MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Water Testing Protocol & Best Management Practices

Holly Gohlke, R.S., M.S.A.
School Drinking Water Program
517-220-1904| GohlkeH@Michigan.gov

www.Michigan.gov/SchoolWater

Items for Discussion

- Importance of quality drinking water
- Strategies for drinking water management
- Drinking water sampling and testing protocols

EGLE Drinking Water Program Objective

To help schools and child care facilities reduce the risk of lead at all drinking water taps for the health of children

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Lead Testing Grant Program

Voluntary program for eligible facilities

- Training
- Sampling & testing for lead
- Guidance

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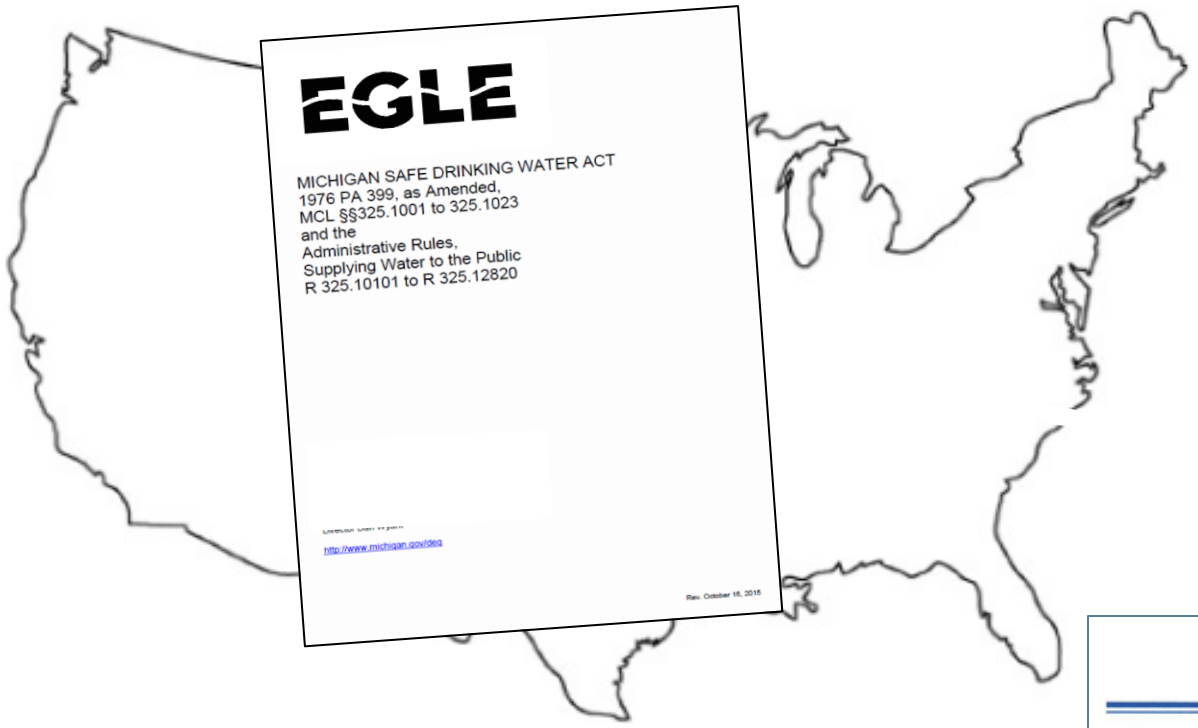

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MICHIGAN SAFE DRINKING WATER ACT
1976 PA 399, as Amended,
MCL §§325.1001 to 325.1023
and the
Administrative Rules,
Supplying Water to the Public
R 325.10101 to R 325.12820

http://www.michigan.gov/deq

Rev. October 16, 2015

CLEAN DRINKING WATER ACCESS ACT

S.B. 184 & 185:
SUMMARY OF INTRODUCED BILL
IN COMMITTEE

Senate Fiscal Agency
P.O. Box 30036
Lansing, Michigan 48909-7536

BILL ANALYSIS

Telephone: (517) 373-5383
Fax: (517) 373-1986

Senate Bills 184 and 185 (as introduced 2-25-21)
Sponsor: Senator Curtis S. Vanderwall (S.B. 184)
Senator Jim Ananich (S.B. 185)
Committee: Environmental Quality

