













































#### **Dosages & Residuals**

Chlorine demand = Chlorine Dose - Chlorine Residual

Free chlorine residual, HOCL and OCL-, are much more effective as a disinfectant than combined chlorine residual.













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Sanitary Risks - Gas Chlorination Systems cont'd
12. Are all cylinders properly marked and restrained to prevent failing?
13. Does the facility transport gas chlorine cylinders? If so, are the requirements of 49 CFR parts 171 and 172 followed?
14. Is the proper concentration of ammonia available for testing for leaks?
15. Are there adequate leak containment provisions?
16. Are safe practices followed during cylinder changes and maintenance?
17. How many individuals are present when the chlorine

cylinders are changed? 18. What type of respiratory protection is used?















#### **PUMPS AND PUMPING**

- Pumps and pumping facilities are; \* Essential components \* Vulnerable components Improper design or 0 & M can cause complete loss of
- water.
- Data Collection

  - Data Collection
    Operating records provided by the water utility.
    Specifications used by the water utility for
    construction, operation, and maintenance.
    Develop a list of the pumps in the system to insure
    that they all are evaluated during the sanitary
    Survey.
    Survey.
  - Regu

  - a
     State design guidelines for pumping systems.

     a
     ANSI/NSF standards 60 and 61.













































#### **Sanitary Risks - Pumping Facilities**

- 1. Is security adequate?
- 2. Is the building and equipment protected from flooding?
- 3. What is the structural condition of the building?
- 4. Is heating, ventilation, and lighting adequate? 5. Can equipment be accessed for maintenance and
- removal from the building?
- 6. Is the building orderly and clean?7. Is the pumping station also used for storage?
- 8. Is safety equipment adequate?

#### Sanitary Risks - Operation and Maintenance

- 1. Is the number and skill level of the staff adequate for operating and maintaining the pumping facilities?
- 2. Are adequate operational records maintained for pumping facilities?
- 3. Are written standard operating procedures available and followed?
- 4. Is there an established and documented preventative maintenance (PM) program?



# STORAGE FACILITIES

Finished water storage facilities play a vital role in providing a safe, adequate and reliable supply of water.

Failure to maintain the structural and sanitary integrity of storage facilities can lead directly to the loss of property, illness

### **Typical Defects That Allow** Contamination

- Damaged or missing screen
- Holes cut in the tops of tanks
- Poorly constructed access openings
- •Open or unlocked access lids
- •Unsealed cathodic access plates
- •Outdated design (ex. "Finial ball" vent)















![](_page_15_Picture_4.jpeg)

![](_page_15_Picture_5.jpeg)

![](_page_16_Picture_2.jpeg)

![](_page_16_Picture_3.jpeg)

![](_page_16_Picture_4.jpeg)

![](_page_16_Picture_5.jpeg)

![](_page_16_Picture_6.jpeg)

![](_page_16_Picture_7.jpeg)

![](_page_17_Picture_2.jpeg)

![](_page_17_Figure_3.jpeg)

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![](_page_18_Picture_2.jpeg)

![](_page_18_Picture_3.jpeg)

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![](_page_19_Picture_2.jpeg)

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![](_page_19_Figure_7.jpeg)

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![](_page_21_Picture_2.jpeg)

![](_page_21_Picture_3.jpeg)

![](_page_21_Picture_4.jpeg)

![](_page_21_Picture_5.jpeg)

#### MONITORING, REPORTING, RECORDS

- Is there a Coliform Monitoring Plan? Is it representative of the distribution system?
- Is the monitoring up to date with the schedule? Has a CCR been completed?
- Have there been any violations? If so did the system do Public Notice? Are there daily chlorine residual records on site (GWR requirement)?

![](_page_21_Picture_11.jpeg)

### MANAGEMENT AND OPERATIONS

- Is there a Cross Connection Control Program?
- Is there safety policy, appropriate PPE?
- Is there an emergency response plan? Last time revised?
- Has a security assessment been completed?
- Are there management or operational issues that could be considered a SIGNIFICANT DEFICIENCY?
  - Billing/revenue not sufficient to cover operational costs?

## **8 STATE REQUIREMENTS**

## STATE REQUIREMENTS

Operator certification

- Is there a designated Operator-In-Charge "Available" for each shift?
- Is the Operator-In-Charge certified at the level of the system?
- Are other operators making quality/quantity decisions certified?

## **END EIGHT COMPONENTS**