Passenger Interface items

Coaching

Objectives

- Furnishing items
- Fire & safety issues in LHB & ICF coaches
- Toilet systems & biotoilet introduction
- Plumbing systems
- Water tanks

Furnishing Items

- Round cornered Seats & Berths in Carriages
  - WGSCN & WGCB
  - WGFAC, WGFACCW, WGACCWN, WGACCW, WGACCN, WGCBAC & WLRRM
  - LWFAC, LWACCW, LWACCN
  - LWCBAC & LWLRRM
  - GS & GSLR {only seats}
- Chairs in Chair Car Coaches
  - WGSCZ, WGACCZ & LWACCZ
- Reclining arrangements in Chairs

Seats & berths accessories, amenities

- Rolling Berth holding catches, pivots + latches & PU foam rounded rest angles
- Bed cum Back Rest pivots
- Berth holding chains {Rexine covered}
- **Self foldable UB child guard {crashworthy feature}**
- **Foldable bottle holders {injury free characteristics}**
- Nylon magazine bags
- Sunken LED Reading lights
- Arm Rests in coaches
- PU foam cladded ladders

Other passenger amenity items

- Coat hooks {Electrostatic spray powder coating} in Coupes & lavatories
- Overhead Luggage racks
- Luggage securing rings beneath seats
- Mirrors in compartments & toilets
- SS D type wash basin
- Soap tray & Liquid Soap dispenser
- Towel rings
- 110 Volts Mobile/Laptop chargers
- CFL & Air Circulating DC ceiling fans
- Roof ventilators
- MS chequered plate made footsteps beneath BSDs
- BSD {Body Side door} handle {Bolted SS handhold}

Upholstery : AC coaches -

- Fire {flame} retardant Curtains in 1AC & 2AC coaches
- Bedsheets, Blankets, Napkin/Towel & Pillows {i.e. Linens} in all AC Sleeper Class coaches

Trimmings

- Rexines & PU foams in all the seats & berths
- 2 mm thick PVC flooring replacing MgOCl ones
- 2 mm thick Al chequered sheets on Doorways & Gangways

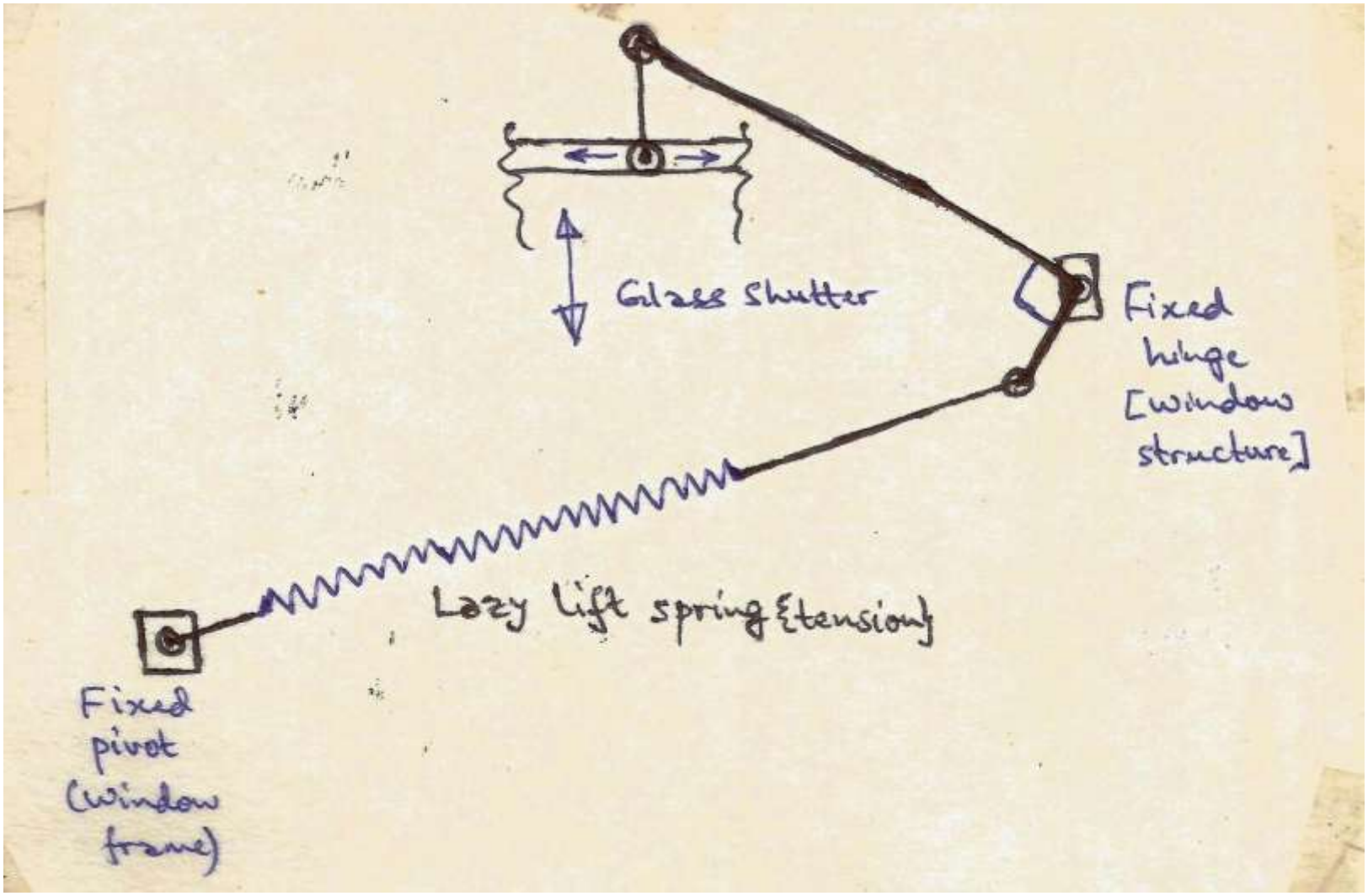
Vestibule areas

- Fire {flame} retardant UIC “rubber” on MS 3.15 mm thick vestibules
- 6 mm chequered MS “fall” {flap} plates

Doorways around Wash basin

- Garbage bins beneath SS wash basins {box covered} {garbages collected in plastic bags at CTS & accordingly disposed off}

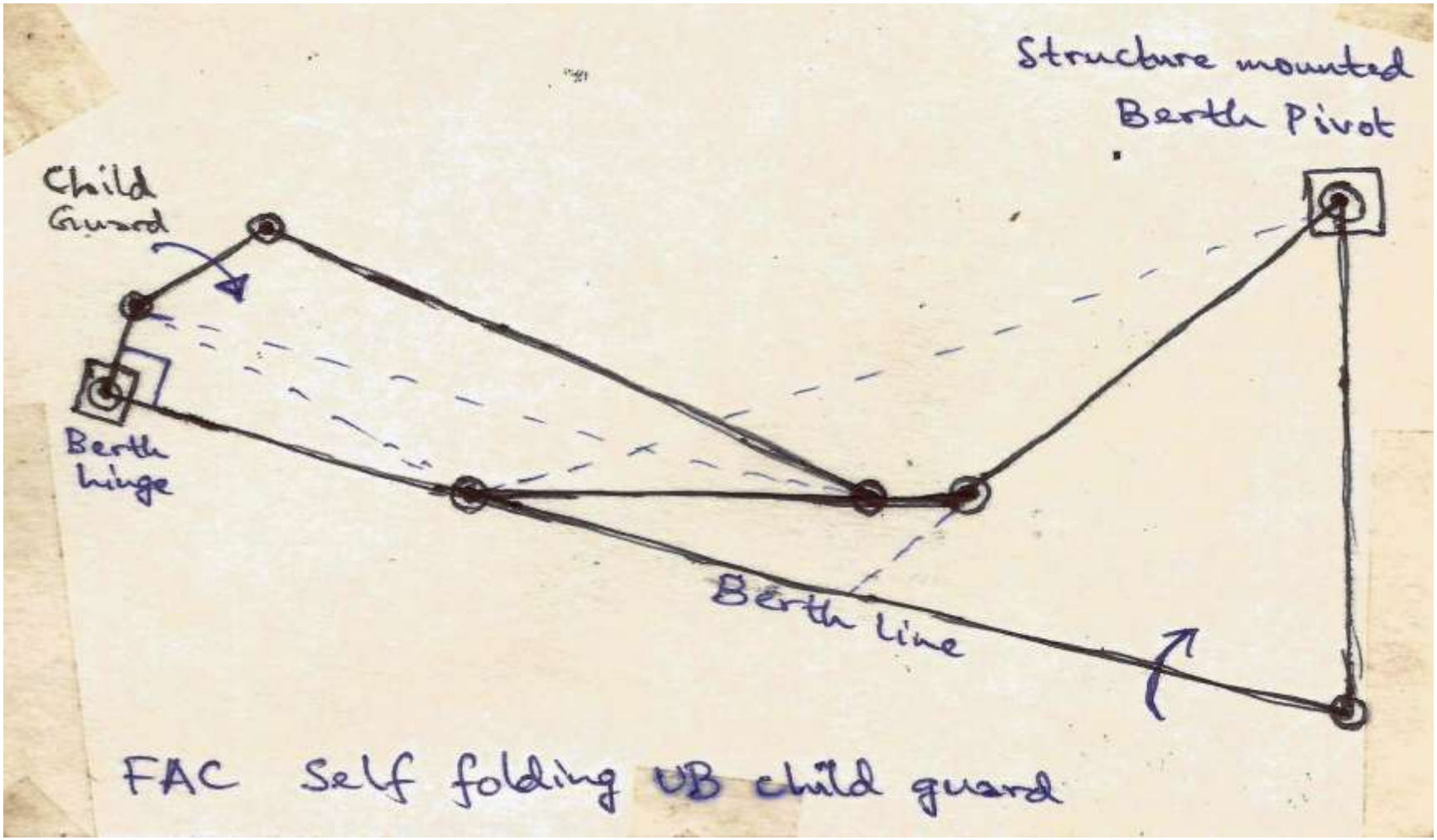
Lazy lift in ICF NAC coach glass shutter



