Ship Sanitation Inspection and Issuance of Ship Sanitation Certificate

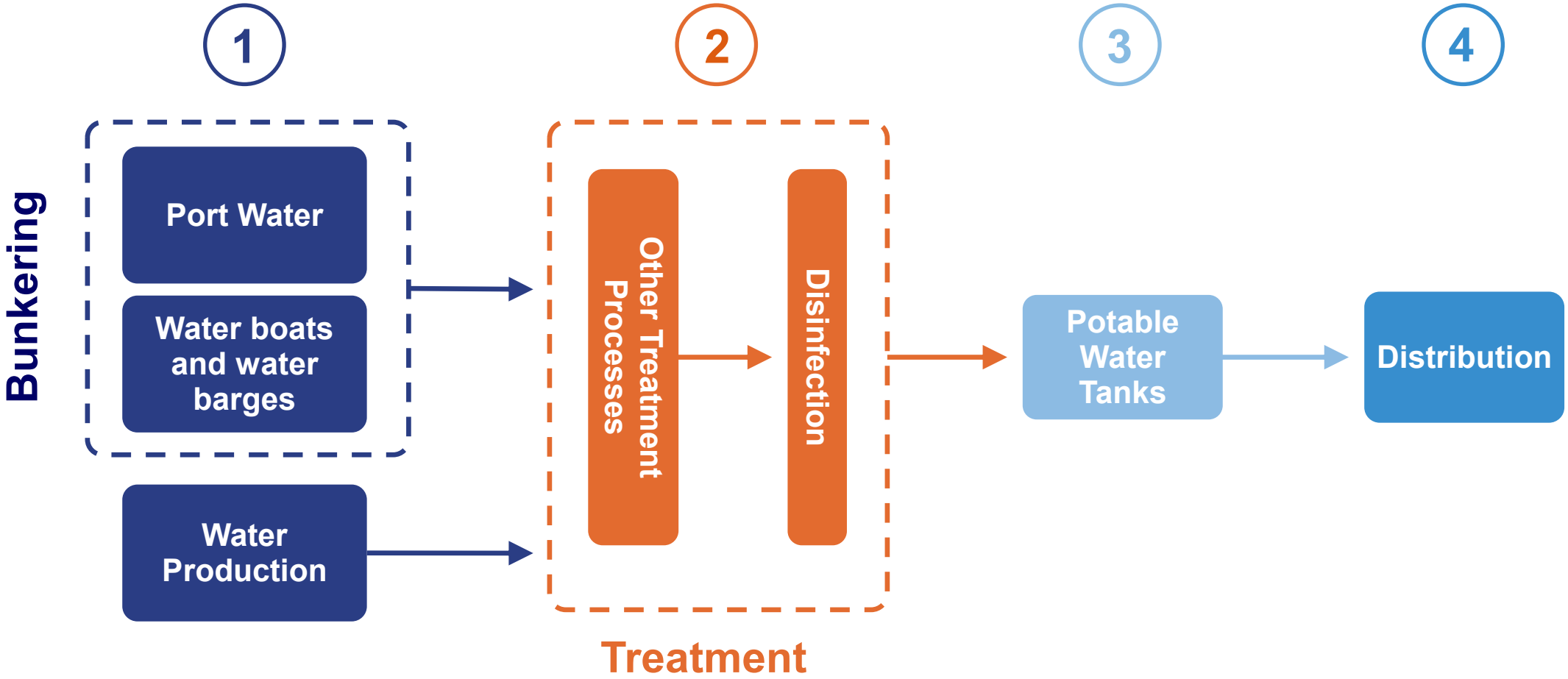
Potable Water

LWhat is Potable Water?

Defined in area 9 of the WHO Technical Handbook:

- Also defined by WHO as "drinking water":
- Means "any water for human consumption"
- "Human Consumption means "drinking, cooking, brushing teeth, showers, washing hands, washing clothes etc."
- Ships may refer to "Freshwater" - this is untreated water or water perhaps not intended for Human Consumption purposes.