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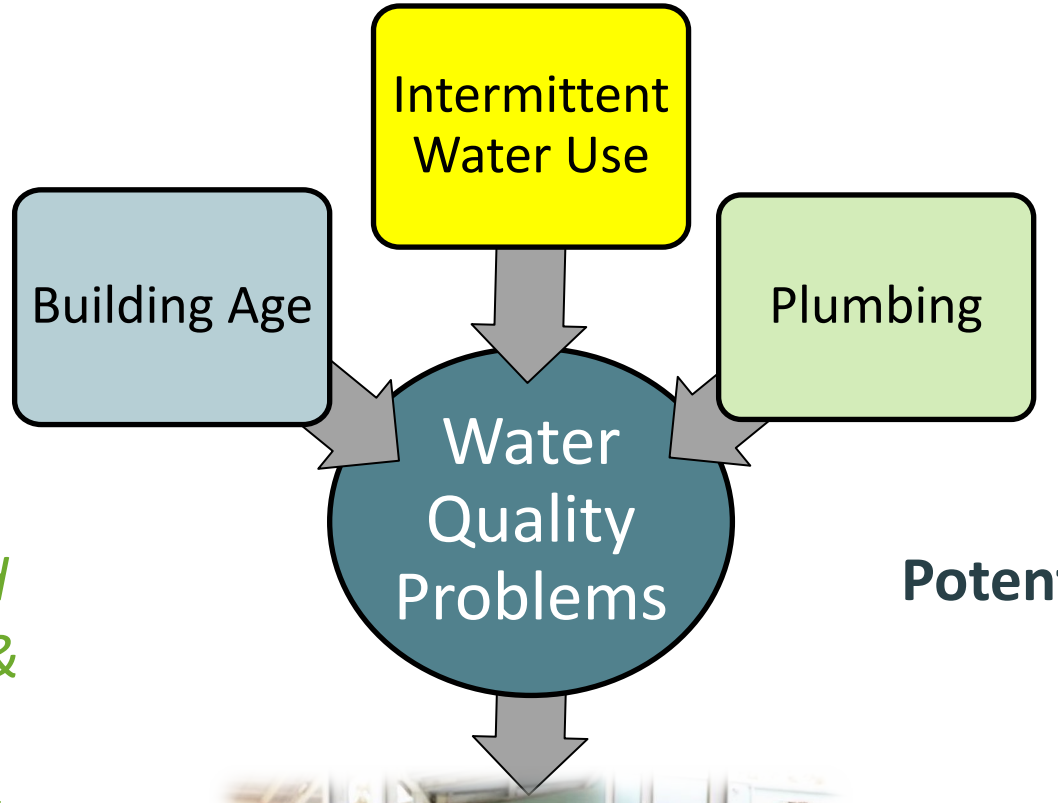
Why Drinking Water Management is Important



A well-maintained plumbing system & water movement preserves healthy drinking water

Potential building contaminants

Bacteria

Lead

Copper

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Drinking Water Management Plan (WMP)

A drinking water management plan is a comprehensive document that includes information and procedures for system maintenance and sampling to ensure water quality that is healthy and nutritious for all who consume it.

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Drinking Water Management Plan

- Assess risks & resources
- Develop the plan
- Communicate
- Perform & evaluate

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Flushing & Sampling Risk Matrix

Factor	High Risk			Lower Risk
Building age	Prior to 1989	1989 - 2014	2014 - Present	
Number of wings	4 or more	3	2	1
Number of floors	4 or more	3	2	1
Plumbing material	Lead	Brass	Galvanized	Non-lead
Dead end plumbing	Yes - multiple	Yes - few	Yes - one	None
Building water use	Long breaks	5 days a week	6 days a week	365 days a year
Water outlet use	Never	Rarely	Weekly	Daily
Water quality history (Lead & copper)	Multiple elevated results throughout	Sporadic results throughout	Sporadic results isolated to one or a few outlets	No elevated test results
Water quality history (Bacteria)	Multiple sites with bacteria detected	Sporadic results throughout	Sporadic results isolated to one or a few outlets	No bacteria detected
Water quality history (Other)	Building wide contamination	Area contained contamination	Aesthetic problems	No water quality problems

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Document the Information

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MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
DRINKING WATER AND ENVIRONMENTAL HEALTH DIVISION
SCHOOL DRINKING WATER TRAINING PROGRAM

SCHOOL BUILDING PLUMBING PROFILE

HEALTHY WATER HEALTHY KIDS

Note: *Complete for each school. For additional information and accompanying documents, go to the Department of Environment, Great Lakes and Energy (EGLE) guidance documents located at Michigan.gov/SchoolWater.* This document is designed to assist with the determination of lead risk in your facility drinking water and will enable you to prioritize your sampling and remediation efforts. A separate plumbing profile may be needed for each addition, or wing of the building, especially if the construction took place at different times. Some of the questions in this document may not apply to your facility for various reasons. Skip those that do not apply or mark as not applicable (NA). This document should be reviewed/updated annually. A list of commonly used acronyms can be found under Appendix A. Explanations regarding items/questions below are found under *Appendix B: School Building Plumbing Profile Information.*

An asterisk (*) indicates a required field.

PART A: BASIC BUILDING INFORMATION

*Name of school:
*School district:
*Type of school: ☐ Preschool ☐ Elementary ☐ Middle ☐ Jr/High ☐ High
*Physical street address of building:
*City:
*School contact person (please print):
*Title of school contact:
*Name of person completing this form (please print):
Grade level(s):
Year original building was constructed:
Building blueprints available? ☐ Yes ☐ No
Name of drinking water supplier:
Additional water line connections: ☐ None ☐ Concession stand ☐ Athletic field(s