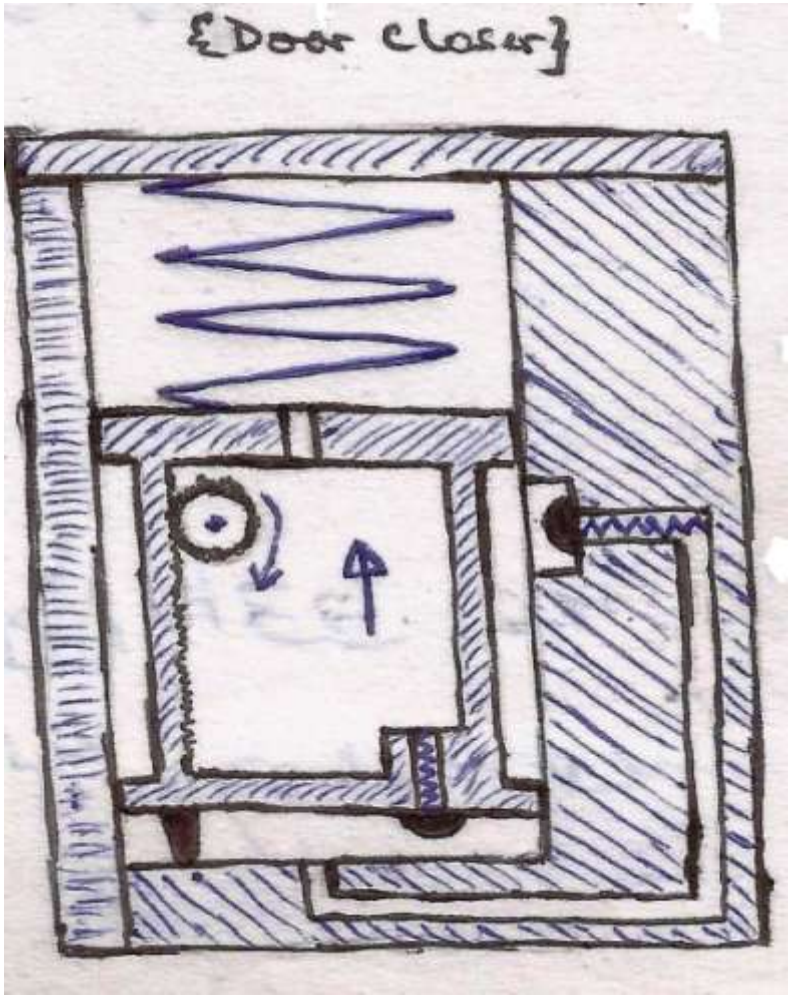
Other passenger interface items

- Body Side Doors
  - Door handle
  - Door Latches
  - Door top structures
- Windows
  - **Inert gas filled sealed glass units in AC coach windows**
  - **Louvre Shutters in Non AC Coach windows**
  - **Glass Shutters in Non AC Coach windows**
  - **Window Side Structures**
- **Lavatories**
  - **Windows with Frosted glass/sealed windows/BANJO fittings**
  - Lavatory doors having tower bolts & turn over catches
  - SS D type/porcelain Wash basins, SS Pans/commodes, Flush valves & taps, SS Mugs, Soap tray, Liquid soap dispenser, Tissue Paper Rolls, Coat Hooks, Towel rings, Exhaust fans & lights, SS Wall protectors