Potable water system on ships

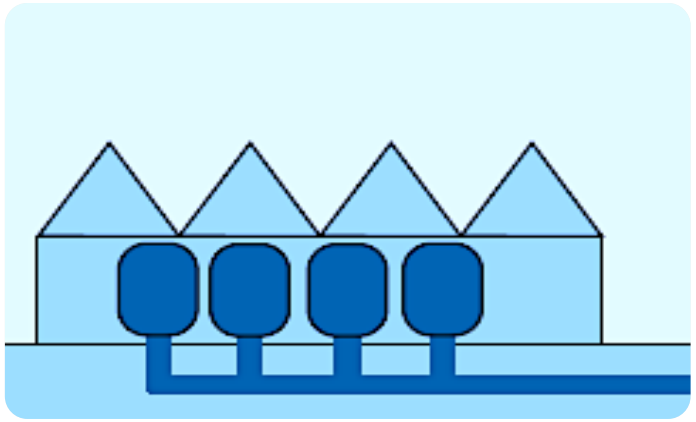


Potable water system on ships

1. **Water source**
   - Bunkering
     - Port
     - Water boats and water barges
   - Production
2. **Treatment**
   - Filtration
   - Remineralization
   - Heating
   - Disinfection
     - Chemical disinfection
     - UV radiation
3. **Storage**
   - Potable water tanks
4. **Distribution**
   - Pumps and pressure tanks
   - Hot water system
   - Plumbing
   - Backflow prevention

1. Water source: bunkering

- Source water comes into the port
- Potable water is transferred from bunker stations or water barges to the ship's potable water tanks
- The water is treated and stored on the ship



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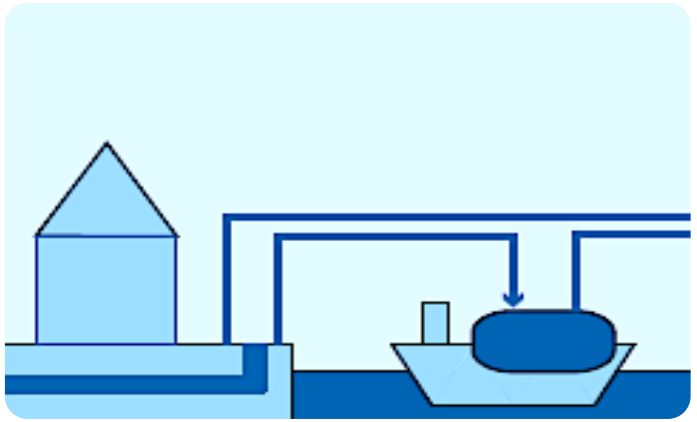

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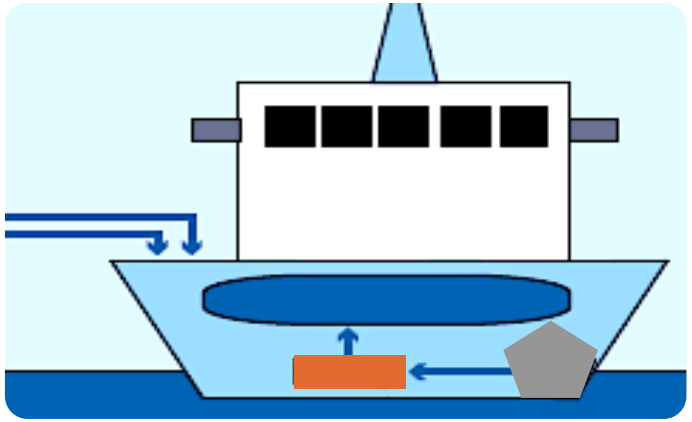

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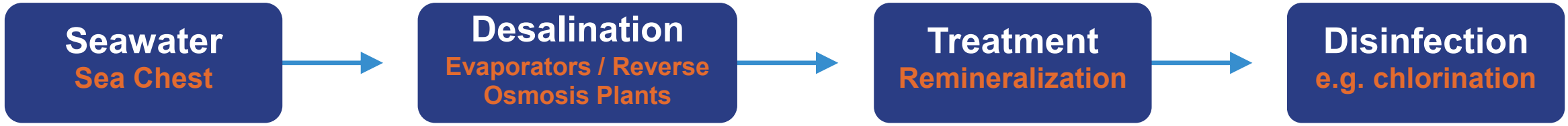
1. Water source: production



