MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

Needs and Opportunities for Professional Engineers on Public Water Projects

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Presentation Objectives

- Provide an overview of Public Water Supplies (PWS)
- Explain the requirements for Professional Engineers (PE) on PWS projects
- Provide examples of projects where PEs are needed
- Provide the reasoning for the PE requirement

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The Michigan Safe Drinking Water Act

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Michigan SDWA, Act 399

- In 1976, the Michigan Safe Drinking Water Act, Public Act 399 was enacted.
- The act prescribed the powers and duties of the Department of Environmental Quality (DEQ now EGLE) for enforcing compliance.

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Act 399, Public Water Supplies

- Stated purposes of Act 399 are "…to protect public health, to provide supervision and control over public water supplies…"
- Act 399 defines a public water supply as, "…a waterworks system that provides water for drinking or household purposes to persons other than the supplier of the water…"

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Public Water Supplies, Types I and II

- Type I Community Water Supplies (CWS)
  Provide year-round service to 15 or more living units or 25 or more residents.
- Type II Noncommunity Water Supplies (NCWS)
  Provide service to 15 or more service connections or 25 or more individuals on an average daily basis of at least 60 days out of the year.

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Community Water Supply Examples

Community water supplies serve residents. They are:

- Public utilities
- Apartment communities
- Housing communities

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Noncommunity Water Supply Examples

Noncommunity water supplies serve students, employees, customers, etc. Can include:

- Schools
- Businesses
- Hospitals (Secondary Treatment)

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Where Professional Engineers Fit In

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The Role of Professional Engineers

From the Michigan Safe Drinking Water Act section 325.1004 (6):

- "**Before commencing the construction** of a waterworks system or an **alteration, addition, or improvement** to a system, a supplier of water shall submit the **plans and specifications** for the improvements to the department and secure from the department a permit for construction as provided by rule. Plans and specifications submitted to the department **shall be prepared by a professional engineer** licensed under article 20 of the occupational code, 1980 PA 299, MCL 339.2001 to 339.2014."

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Community Water Supply Projects

Include:

- Construction of drinking water treatment plants
- Distribution system installation or repairs
- Changes in water treatment

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Noncommunity Water Supply Projects

Include:

- Storage tank rehabilitation
- Adding treatment

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Noncommunity Water Supply Projects

Include:

- Storage tank rehabilitation
- Adding treatment

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Noncommunity Water Supply Treatment

What is treatment?

- Removing what is undesired from the water (contaminants).
- Adding what is desired usually through chemical injection.

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Examples of Contaminants

Possible aesthetic contaminants in drinking water:

- Taste and odor compounds
- Discoloration compounds
- Iron
- Manganese
- Hardness (calcium and magnesium)

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Examples of Contaminants

Drinking water contaminants associated with health concerns:

Naturally occurring	Human caused
• Arsenic	• Nitrate
• Radium	• Per- and polyfluoroalkyl substances (PFAS)
• Uranium	• Microplastics

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Examples of Contaminants

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Contaminant Removal Technologies

- At NCWSs the most common removal technologies are vessels containing resin or granular media.
- Removal mechanisms may be adsorption, ion exchange, or oxidation-filtration.

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Ion Exchange

- Water softening is an ion exchange process.
- Calcium and magnesium ions are exchanged for sodium ions.

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Ion Exchange

Ion exchange can be used to remove other contaminants such as:

- Nitrate
- PFAS compounds

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Oxidation-Filtration

Can be used to remove:

- Iron
- Manganese
- Arsenic

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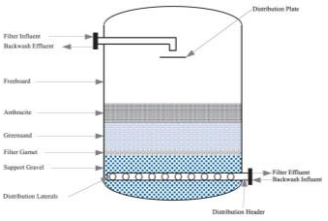
Oxidation-Filtration: Greensand

Greensand is the mineral glauconite coated with manganese dioxide.



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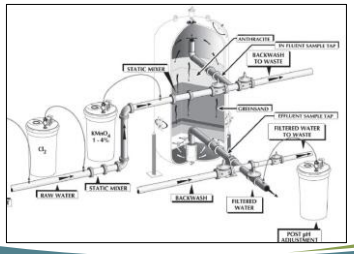
Greensand System with Oxidant



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Chemical Injection Example

Corrosion Control Treatment:

- Orthophosphate can create an internal passivating layer on water pipes.
- The coating may block the release of metals from pipe corrosion.