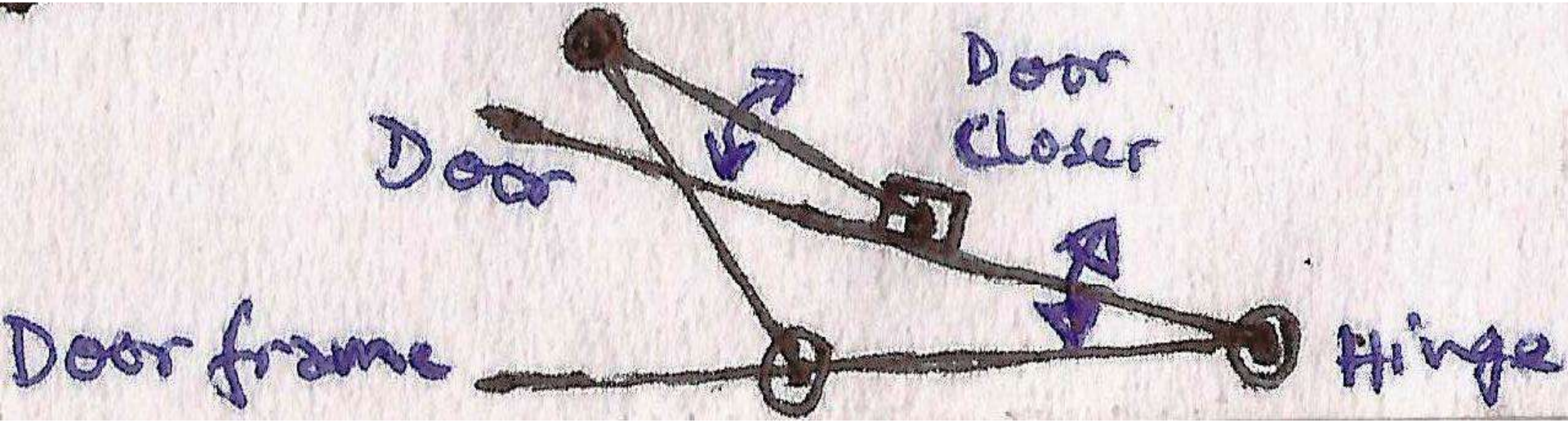
FAC Coach UB foldable child guard



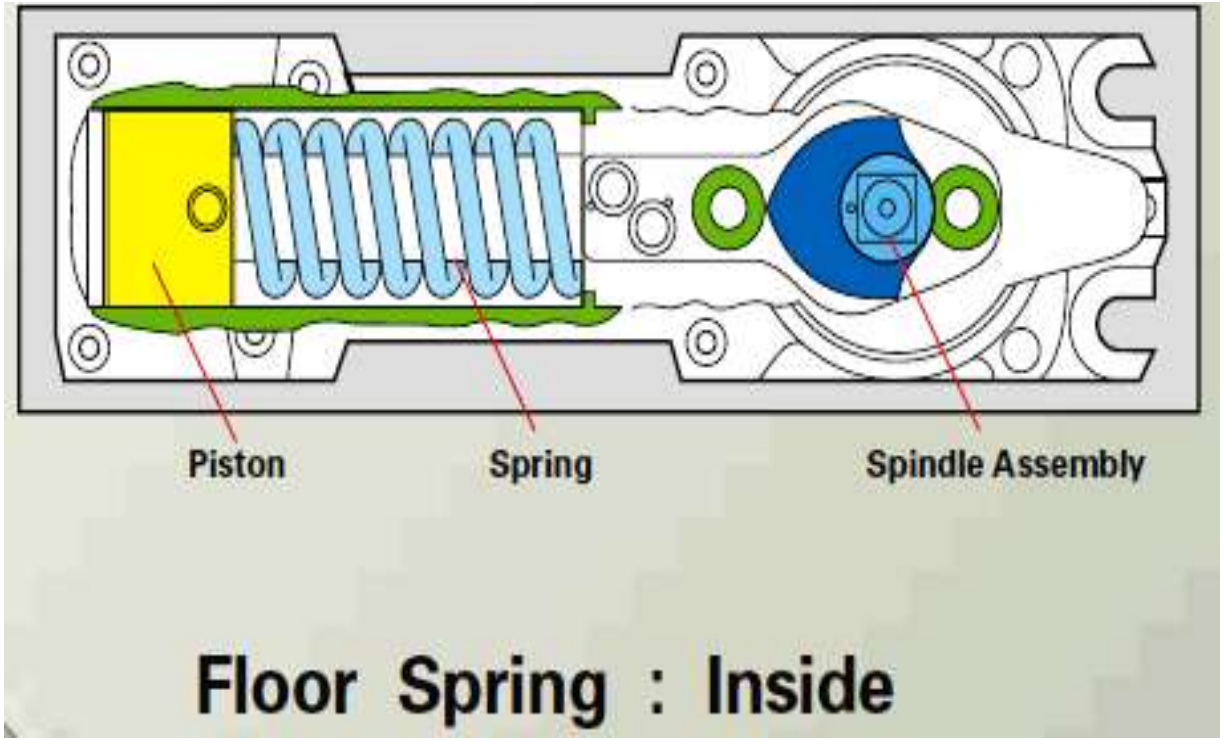
AC coach Flap door closer



AC Flap door closer linkages



GODREJ Floor fixed door closer



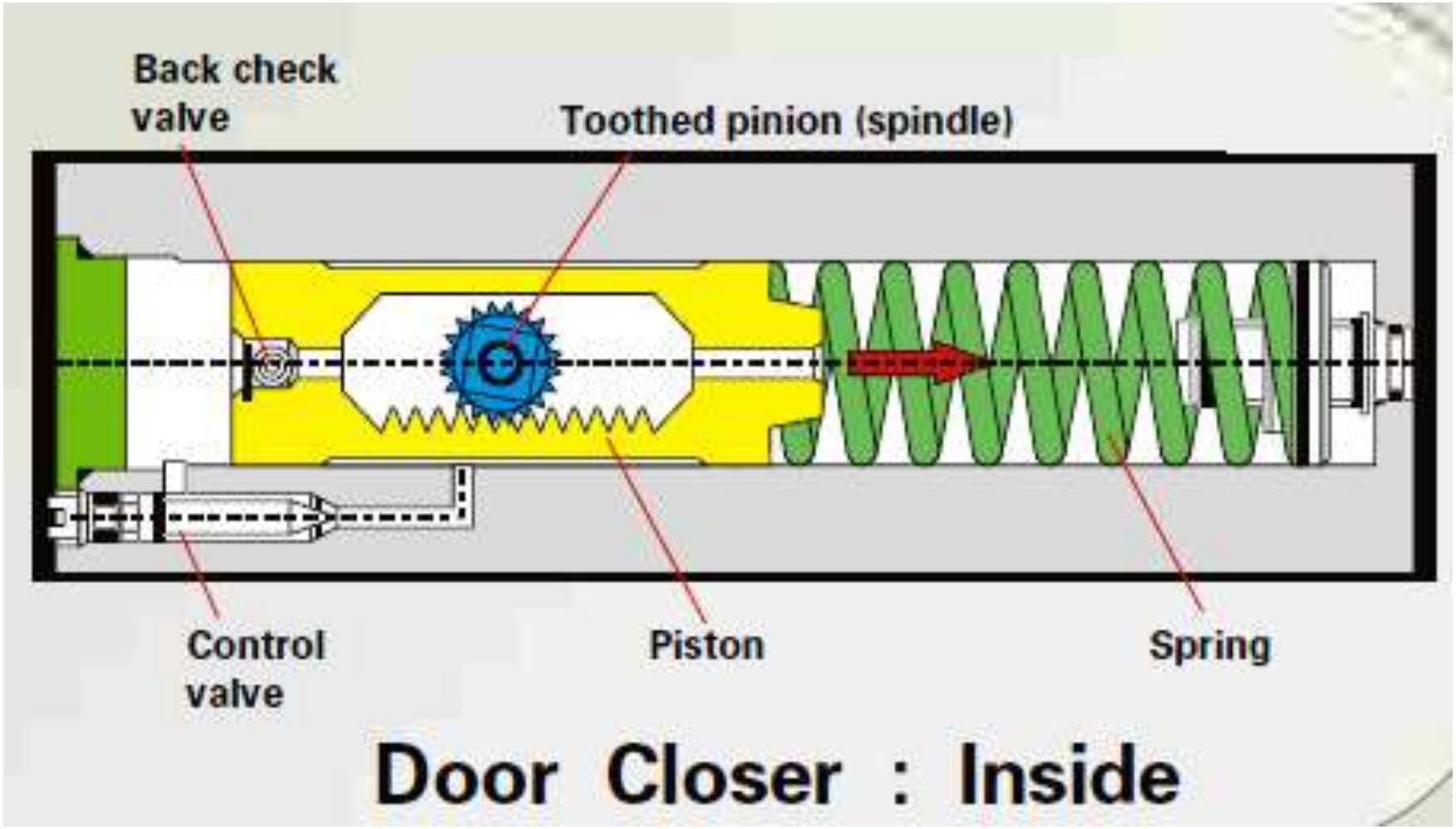
LHB AC chair car specific problem

- Reclining arrangement common types
  - Clock spring type
  - Coiled spring with hydraulic damping plunger type
- General troubles encountered in POH
  - Broken clock type spring
  - Oil leakage in hydraulic damping {orifice flow} type having no replenishment provision

Chair Car reclining arrangements



GODREJ Door Closer



GODREJ door closer design

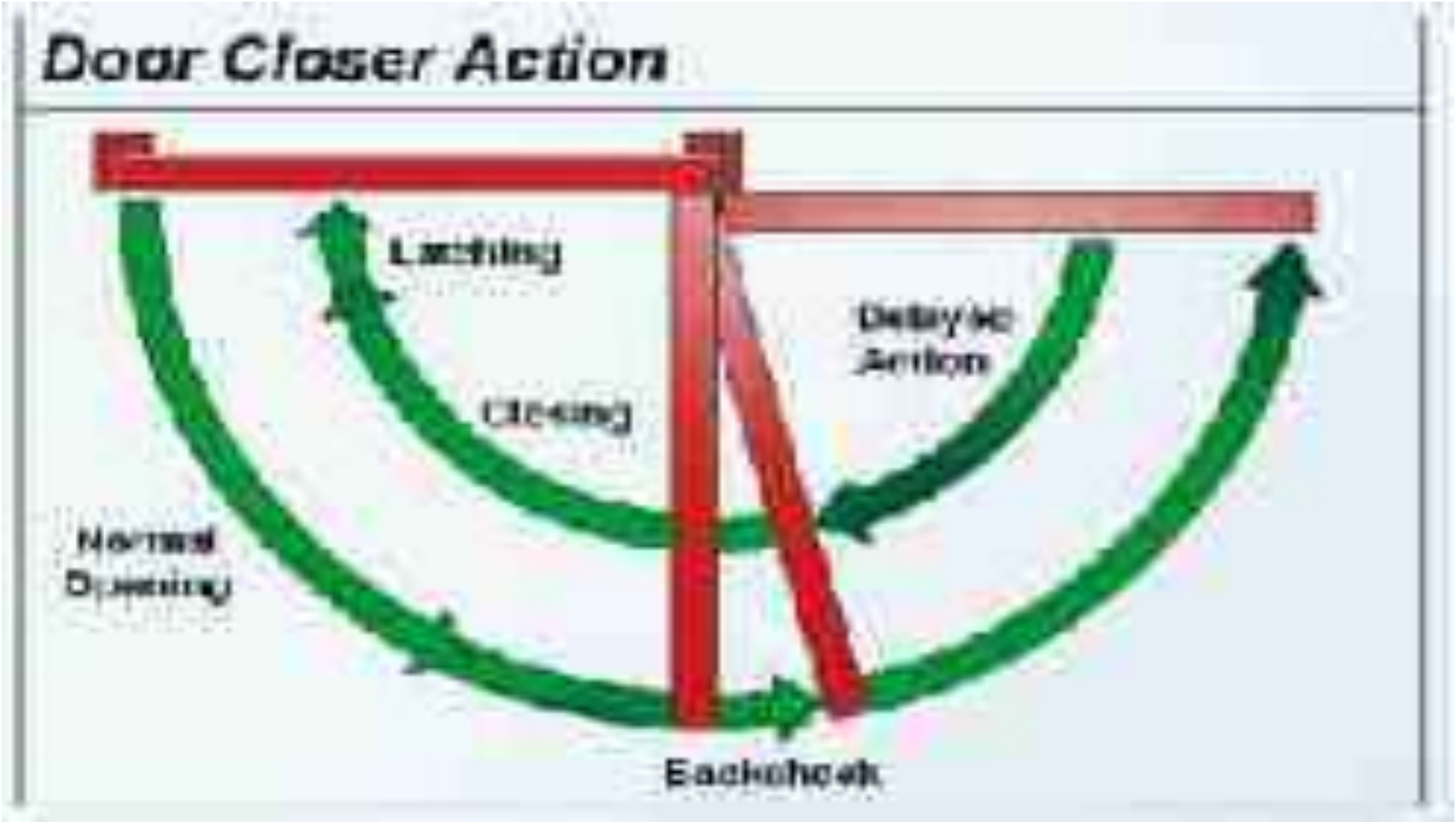
$$Cm = \frac{P.A.w}{2}$$

$$\text{Closing moment (Nm)} = \frac{\text{Air Pressure (Pascal or N/m}^2\text{)} \times \text{Area of Door (m}^2\text{)} \times \text{½ of width of door (m)}}{2}$$