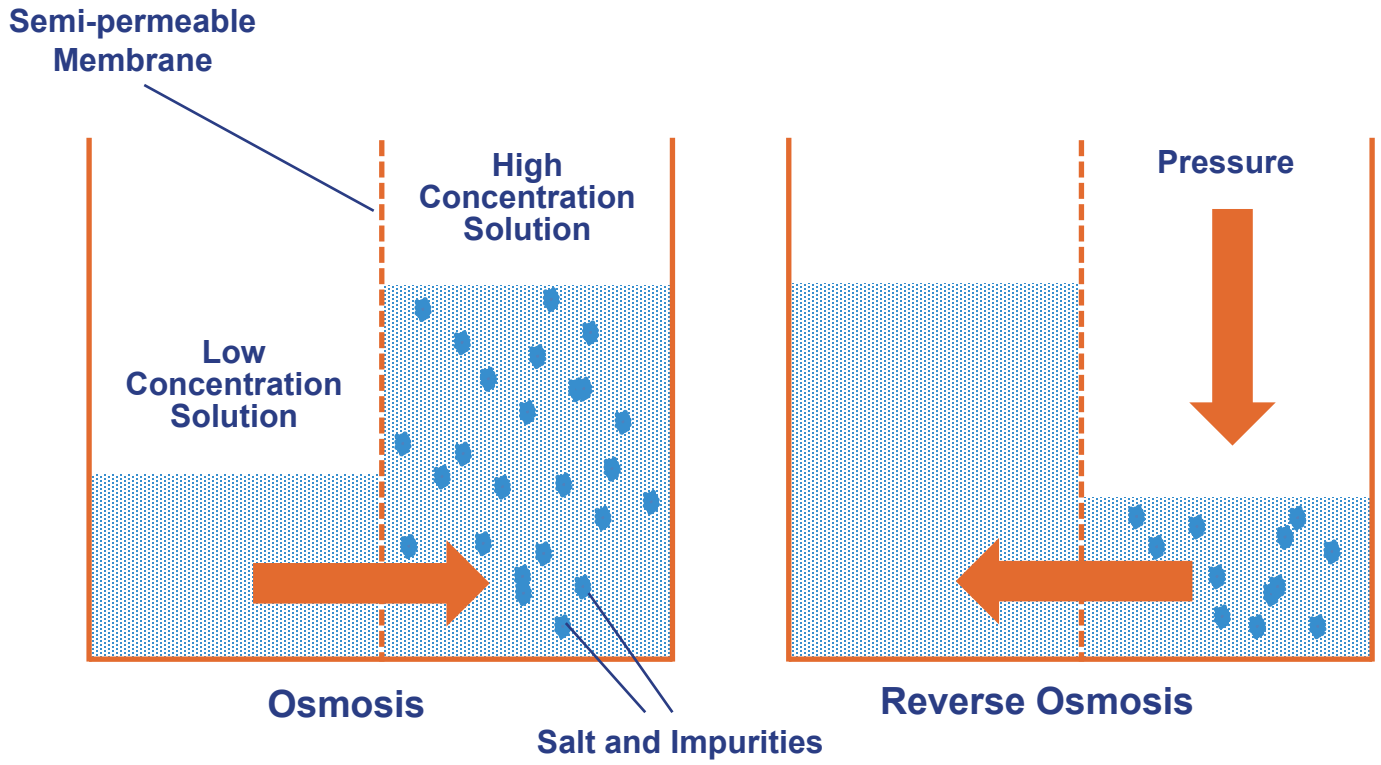
- **Seawater intake:** seawater is pumped from the sea chest of the ship
- **Desalination**
  - Reverse osmosis plants
  - Evaporators
- **Salinity sensor**
  - Measures the salinity of the produced water
  - Used to prevent saline water from entering the potable water tanks
- **Desalinated water:** unstable, bland, flavorless, corrosive
  - Production of water always followed by remineralization process