EGLE Environmental Assistance Center
Telephone: 1-800-662-9278

Michigan.gov/EGLE
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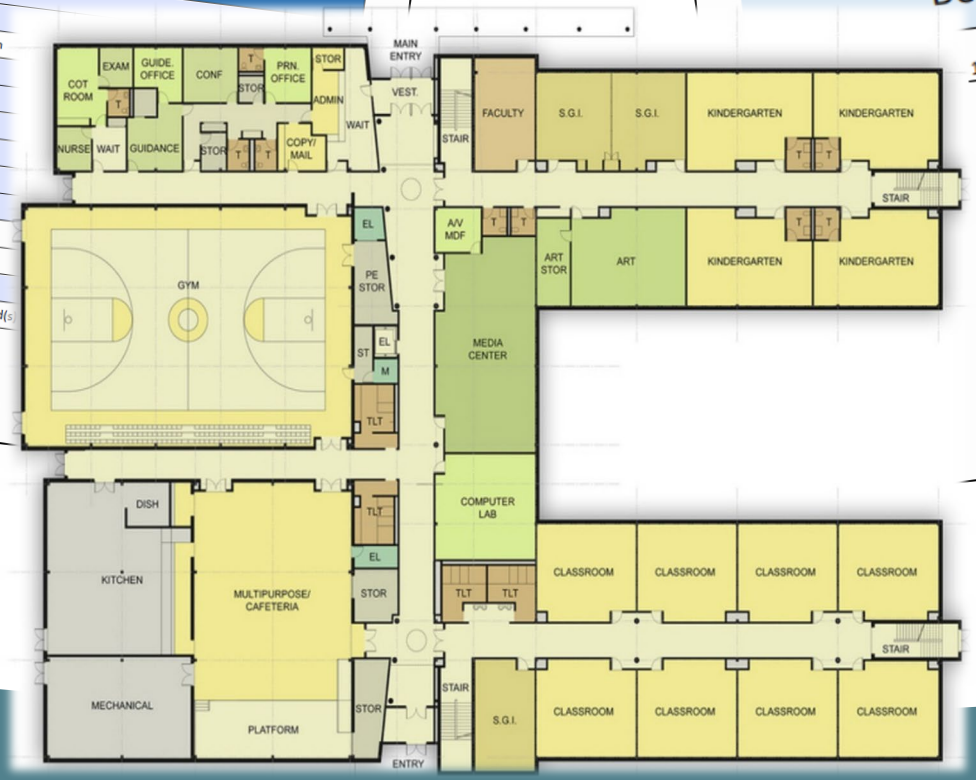

DRINKING WATER MANAGEMENT PLAN

FOR

Dee Elementary School

12345

Example School District

5/5/2021

5/5/2022

Holly Gohlke
Name

517-220-1904
Contact Phone#

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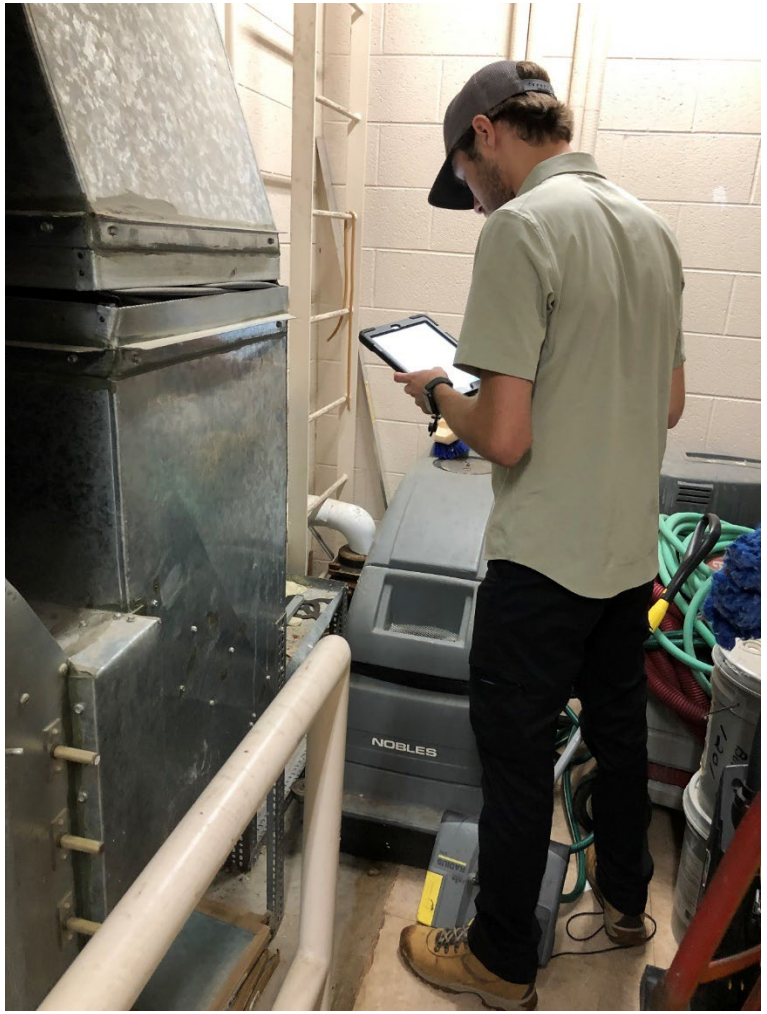
Plan Development - Plumbing Assessment

- Building walk-through
- Gather information for
  - Maintenance
  - Flushing
  - Sampling



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Plumbing Assessment Information

- Identify plumbing materials
- Understand how water enters and flows
- Create an inventory of fixtures
- Identify and prioritize sample collection
- Helps to conduct proper flushing
- Locate cross connections & problem areas

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A Complete Drinking Water Management Plan