Eg : Door Width = 900 mm (0.9m)
Door Height = 2050 mm (2.05m)
Air Pressure = 30 Pa

$$Cm = \frac{30 \times (0.9 \times 2.05) \times 0.9}{2} = 24.9 \text{ Nm}$$

Godrej door closer action



GODREJ door closer selection

Guideline for selecting a Door Control Device :

Door Closer Power Size	Ref. Door Leaf width mm Max.	Test Door mass kg	Closing moment			At any angle of opening	Opening moment between 0 & 60	Closer efficiency between 0 & 4
			Between 0 & 4		Between 88 & 92			
			nm min.	nm max.	nm min.	nm min.	nm max.	% min.
1	<750	20	9	<13	3	2	26	50
2	850	40	13	<18	4	3	36	50
3	950	60	18	<26	6	4	47	55
4	1100	80	26	<37	9	6	62	60
5	1250	100	37	<54	12	8	83	65
6	1400	120	54	<87	18	11	134	65
7	1600	160	87	<140	29	18	215	65

N.B. Where the actual size and mass of door to which the door closer is to be fitted relates to two sizes of door closer, the larger power size of door closer should be used. The door widths given are for standard installations. In the case of usually high or heavy doors, windy or draughty conditions, or special installations, a large power size of door close should be used.

Door closer fitment properties



Features

- Closing speed adjustable.
- Latching action adjustable.
- Back check adjustable.
- Delayed action adjustable.
- High pressure relief valve as standard.
- Fixing concealed by aesthetically appealing cover.
- Suitable for timber, Aluminium, PVC, Steel doors.

Fire Simulation on IR coaches and supply of Simulation Software

- Objective

  The project objective is to conduct computer aided simulation of spread of fire on IR coaches to study the behaviour under varying conditions. Supply of simulation software at RDSO and training of RDSO personnel in use of simulation software.

  The proposed fire simulation software will help in design optimization of the coaches, selection of the combination of the material and devising the evacuation strategies in case of fire.

Fire Simulation on IR coaches and supply of Simulation Software (Contd.)

Deliverables

- Simulation reports on two types of coaches under two scenarios
- Technical specifications for the hardware and the software
- Fire simulation software
- Technical support for one year
- Training of manpower

DEVELOPMENT OF FIRE RETARDANT COACHES FOR INDIAN RAILWAYS

- Fire or combustion, is an oxidation chemical reaction between a fuel and oxygen
- For fire the following three things are needed
  - Fuel
  - Oxygen
  - Activation energy/Flame source



Possible sources of Fire on coaches

- Inflammable goods carried by passengers
- lighting of fire/smoking in coaches
- Coal or kerosene stove carried by unauthorized vendors
- Electrical Equipment and cabling
- Cooking gas in pantry cars
- Generators in power cars
- Locomotive fires
- Miscreant activities and vandalism

Fire can be aided by

- Soft luggage and clothes of passengers
- Newspapers and magazines
- Linen
- Coach furnishing materials

PECULIAR FEATURES OF FIRE ACCIDENTS ON INDIAN RAILWAYS

- Very violent propagation of fire due to wind and open coaches
- Moving train makes escape difficult
- Exits from coach are rather limited compared to the overcrowding
- Long stopping time
- Often, no nearby water source
- Often, far removed from big town and road, thus no fire brigade help

STRATEGY FOR FIRE SAFETY

- Fire Proof coach not feasible
- Prevent initiation of fire
  - Prevention of possible fire sources
  - Use of Fire retardant material
- Quick Detection of fire
  - Fire alarm and smoke detectors
- Quick and safe evacuation
  - Escape routes to be provided
  - Escape routes should be clearly visible and unobstructed
  - Controlled toxic fumes and smoke from coach furnishing material

STRATEGY OF FIRE SAFETY

- Prevent Propagation of fire
  - Fire Barriers
  - Fire proof coach ends
  - Provision of fire extinguishers {DCP type mainly}
- Notices
  - Clearly visible
  - Pictorial to the extent possible
  - Easy to read and understand
- Fire alert awareness in travelling public

Materials in Coach Interiors

- Seat covering (Rexine)
- Seat cushion (Foam)
- Flooring, seat material and side wall paneling
- Curtains and upholstery
- Vestibule
- Roof ceiling

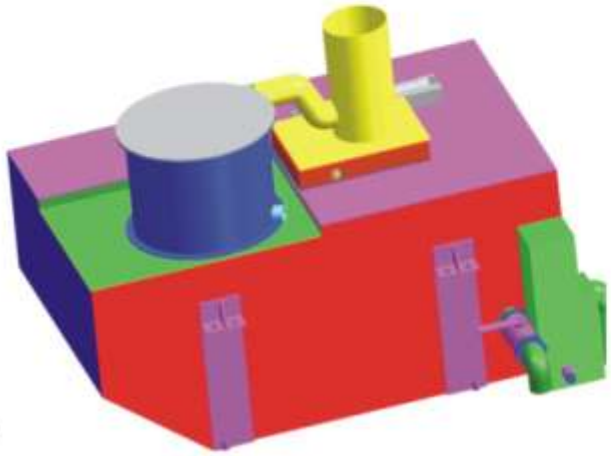
Assistance Sought from DRDO

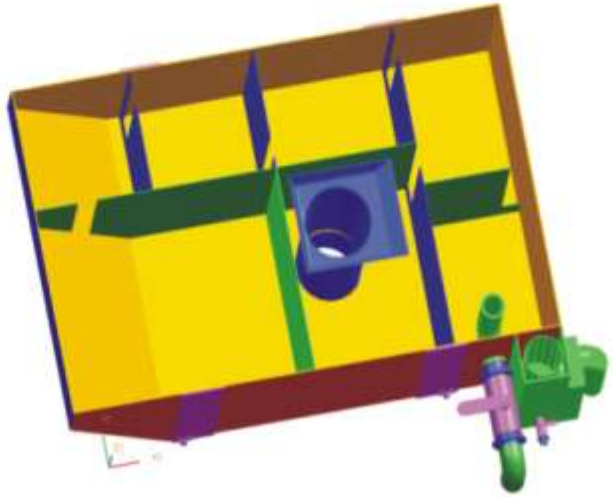
- Sharing the domain knowledge about fire retardant furnishing materials
- Specifications for the furnishing materials
- Specifications for testing equipments
- Strategies for evacuation of passengers
- Emergency exits on coaches
- Fire fighting equipments

Lavatories : Types -

- Direct {Open} Discharge type lavatories
  - SS Squatting Pans & Commode chutes
  - SS Inlay {integral SS Pans} & PVC flooring
- Controlled Discharge type lavatories {CDTS}
- Zero Discharge type lavatories {ZDTS}
  - Anaerobic bacteria {Clostridium} filled Biodigester
  - Partitioned retention chamber
  - Gas ventings {releasing converted CO_2 & CH_4}