1. Water source: evaporators

- **Evaporators**
  - Seawater is heated
  - Vapor is generated
  - Vapor is condensed by cool seawater
  - Condensed water is collected
- **Distilled water is free of solids**
- **Vaporization may start at temperatures lower than 80°C**
  - Distillate may not be free of pathogens
  - Disinfection is required

1. Water source: reverse osmosis

- **Reverse osmosis**
  - A high pressure pump forces water through a series of semi-permeable membranes
  - Water is separated from salts
  - Concentrate (brine) is discharged
  - Desalinated water is treated and distributed



2. Treatment: filtration

Filtration increases the clarity of the water by removing suspended solids

- **Uses of filtration:**
  - Seawater filtration prior to reverse osmosis plant
  - In the filling line during bunkering
  - Other
- **Media filters**
  - Usually sand filters
  - Require regular backwash according to manufacturer
- **Cartridge filters**
  - Fiber or membrane filters
  - Require regular washing, disinfection or replacement according to the manufacturer

2. Treatment: remineralization

- Mineralizers increase the mineral content of the desalinated water
- Required after the reverse osmosis plants or the evaporators
- Water percolates through a rehardening filter (usually dolomite or limestone)
- Minerals are transferred to the water
- Requires regular backwash and replacement of filter medium

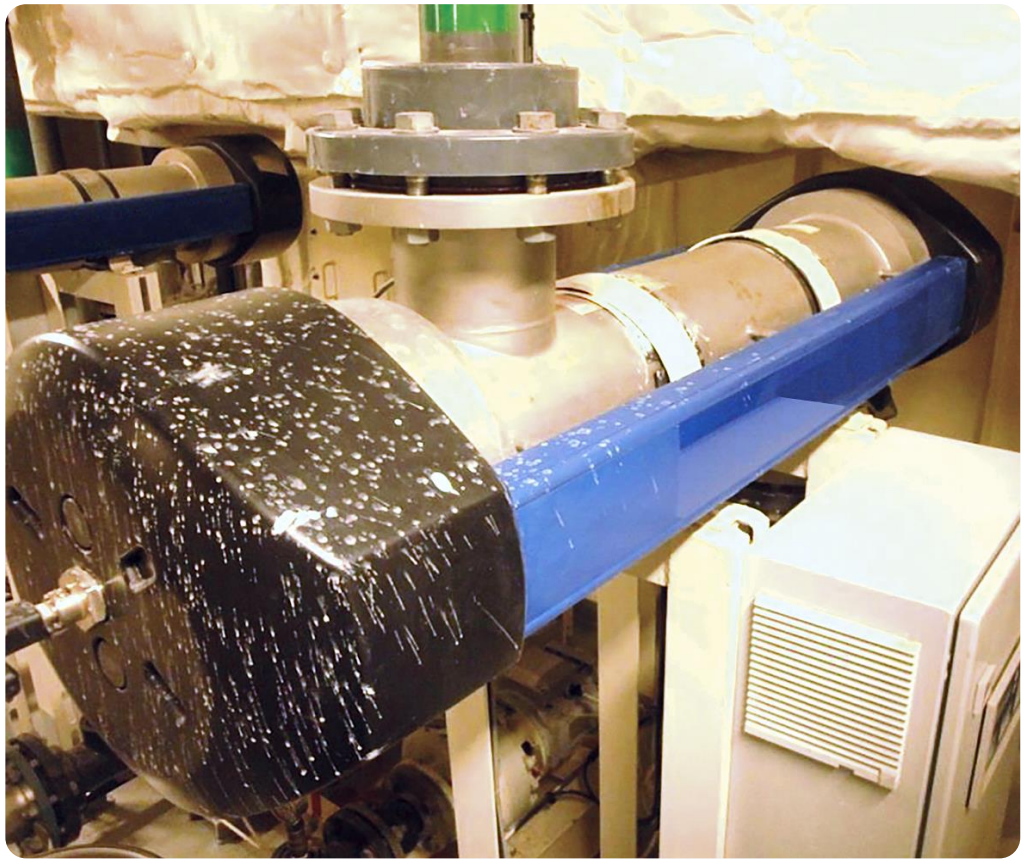
2. Treatment: disinfection

Chlorination

- **Chlorine disinfects potable water and provides residual disinfectant throughout the distribution system**
- **Chlorine dose depends on chlorine demand**
- **For effective disinfection chlorine should be in contact with water for 30 minutes**
- **pH affects the disinfection process**
  - pH < 8 for effective disinfection
- **pH adjustment may be required**
  - Bases or acids can be dosed at the disinfection point to adjust the pH

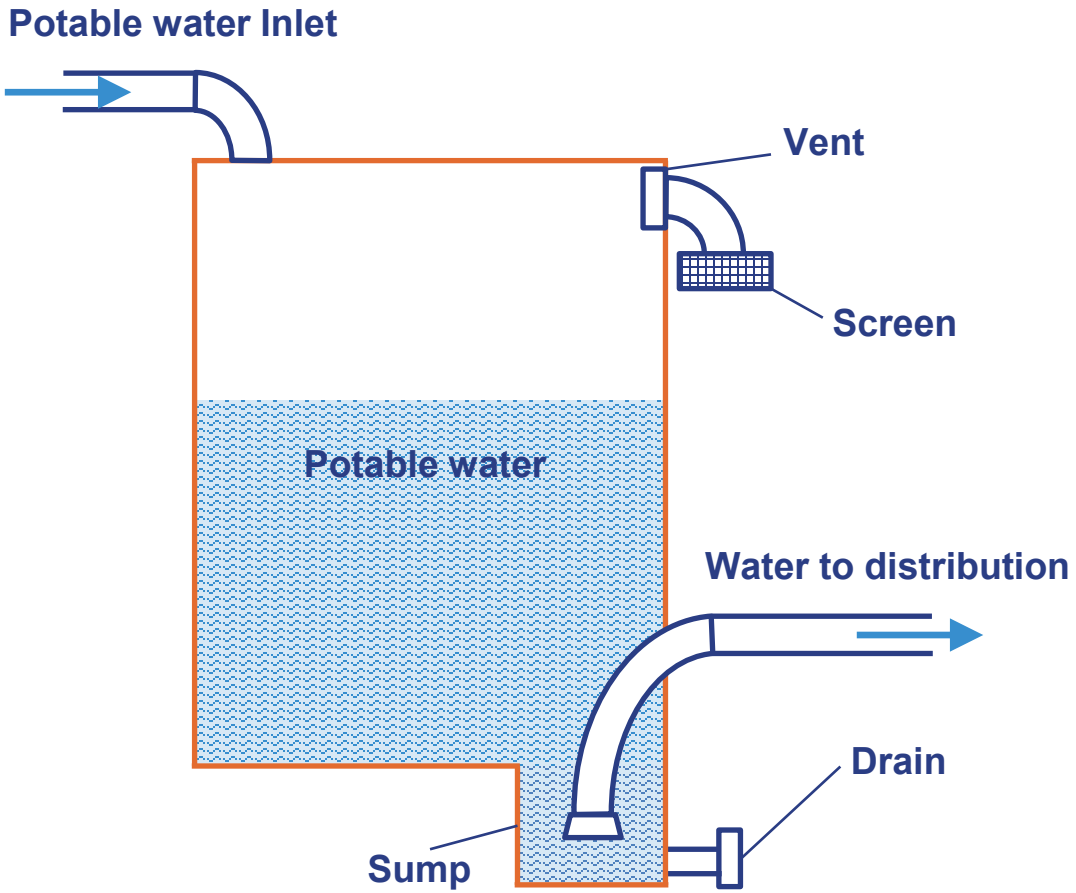
2. Treatment: disinfection

- **UV disinfection**
  - UV lamps expose water to ultraviolet radiation which inactivates the pathogens
  - All water needs to get in direct contact with the light
  - Low turbidity water is required
  - Spare parts should always be available
- **No residual disinfectant is provided**



