DISINFECTION
What is disinfection

- Disinfection vs sterilization
- Pathogenic organisms
- Killing most of them
  - Chlorine Cl2
  - Ozone O3
  - Iodine I2
  - Ultra Violet
  - Hydrogen peroxide H2O2
    - Heat
    - pH
    - Silver/copper
Chlorine is a highly poisonous, greenish yellow gas, about two and a half times as dense as air, and with a strong, sharp, choking odor. It was, in fact, one of the first poisonous gases used in warfare—in 1915 during World War I.
Chlorine - forms

- Liquid – 1 liquid volume = 450 gas volumes
- Gas
- Solid
  - Calcium hypochlorite
Chlorine Containers
- 100 – 150 lb cylinder
- 1 ton cylinder
- Railroad tank cars
- Tanks filled to 85%
- 1-ton cylinder draw either gas or liquid
Evaporator
Safety precautions

- Fusible Plug
Fusible Plug

- In smaller cylinders
Handling tanks

- Separate full and empty cylinders
- Chained 2/3 to prevent falling
- One-ton cylinders blocked/rollers
- Never apply heat
- Weather or temp extremes
Handling

Fred Hemenick – City of Dunedin RO Water Treatment Plant

The Ultrasecure LPCB approved cylinder clamp is a space-efficient, modular unit offering the flexibility to configure secure storage installations for any number of cylinders, in-line and back-to-back.
Changing cylinders
Hypochlorites

- **Liquid**
  - Sodium hypochlorite
- **Solid**
  - Calcium hypochlorite
Hypochlorites

Hypochlorinator

Hypochlorite solution

Check valve

Disinfected water

Raw water

Pump

Polyethylene discharge tubing

Vinyl suction tubing

Point of application (1/2 N.P.T.)

This tube should not extend beyond center of main

Main connection

Sinker

Strainer

Solution container

Frame motor

Metal table
Hypochlorinators

- Adds chlorine by metered dose
Dosage pump
Chlorine Feed Equipment

- Gas Feed Equipment
  - Vacuum feed
- Liquid Feed Equipment
  - Required an evaporator
Gas Feed Equipment

- V-notch chlorinators
To increase gas production

- 150 lb cylinder – 40 lbs/day
- One-ton cylinder – 400 lbs/day

One volume of liquid = 450 volumes of gas
How to get it into the Water?

- Venturi to create strong chlorine solution
Hypochlorites mixed into stream
Ozone Generation

- generator
Ultra Violet
Criteria

- Clear Water
- Design flow
- Clean tubes
- Transmittance
Maintenance

- Clean the contract chamber
- Clean the tubes
- Monitor transmittance
Cleaning the Tubes