BIO-TOILET System







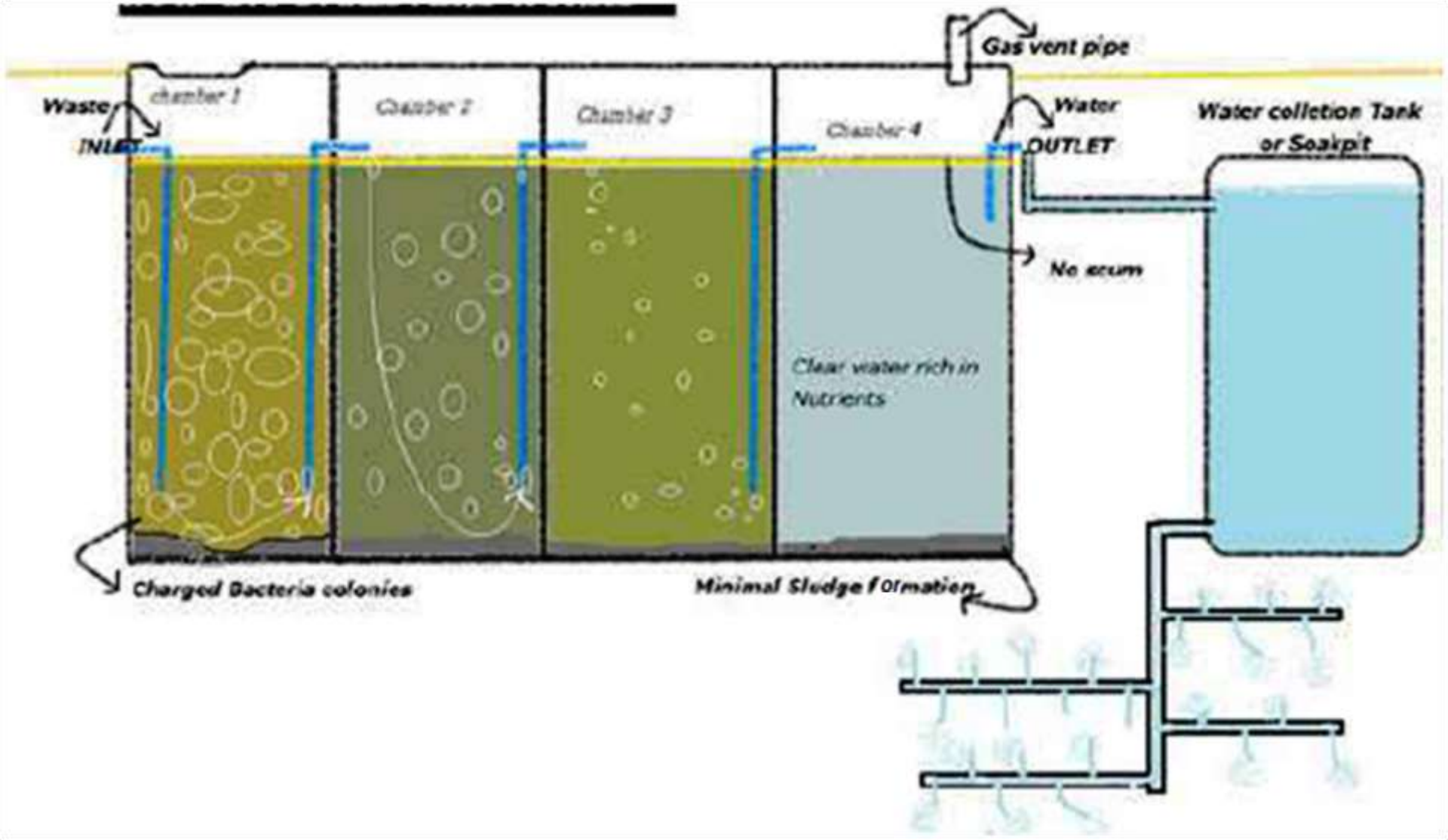


Discharge on track creates environmental problems as well as problem in working to work man.

ADVANTAGES

1. No bad smell in toilets from the tanks
2. No infestation of Cockroaches & flies
3. Fecal matter in the tank not visible
4. No clogging of digester
5. Effluent is free from off odour and solid waste
6. No maintenance required
7. Reduction in organic matter by 90%
8. No requirement of adding bacteria/ enzyme
9. No need of removal of solid waste

ZDTS


Gas vent pipe
Waste
INLET
chamber 1
Chamber 2
Chamber 3
Chamber 4
Water
OUTLET
Water collection Tank
or Soakpit
No scum
Clear water rich in
Nutrients
Charged Bacteria colonies
Minimal Sludge formation

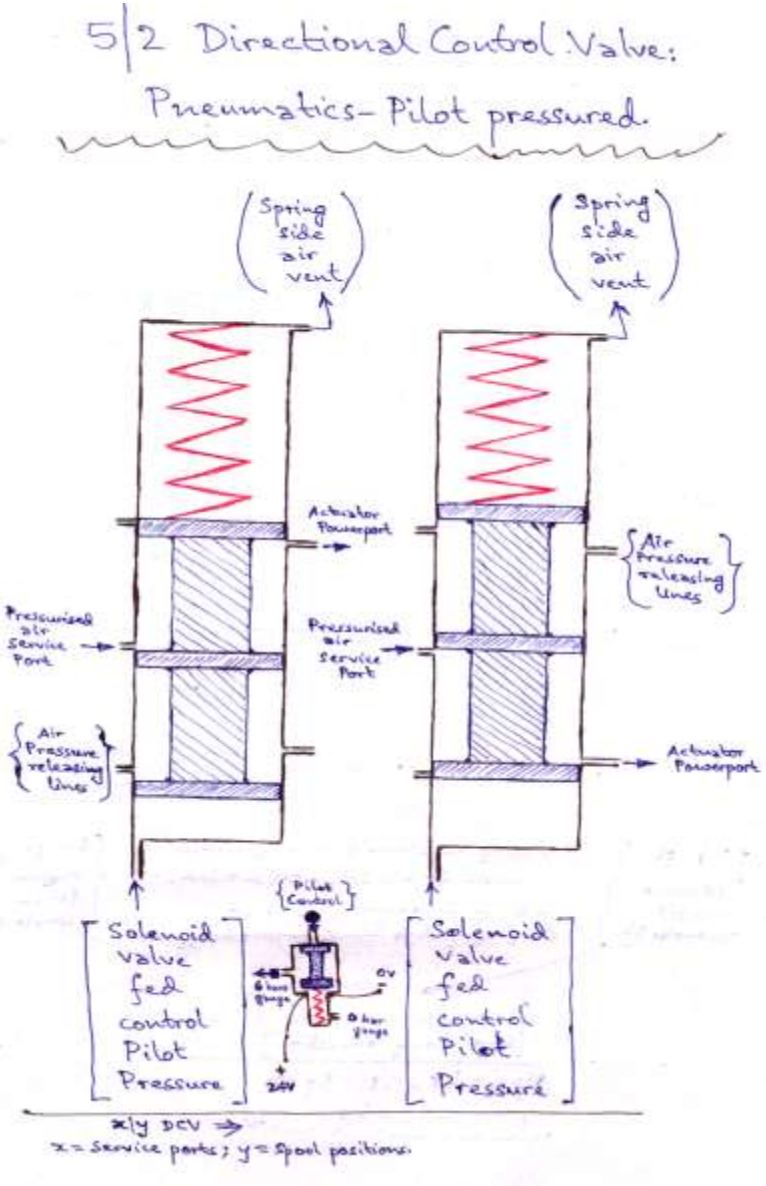
WSP & CDTS

- CDTS retention tank upper flapper valves
- CDTS retention tank lower slider valves
- CDTS control panel solenoid operated directional control {pilot “pressured” Spool} valves
  - Sliding spools must be lubricated by WD40
  - Air filter must be changed in alternate POH
  - Oil in air lubricator must be replenished in POH
- CDTS Commode/SS Pan Flush plumbing
  - Flush valves must be descaled {$CaCO_3$} in POH

CDTS

- Spring loaded Upper Flapper Valve {providing water sealing} over 60 ltr.s SS retention tank sending wastes from SS Pan/Commode flush to Storage
- Lower Slider Valve beneath 60 ltr.s SS retention tank discharging wastes from storage to the tracks below at above 30Kmph vehicle speeds AND 8 flush counts OR beneath 30 Kmph speed under deceleration keeping Station areas clean
- Overflow spout {additional fail safe mode} in Storage {Retention Tank}
- Water /pressurised flushing cycle = 3 ltr.s

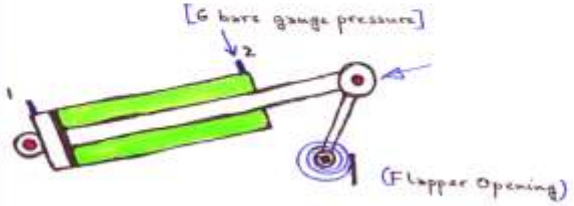
CDTS Direction Control Valve Sketch



AIKON CDTS "ROTEX" made actuators

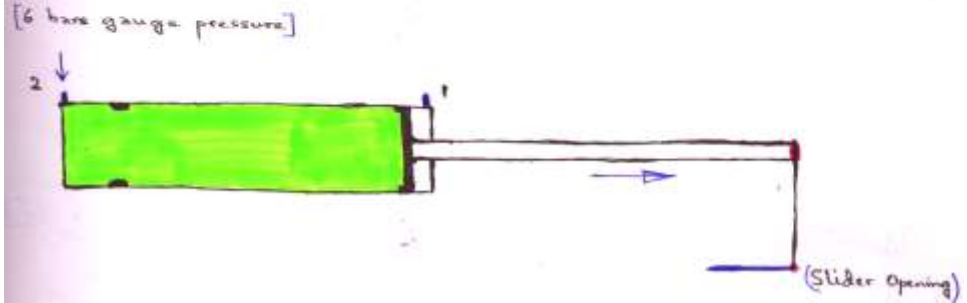
AIKON CDTS :

