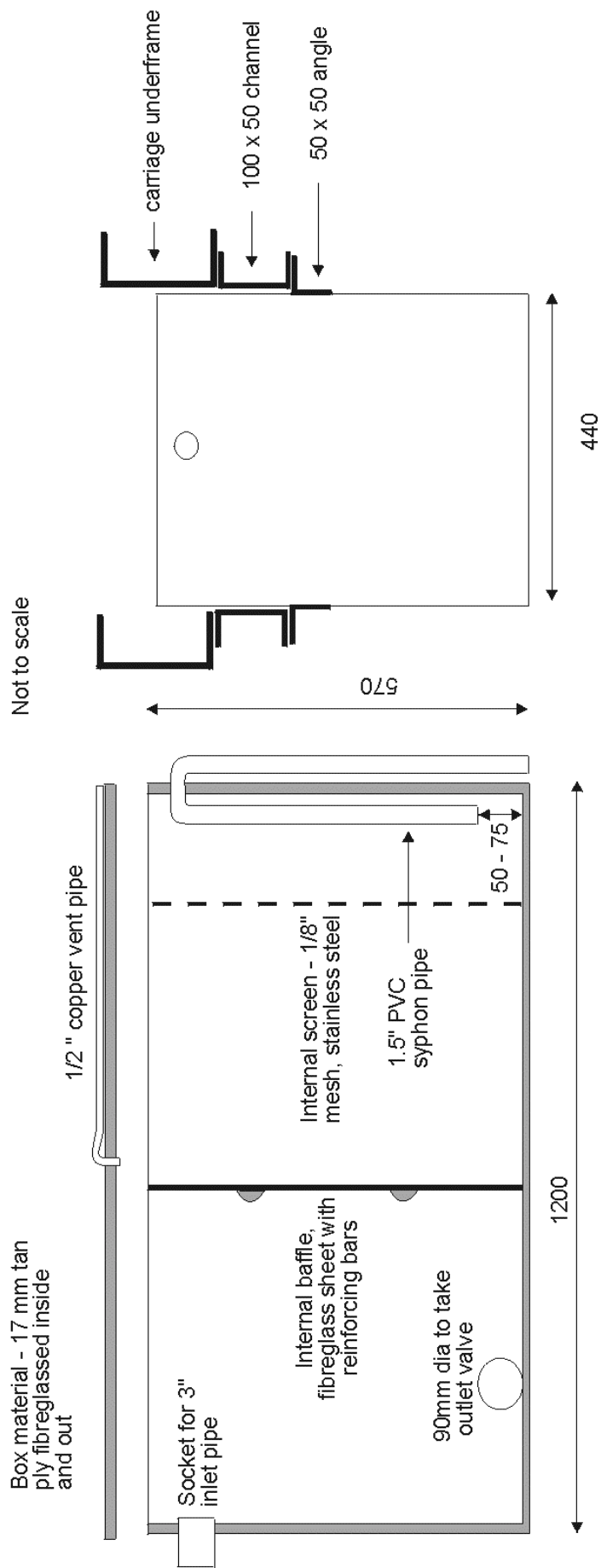
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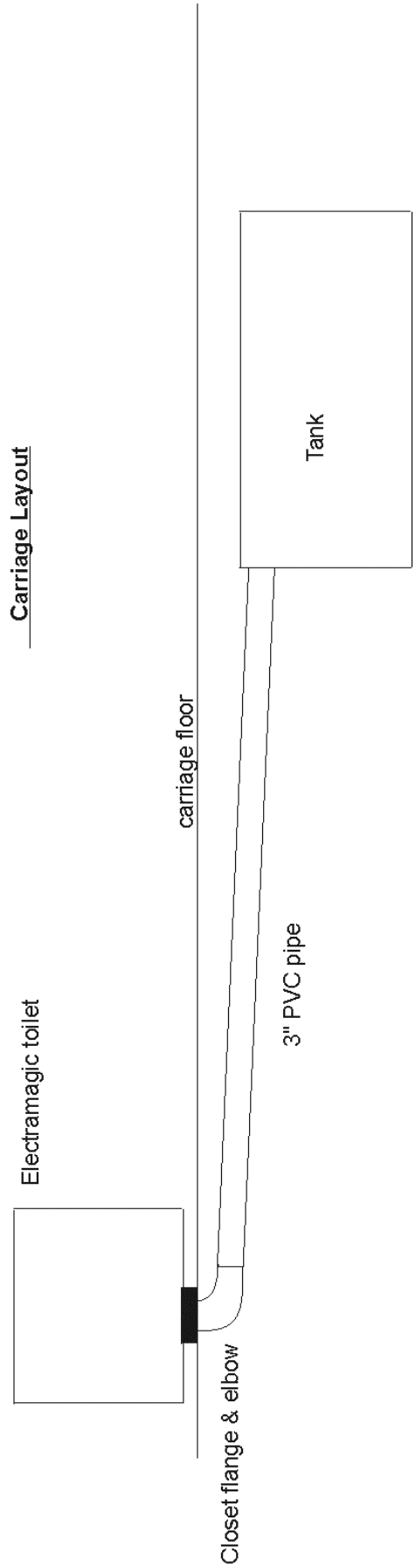
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Tank Details

Not to scale



Carriage Layout





Interior of tank showing baffle and screen.



Completed tank with mounting brackets.
The angle iron bolts to the tank. The short channel sections bolt
between the angle iron and the carriage underframe.

Typical tank installation under a carriage.
(The colour does match the rest of the underframe after a time.)



Typical toilet installation.
(Yes, the plastic bag was removed before the toilet was christened.)