- Based on reducing public health risks
- Plumbing & fixture inventory
- Repair & replacement requirements
- Equipment & device maintenance schedule
- Drinking water & system flushing protocols
- Routine water sampling & testing protocols
- Corrective action plan
- Communication plan

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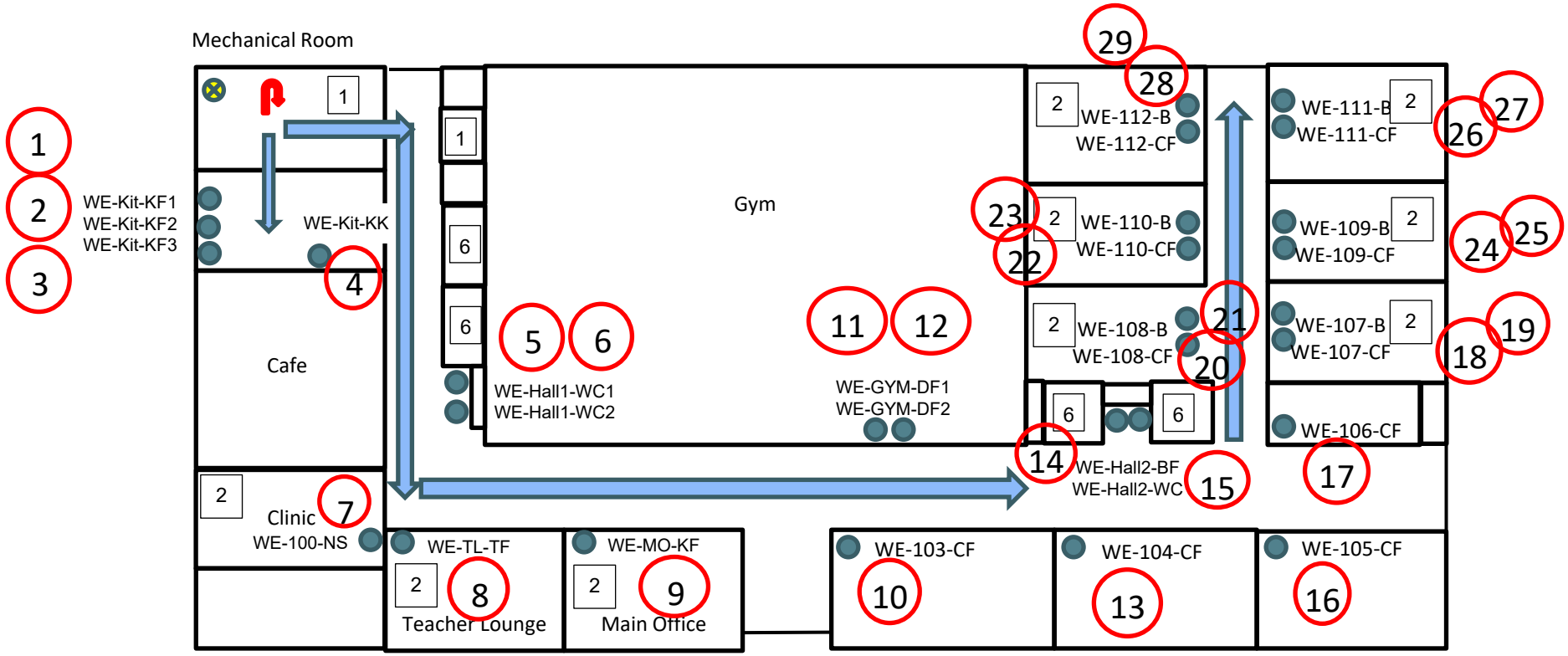
Mechanical Room
1
2
3
WE-Kit-KF1
WE-Kit-KF2
WE-Kit-KF3
WE-Kit-KK
4
Cafe
2
Clinic
7
WE-100-NS
1
6
6
5
6
WE-Hall1-WC1
WE-Hall1-WC2
Gym
11
12
WE-GYM-DF1
WE-GYM-DF2
29
28
2
WE-112-B
WE-112-CF
23
2
WE-110-B
WE-110-CF
22
2
WE-108-B
WE-108-CF
21
20
6
6
14
WE-Hall2-BF
WE-Hall2-WC
15
WE-111-B
WE-111-CF
2
26
27
WE-109-B
WE-109-CF
2
24
25
WE-107-B
WE-107-CF
2
18
19
WE-106-CF
17
WE-TL-TF
2
8
Teacher Lounge
WE-MO-KF
2
9
Main Office
WE-103-CF
10
WE-104-CF
13
WE-105-CF
16

Importance of “Moving” Building Water

Prevent stagnation

Improve quality

Maintain system

Moving “old” water out and “fresh” water in

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Establishing a Flushing Program

Decisions about when and how-to flush are specific to the building, plumbing system, and potential, suspected or known contaminant(s).

Flushing is by far the #1 best strategy!

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Establishing a Flushing Program

- Be prepared for different flushing methods
- Understand your building plumbing system
- Understanding historical and current test results
- Understand factors and categories of contaminants

A flushing program is dynamic!