Upper FLAPPER CYLINDER –

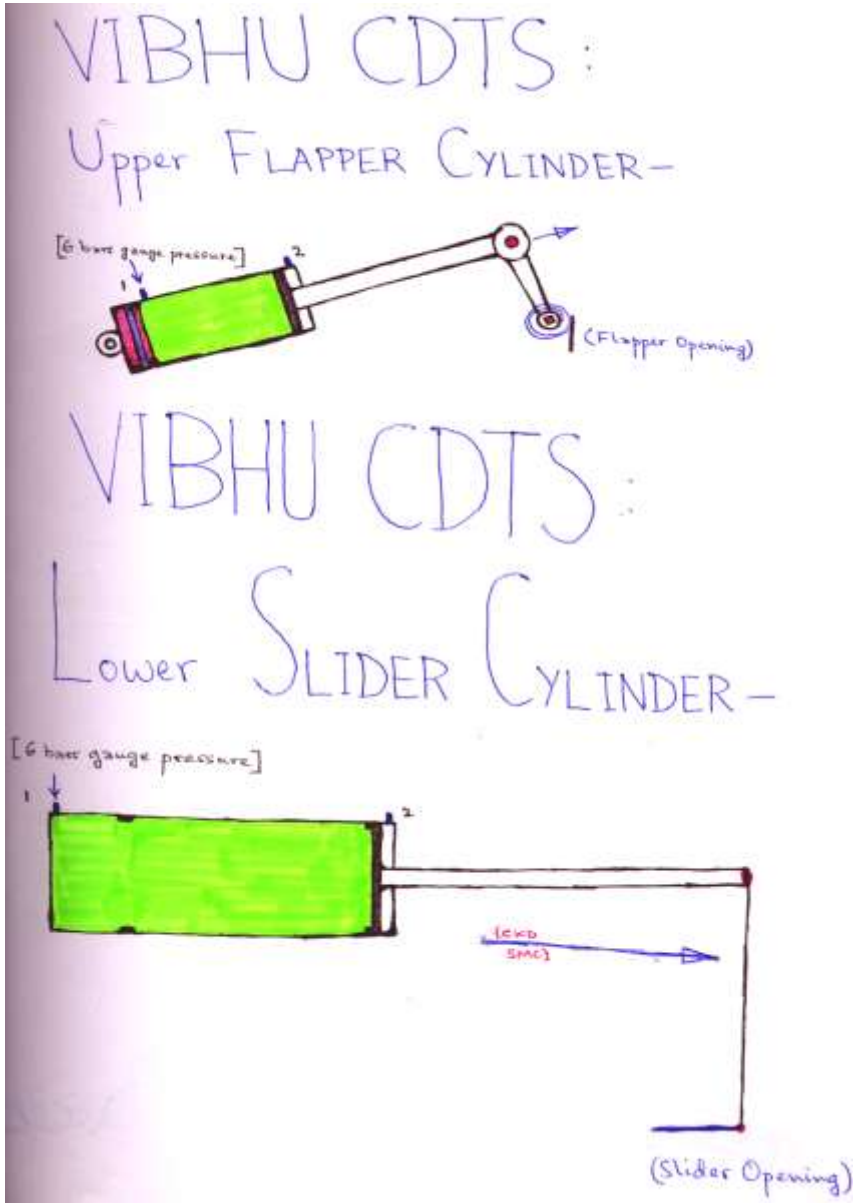


AIKON CDTS :

Lower SLIDER CYLINDER –

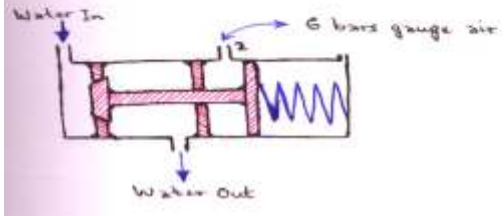


VIBHU CDTS "{SMC} CETOP" made actuators

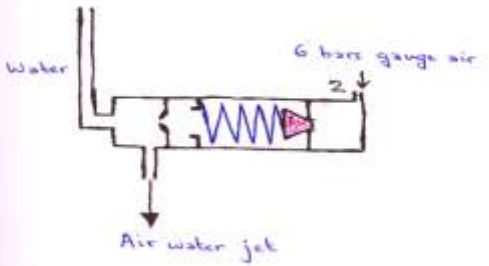


AIKON CDTS Plumbing System

AIKON CDTS
FLUSHING :
PLUMBING SYSTEM
CONTROLS-



CHECK
VALVE



AIR
INJECTOR

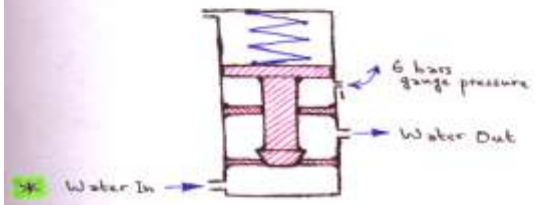
VIBHU CDTS Plumbing System

VIBHU CDTS

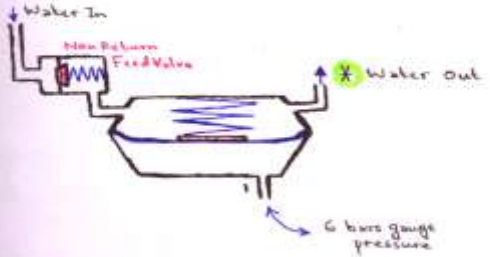
FLUSHING –

PLUMBING SYSTEM

CONTROLS:

