Distribution Review

Disinfection Training Objectives

To gain an understanding of:
- The characteristics of the different disinfecting agents
- The different disinfection methods for water mains
- The different disinfection methods for water storage facilities

Disinfecting Agents

- Chlorine gas/liquid
  - 100% available chlorine
  - 100# - 150# - 2,000# steel cylinders
  - Special safety practices must be followed
- Sodium Hypochlorite
  - 5% - 15% available chlorine solution
  - 1 gallon – 55 gallon containers
- Calcium Hypochlorite
  - 65% available chlorine
  - granular, powder or tablet form
Factors Affecting Disinfection

- Temperature – higher is better
- pH – lower is better
- Turbidity – lower is better
- Chlorine dose – higher is better
- Contact time – longer is better
- Tuberculation – lower is better
- Biological growth – less is better

Distribution System Chlorine Residual

- Residual – the chlorine concentration once the chlorine demand has been met
- Demand – difference between the dose and residual
- A residual should be maintained in the system because contamination can happen at any time
- Residual range – 0.2 mg/L to 4.0 mg/L
- Measured in the field with DPD method
- Dead ends and zones with high water age are difficult to maintain a chlorine residual

Disinfecting Mains

Three methods commonly used:
- Tablet method
- Continuous feed method
- Slug method

AWWA Standard C651-99
Disinfecting Mains

Tablet Method:
Best suited for short sections of pipe (few hundred feet)
Best on small diameter pipes (24 inches or less)
As pipe is laid in a trench, tablets are placed in each section with an approved adhesive on the top of the pipe
Sufficient tablets are added to give a dose of 25 – 50 mg/L
Pipe is slowly filled with water to prevent washing away chlorine tablets (< 1 fps)
Water is left for 24 hours (48 hrs. if water < 41°F)
Monitor to ensure residual is greater than 25 mg/L throughout the pipe

Continuous Feed Method:
Preliminary flushing at 2.5 fps or greater is required (5 fps is preferred)
Solution of at least 25 mg/L free chlorine injected into pipe as it is being filled
Added at a rate to ensure a 10 mg/L residual will remain in all portions of the system at the end of a 24 hour period

Slug Method:
Used for long, large diameter mains
Reduces the amount of chlorinated water to be flushed
Calcium hypochlorite tablets are placed in the main during construction
Fill water main for initial dose to meet initial demand
Then, using the continuous feed method, dose to produce a concentration of 100 mg/L (C651-92 required 300 mg/L)
Feed to produce a long slug of 100 mg/L water which will contact all interior surfaces of the pipe for 3 hours
Monitor to ensure > 50 mg/L – re-dose if necessary
Disinfecting a Main With the Slug Method

100 mg/L -> 50 mg/L

Cl₂

3 hours

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Disinfecting Mains

Monitoring
After required contact time, measure residual to ensure adequate chlorine concentration remains.

Flush system to lower residual to less than 4 mg/L (< 2 mg/L is preferred for taste concerns)

Sample for coliform bacteria with the P-A method

Once bacteria results are negative, system can be put in service

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Disinfecting Storage Tanks

Three methods commonly used:
- Complete fill
- Surface spray
- Partial fill

AWWA Standard C652-92

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Disinfection

**Disinfecting Storage Tanks**

**Method 1 - Complete Fill**

Storage tank is filled to overflow level with potable water and enough chlorine to result in a 10 mg/L residual.

When gas is used, required contact time is 6 hours.

When hypochlorite is used, contact time is 24 hours.

Residual is reduced to 2 mg/L following contact time.

Coliform samples taken prior to placing tank in service.

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**Method 2 - Surface Spray**

All surfaces that may contact water are coated with a 200 mg/L chlorine solution.

Minimum contact time is 30 minutes.

Following contact time, tank is filled with potable water to the overflow pipe.

Coliform samples taken prior to placing tank in service.
Disinfection

Disinfecting Storage Tanks
Method 3 - Partial Fill
Fill storage tank to 5% of total capacity
Add enough chlorine to bring residual to 50 mg/L
Hold for at least 6 hours
Fill tank to overflow level with chlorinated water and hold for 24 hours
Residual must be at least 2 mg/L after 24 hours
Coliform samples taken prior to placing tank in service

Review the lecture handout and then complete the quiz. This will help you remember the information we just covered.