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Establishing a Flushing Program

- When should flushing occur?
  - Prior to re-opening a school building
    - After extended breaks (summer, winter, spring, in-service, etc.)
    - After emergency shut down's
  - Throughout the school year
    - After weekends
    - Every use, every day, once a week, once a month
  - After plumbing or fixture changes or disturbances to the system
  - In response to system or fixture contamination

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Flushing Methods

“Fresh Tap Method”

- Refreshing the water
- Drinking or food preparation fixtures
- Remove soluble contaminants
- Individual fixture flushing
- Flush for 30 seconds to a minute
- Daily, weekly, or monthly
- Every use flushing

“High Velocity Method”

- Removes sediments & biofilms
- Based on maintaining 3 ft/sec velocity
- Flush of all water outlets
- Flushing occurs in zones
- Zone flushing for at least 15 minutes
- Once to twice a year
- A week to a few days before re-opening

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HIGH VELOCITY FLUSHING METHOD PROCEDURES

This flushing method involves moving the water in zones at all water fixtures including toilets, handsinks, etc.

The procedure is to open all the taps in a zone, let the water run for 15 minutes, then move to the next zone and repeat the process.

Reference: *EGLE Guidance for Flushing School Plumbing (High Velocity Method)* ***READ THOUGHLY BEFORE CONDUCTING FLUSHING**

Use the building floor plan and zone map(s) to assist in this process.

Zone Flushing		**Total Number of Zones:**	1	Estimated Total Flush Time(minutes):	15

STEP	ACTION (More than one person required)
1	Start flushing hot water tank(s) in utility room (flush until cold water comes out of tank)
2	Go to first zone (closest to the service line)
3	Remove any aerators, strainers, or screens
4	Fully open the cold water side of fixtures
5	Systematically flush all toilets
6	Record initial reading at the meter
7	Time one minute and record a second reading at the meter
8	If flow rate is close to or equal to 3 ft/sec through the meter start the flushing timer for this zone
9	Flush this zone for 15 minutes. Monitor flow rate at least three times during flush period.
10	Adjust zone size if needed - if flow rate is below 3ft/sec, open more fixtures; if above 3 ft/sec, close some fixtures
11	Close all fixtures in this zone (clean and replace aerators, strainers, and screens)
12	Go to next zone, repeat steps 3-11 until all zones are flushed (no need to flush hot water tank again)

NOTE: Keep a record of the calculated flow rates obtained during the flushing process for each zone, time of zone flushing, and problems noted.

Do not use filtered bottle fill drinking fountains or other inline filtered drinking fountains as a flushing point.

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FRESH TAP FLUSHING METHOD PROCEDURE

The fresh tap flushing method involves bringing fresh cold water to every fixture used **for drinking or food preparation**.

The procedure is to open the tap one at a time and let the water run for a specified time to get fresh cold water to the tap.

Reference: *EGLE School Building Flushing Best Practices (Fresh Tap Method)* for detailed information. ***READ THOUGHLY BEFORE CONDUCTING FLUSHING**

Use the building floor plan with fixture locations to assist in this process and make sure every drinking/food prep tap is flushed.

STEP	ACTION						
1	Go to fixture closest to POE		ID#	**WE-BR-SC**	Location	**Boiler room**	
2	Remove aerator or screen						
3	Fully open the cold water side of fixture						
4	Run cold water for	4	minutes				
5	Turn off fixture						
6	Clean and replace aerator or screen and re-install						
7	Go to fixture farthest from POE		ID#	**WE-112-CF**	Location	**Room #112**	
8	Remove aerator or screen						
9	Fully open the cold water side of fixture						
10	Run cold water for	**30**	minutes (can determine precise amount of time based on calculation of lenth of pipe and flow rate of this tap)				
11	Turn off fixture						
12	Clean and replace aerator or screen and re-install						
	If multiple floors and/or wings, conduct steps 7-12 on each						
13	Working your way back to the POE, flush every consumptive fixture except for the non-filtered refrigerated fountains one at at time for:				30	seconds	
14	Flush **non-filtered refrigerated** fountains for 15 minutes						
15	Run water through appliances connected to the water supply such as pop machines, coffee machines, etc.						

DETERMINING TOTAL FLUSHING EVENT TIME

	Number of consumptive fixtures (not including non-filtered refrigerated):			**28**			
	Time to flush consumptive fixtures:	**14**	minutes				
	Number of **non-filtered** refrigerated drinking fountains:			2	Time to flush:	**30**	minutes
	Total flushing event time	**78**	minutes	*Note: Include about five minutes for aerator removal/replacement at each fixture*			
	Estimated time to walk to each fixture during the process			**30**	minutes		
	Estimated time from beginning to end including walk time			**108**	minutes	Time in hours:	**1.8**

Do not use filtered refrigerated bottle fill drinking fountains for a 15 minute flushing point.

Note: Be aware not to overload wastewater drains during tap flushing. Record event on the Flushing Log (see FlushingLog tab).

All cells that allow data to be entered must have a value for the formulas to work. Be sure to at least enter a zero in the cell if there is no other value.

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Drinking Water Sampling

Drinking Water Sampling Plan

Own Water Source (Noncommunity)

- Required by law to sample per the Michigan Safe Drinking Water Act
- Sampling for many contaminants
- Local Health Department determines compliance sampling plan
- Additional investigation sampling plan

Water From Community Source

- No current law for drinking water sampling (legislation pending)
- Will require only lead testing
- Plan created by facility or hired contractor
- Investigation sampling plan

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Drinking Water Tests

What tests are *required* for a school with its own water source?