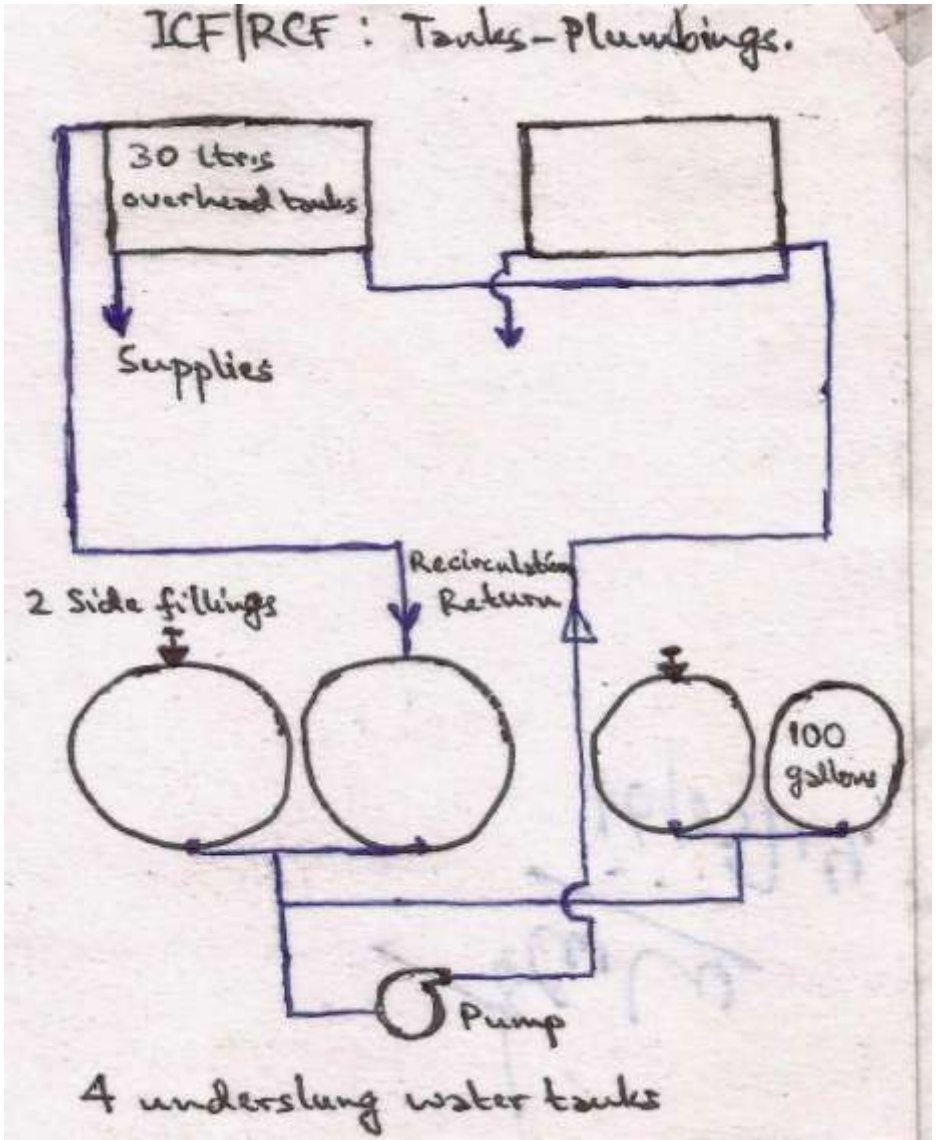


SHUTTLE VALVE

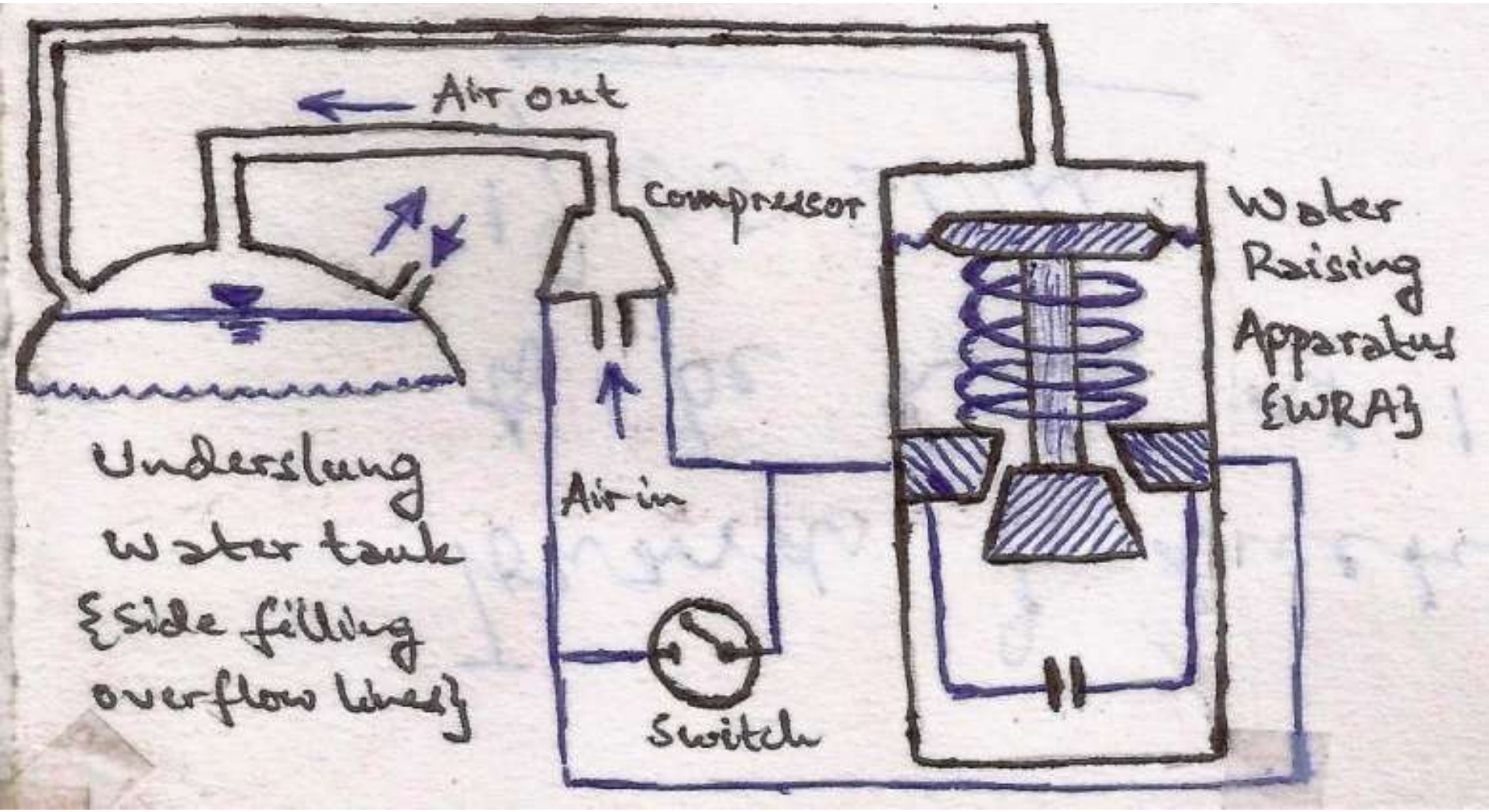


PRESSURISER ASSEMBLY

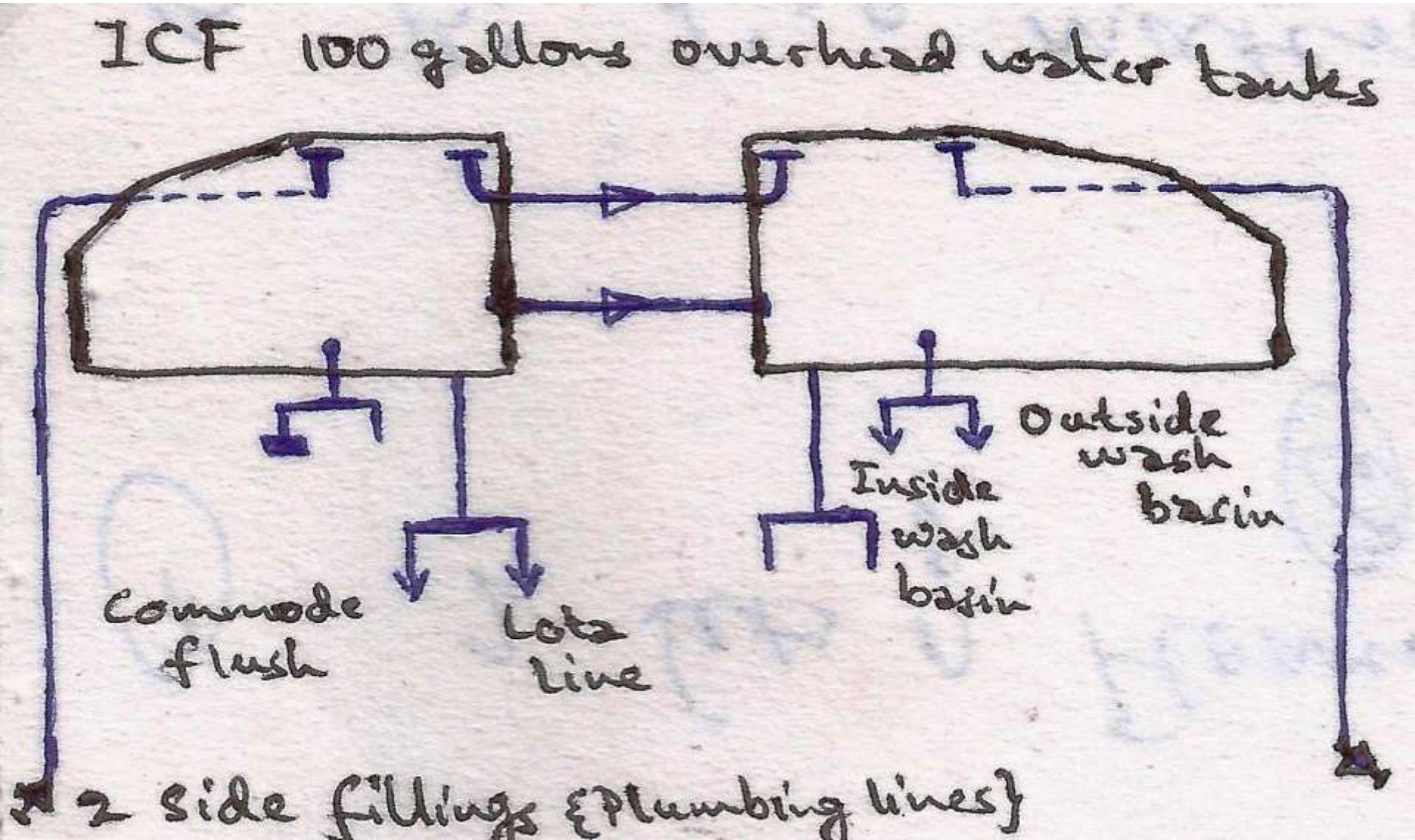
RCF AC coach underslung tanks & plumbing