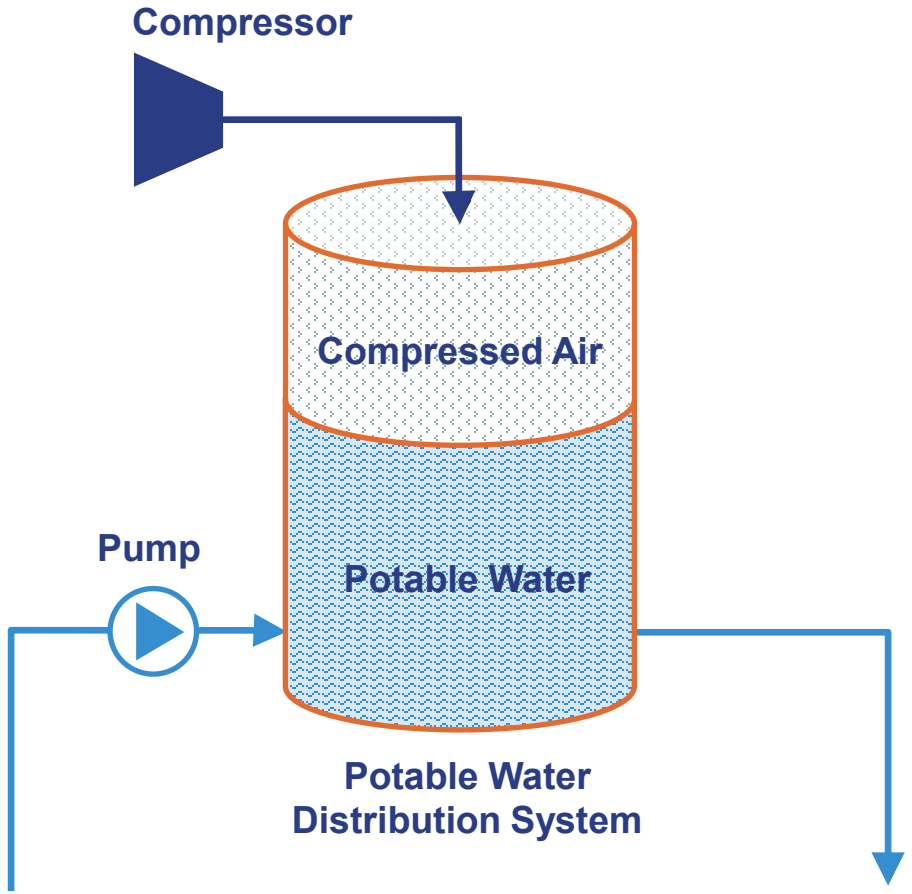
3. Storage

- **Potable water storage tanks consists of:**
  - The vessel
  - Pipes
  - A vent (properly constructed to prevent entrance of contaminated substances)
  - An overflow (vent may be used as an overflow)
  - Manholes
  - Drainage system