- Coliform bacteria
- Lead & Copper
- Nitrates
- Arsenic
- Metals
- SOC & VOC
- PFAS

What tests are *recommended* for schools on community water?

- Coliform bacteria
- Lead
- Copper

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Drinking Water Sampling Plan

- Communication
- Understanding the plumbing system
- Identifying factors that affect water quality
- Knowing how to sample and interpret test results
- Knowing how to reduce risk or improve water quality

Michigan Safe Drinking Water Act

EGLE Guidance on Investigative Drinking Water Sampling for Lead at Schools & Child Cares

EPA 3T's for Reducing Lead in Drinking Water in Schools & Child Cares

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Water Sampling Protocol

- Use only a certified drinking water laboratory
- Use the proper bottle
- Request the right analysis
- Follow the lab's instructions
- Bottles from one lab cannot be submitted to another lab

TESTING INFORMATION

Check	Test Code	Unit Number	Test Description	Fee
☐	B	30	Total Coliform/E. coli	$16.00
☐	NN*	32	Nitrate and Nitrite	$17.00
☐	R*	32	Automated Partial Chemistry	$18.00
☐	CAS	36ME	Arsenic	$18.00
☐	CCUB	36CC	Lead/Copper for corrosion (first draw sample)	$26.00
☐	CPB	36ME	Lead	$18.00
☐	CXVO*	36VO	Volatile Organic Compounds	$100.00
☐	CXTM* CXHA*	36VO 36HA	Disinfection Byproducts Rule (TTHM & Haloacetic Acids)	$175.00
☐	CXPT*	36PT	Pesticides	$125.00
☐	CXHB*	36HB	Herbicides	$120.00
☐	CXLP*	36LP	Carbamates	$125.00

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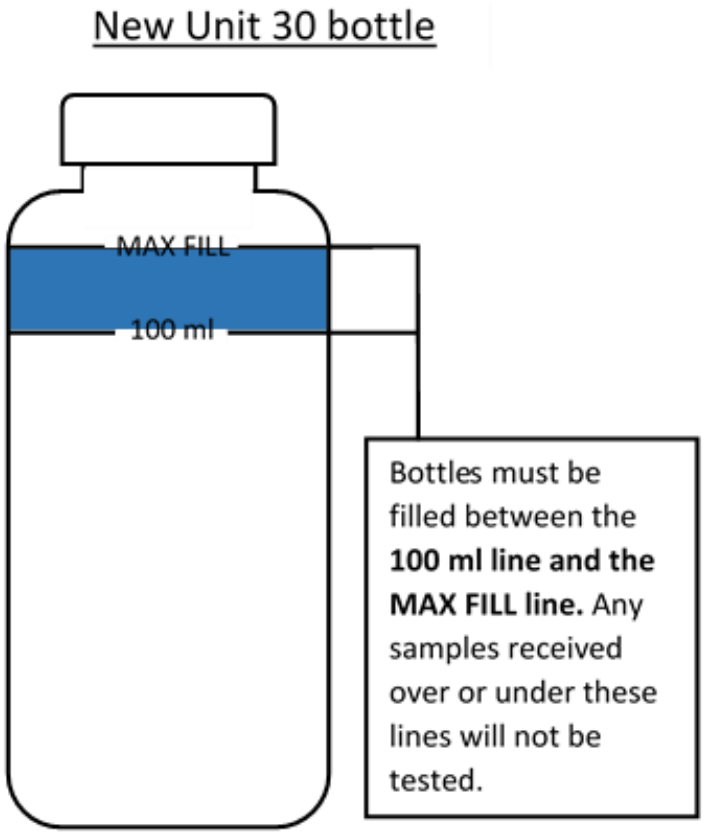
Total Coliform Bacteria Testing Bottles



$16 cost at EGLE lab

Total Coliform Sampling

Compliance - Requirements

- Typically one sample per building
- Taps commonly used for drinking or food preparation
- Frequency is per the LHD
- Further investigation if detected
- Sample must be analyzed w/in 30 hours of collection

Investigative - Recommendations

- Collect one sample per building
- Collect at a drinking fountain
- At least once a year
- Further investigation if detected
- Sample must be analyzed w/in 30 hours of collection