RCF AC Coach WRA : {obsolete} -



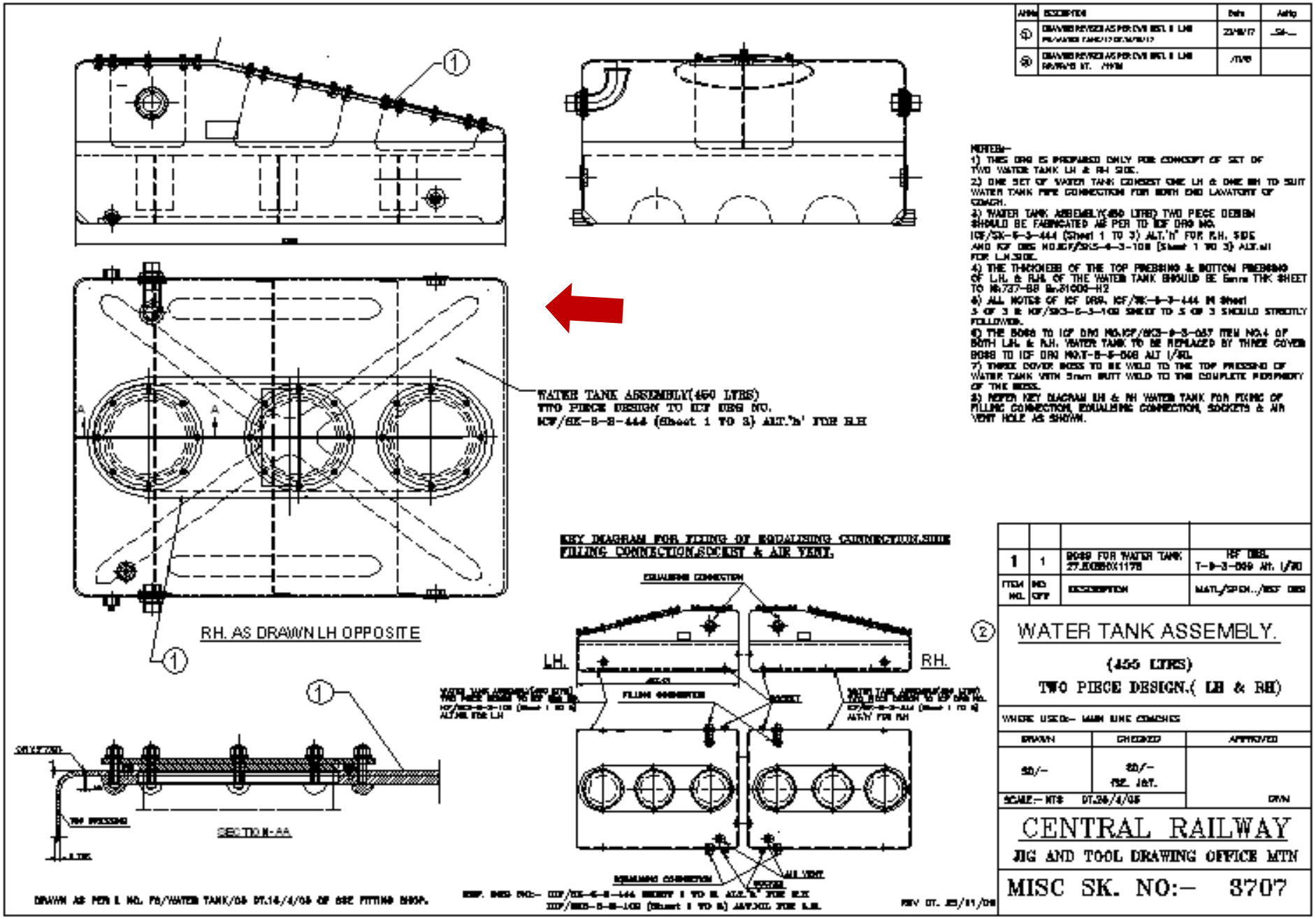
ICF coach overhead water tanks



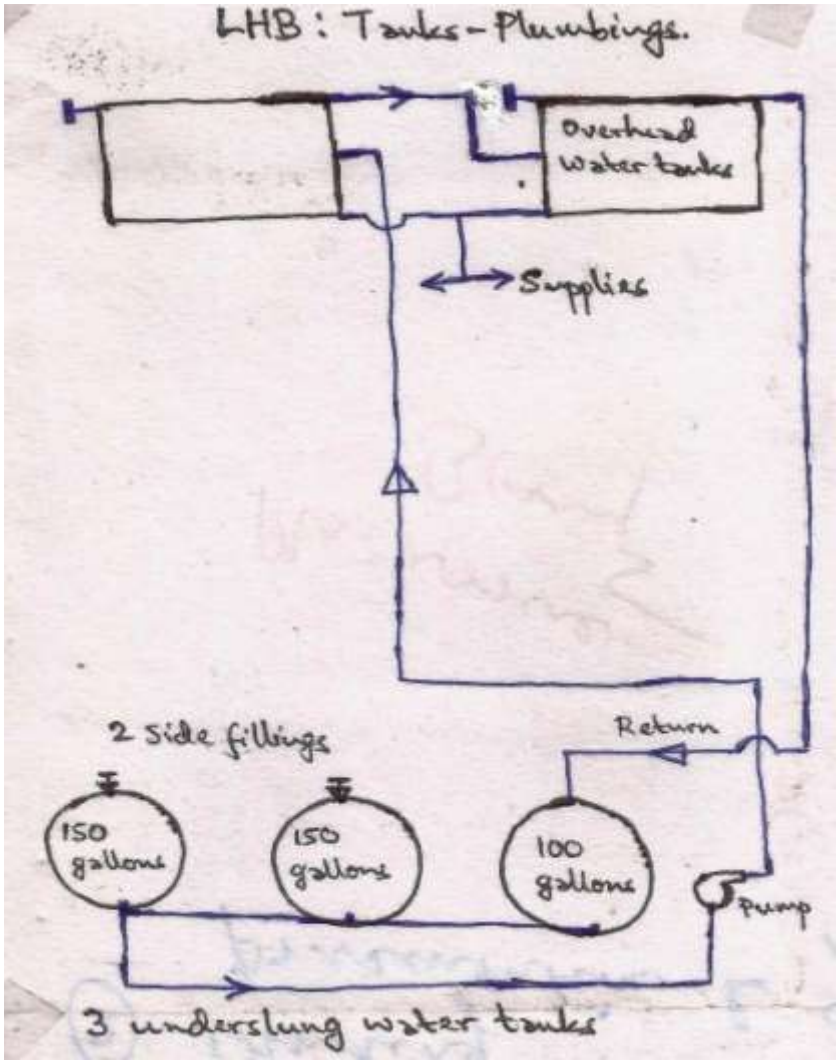
OVERHEAD WATERTANKS

- Types of Overhead 100 gallons Al Water Tank currently used in ICF NAC coaches ➡
  - Conventional design ➡ ICF SK-6-3-080, being used from early 90's {Al fabricated tanks in Non AC coaches}
  - Two Piece design ➡ ICF SK-6-3-444, being used from 2003 {Welded zones not at the tank floor}

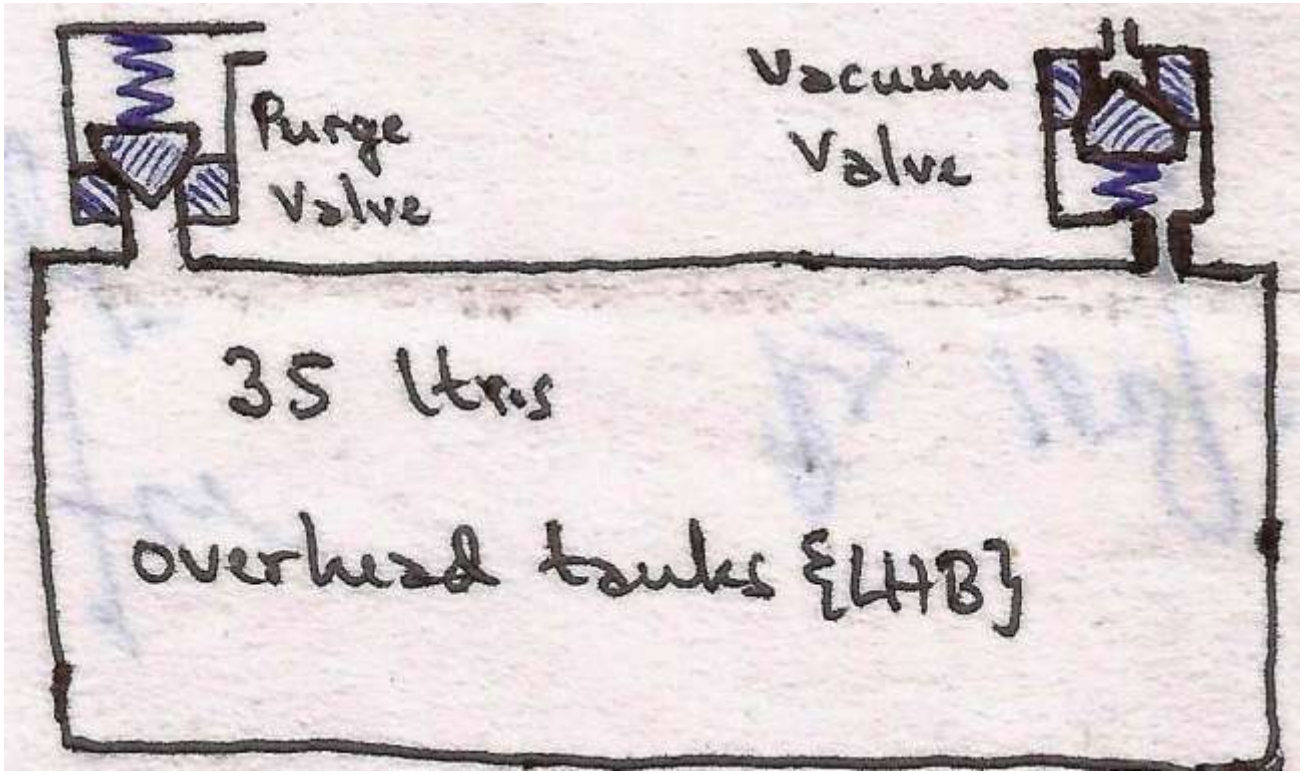
ICF NAC Al 450 ltr.s Water Tank Drg.



LHB plumbing system general layout



Purge {Air vent} & Vacuum valves: Auxiliary tanks-



THANK YOU