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Let's Pause for Review

- Noncommunity water supplies include schools, daycare centers, small businesses, churches, etc.
- The have a need for professional engineering services when installing treatment.
- Treatment may be contaminant removal or chemical injection.

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Secondary Treatment

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Secondary Treatment

- Where a facility that is a customer of a public water supply adds treatment. Often this is done to boost disinfectant levels for the water in the plumbing system.
- A driving factor behind the installation of secondary treatment (ST) systems has been the increasing reports of cases of Legionnaires' disease.

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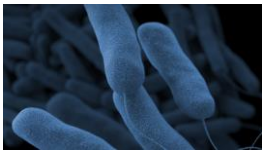
Legionnaires' Disease

- Legionnaires' disease is a pneumonia caused by the bacterium *Legionella pneumophila.*
- The bacteria can proliferate in facilities with large complex plumbing systems.



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Treatment as Water Management

- To control Legionella, facilities may opt for chemical disinfection treatment.
- Per federal law installing treatment causes a facility to be a public water supply.

40 CFR, Section 141.3(a)

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Secondary Treatment Technology

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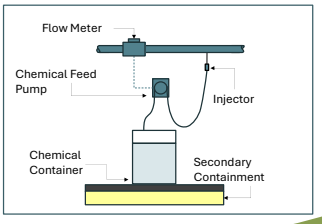
Sodium Hypochlorite Injection

- Sodium hypochlorite, (chlorine) is a common disinfectant.
- These systems can be relatively simple to operate.



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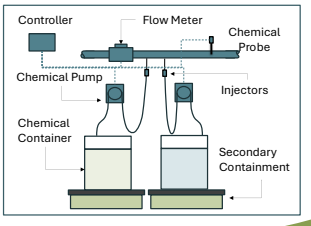
Monochloramine Injection

- Chlorine combined with ammonia can produce monochloramine.
- Not as powerful as chlorine but may persist longer.



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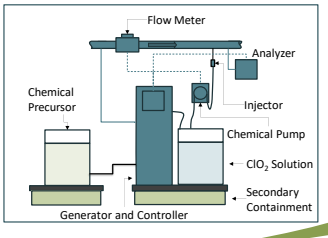
Chlorine Dioxide Injection

- Chlorine dioxide (ClO_2) is typically generated onsite.
- Strong disinfectant but carries safety concerns.



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Why the PE Requirement?

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Reasoning for PE Requirements

- Requirement has been the rule of law since 1976.
- Had previously been waived for NC applications.
- Recent treatment applications revealed the need to adhere to this law.

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Reasoning for PE Requirements

1. Sets a standard for the level of qualifications for treatment system designers.

   - Water treatment has public health implications.

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Reasoning for PE Requirements

2. To allow for an objective analysis of the need for treatment.

   - Consider other options water management.

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Reasoning for PE Requirements

3. To produce a higher quality application.

   - Improve efficiency of the EGLE review.

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PE Familiarity: Specifications

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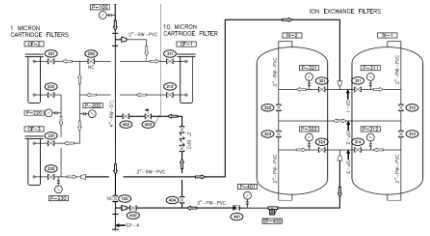
PE Familiarity: Plans



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Final Recap

- Noncommunity water supplies have a need for professional engineering services when installing treatment.
- These supplies may be schools, daycare centers, small businesses, churches, hospitals, etc.
- While not the typical clientele, these supplies provide opportunities for engineering firms to offer services in designing water treatment systems.

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Useful Links

Regulations

- Legislature.Michigan.gov/Act 399
- Michigan.gov/EnvironmentalRegulationsGuide

Treatment Technologies

- EPA.gov/ArsenicTreatment/SmallSystems
- EPA.gov/TreatabilityDatabase

Secondary Treatment

- Michigan.gov/SecondaryTreatmentPolicy
- Michigan.gov/EGLE/SecondaryTreatmentRequirements

Construction Standards

- DEP.State.PA.US/RecommendedStandardsWaterWorks

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