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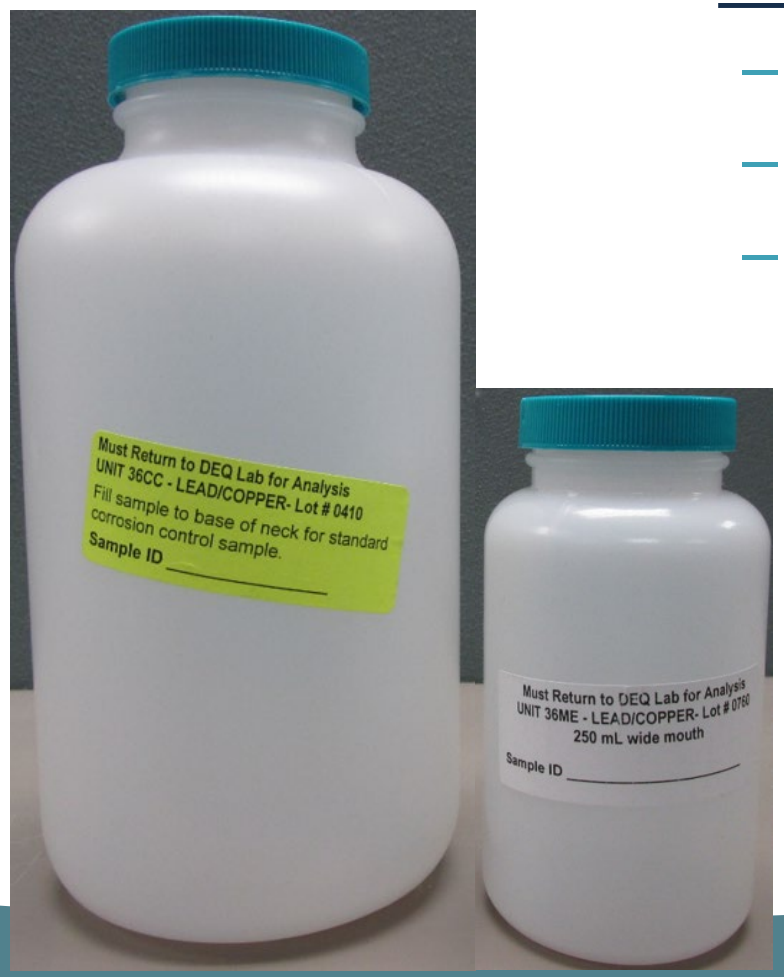
Total Coliform Bacteria Test Results

- Not Detected (ND)
  - Coliform bacteria is not detected in the sample
  - Result meets bacteriological water quality standards at the time of sampling
- Positive (POS)
  - Coliform have been detected
  - Safety cannot be assured & repeat samples are required
- Fecal Positive (FC POS)
  - Fecal coliform organisms have been detected
  - Water may be more likely to contain disease-causing organisms

Lead & Copper Testing Bottles

- Compliance Sampling
  - 1-Liter
  - Wide-mouth
  - EGLE lab
    - Bottle unit #36cc
    - Lead & copper for corrosion (CCUB)
    - $26 cost



- Investigative Sampling
  - 250 ml
  - Wide-mouth
  - EGLE lab
    - Bottle unit #36ME
    - Lead only
    - $18 cost

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Lead & Copper Sampling

Compliance - Requirements

- Number based on population
- Collected at taps used for drinking or food preparation
- Frequency is per the LHD
- 1-liter bottle
- 6 hours of no water use prior to sampling
- First draw sample

Investigative - Recommendations

- Depends on various factors
- Every drinking and food preparation tap
- Minimum of annual testing
- 250 ml bottle
- 8 hours of no water use in the building
- First draw sample
- 30-second flush sample

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Lead Test Results

Compliance - Requirements

- Corrosion control for the *system*
- Compliance is based on a statistical calculation of a *set of samples*
- Highest risk for lead locations
- Action level is 15 ppb (0.015 mg/L)
- 90th % exceedance triggers actions
- 10% of the samples can be greater than 15 ppb

Investigative - Recommendations

- Health based for tap consumption
- All consumptive taps are sampled
- Each tap is individually evaluated
- Action level is >5 ppb (0.005 mg/L)
- Any tap >5 ppb is not safe for consumption
- Action triggered for all taps >5 ppb

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Copper Test Results

Compliance - Requirements

- Corrosion control for the *system*
- Compliance is based on a statistical calculation of a *set of samples*
- Action level is 1300 ppb (1.3 mg/L)
- 90th % exceedance triggers actions
- 10% of the samples can be greater than 1300 ppm

Investigative - Recommendations

- Health based for consumption
- Results typically indicate copper pipe, not fixture issue
- Action level is same as compliance

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Lead & Copper Investigation Sampling

- Communication
- Plumbing assessment
- Flow of cold water
- Location of drinking & food preparation taps
- Developing a coding system & sample sequence for the taps
- Communication & pre-sampling preparation
- Collecting samples & delivery to the lab
- Interpreting & communicating the results
- Remediation