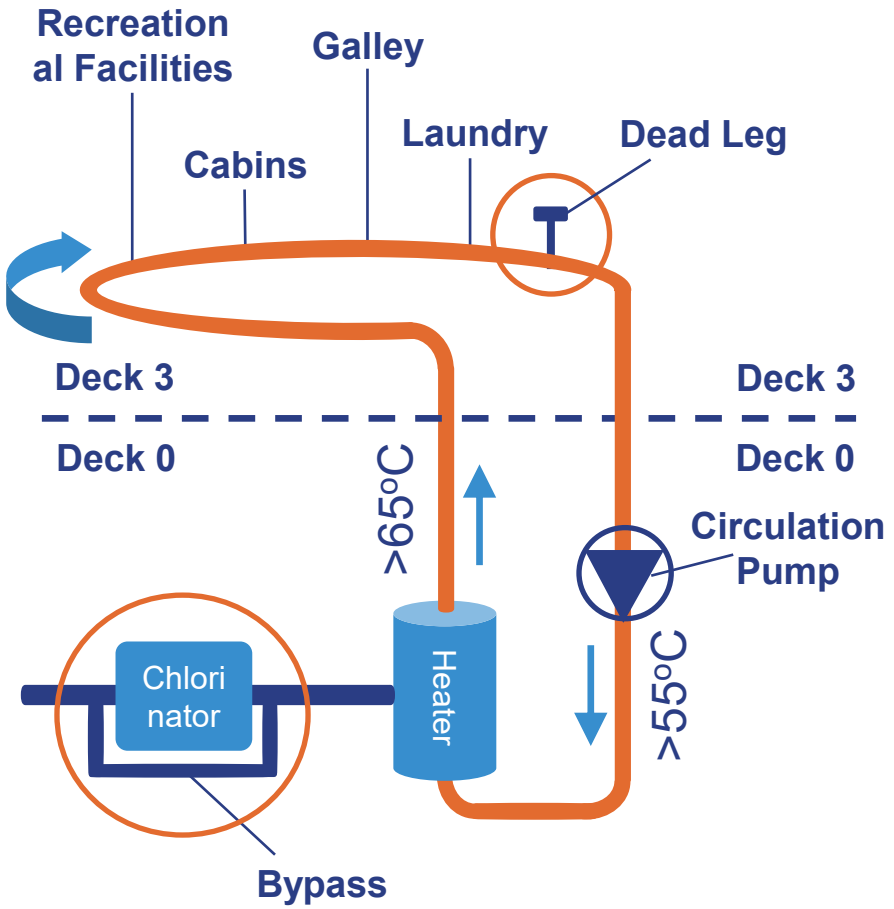
4. Distribution system: pumps and pressure tanks

- **Pumps**
  - Provide pressure to the system
  - Circulate water
  - Dedicated only for potable water
- **Pressure tanks (Hydrophores)**
  - Provide constant pressure to the system
  - Buffer small pressure variations
  - Where compressed air is used, provide air filter or liquid trap to protect the potable water system from oil and other substances



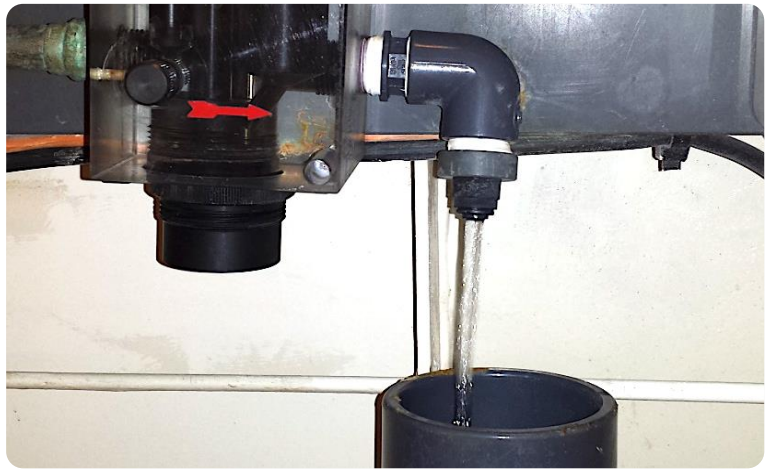
5. Distribution system: plumbing

- **Piping should be made of appropriate materials**
  - No lead or cadmium
- **Components should be resistant to water temperatures up to 90°C**
  - Allow thermal disinfection
- **Stagnant water**
  - Dead legs
  - Bypasses
  - Back-up equipment
- **Avoid bypass of important treatment processes**
  - e.g. chlorinator



5. Distribution system: backflow prevention

- **Backflow:** flow of non-potable water into the potable water system
  - e.g. backsiphonage
- **Backflow prevention**
  - Air gaps
  - Mechanical backflow preventers
- Type of backflow prevention according to the particular risk
- Backflow preventers should be tested once per year (records should be kept)



THANK YOU

World Health Organization