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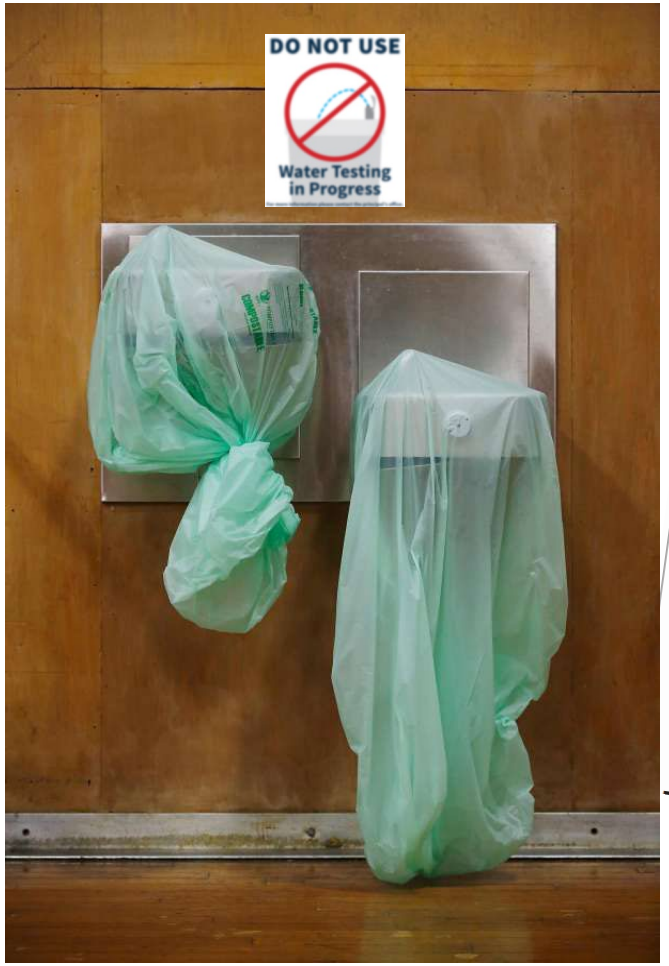
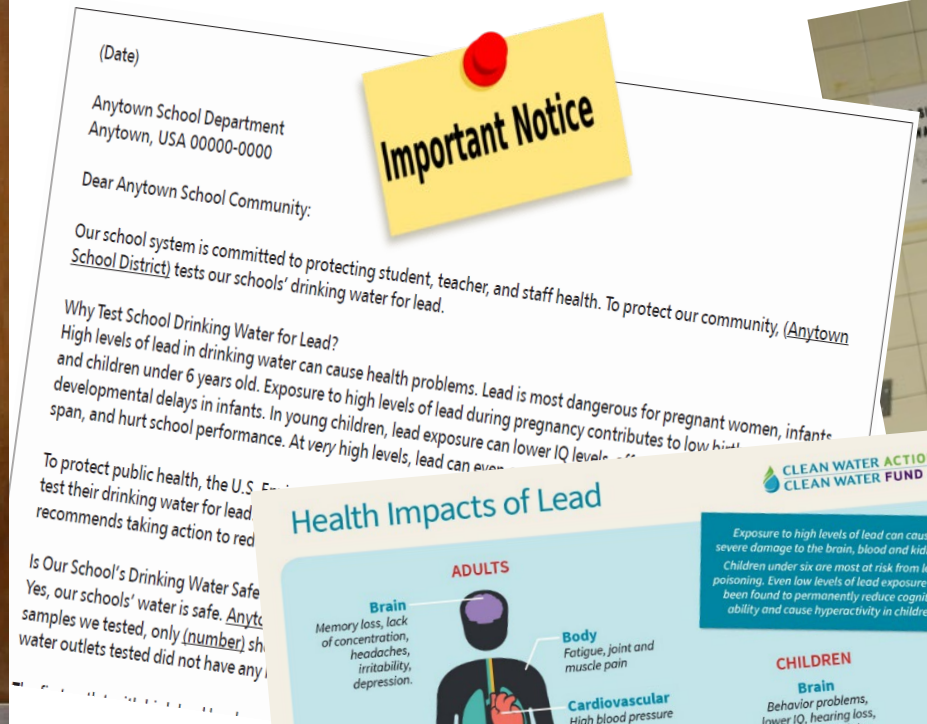
Communication & Education





(Date)

Important Notice

Anytown School Department
Anytown, USA 00000-0000

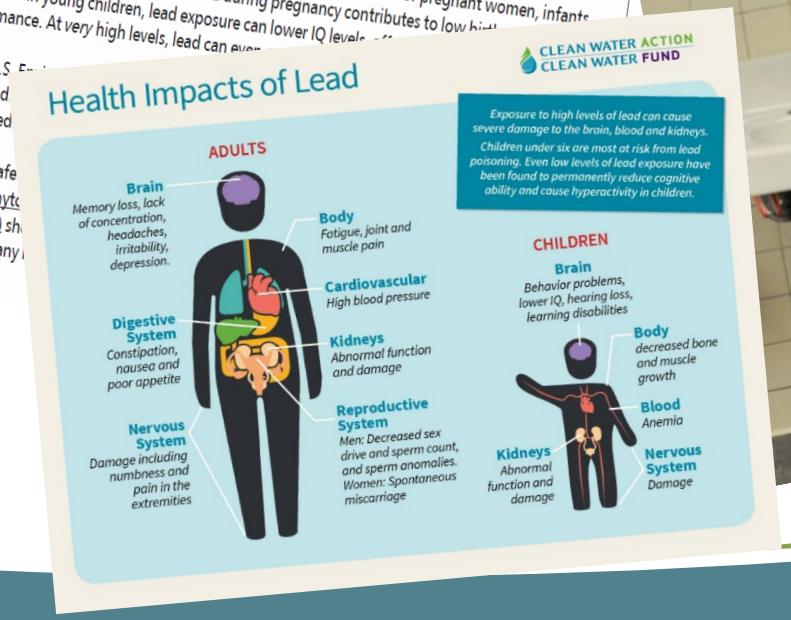
Dear Anytown School Community:

Our school system is committed to protecting student, teacher, and staff health. To protect our community, (Anytown School District) tests our schools' drinking water for lead.

Why Test School Drinking Water for Lead?
High levels of lead in drinking water can cause health problems. Lead is most dangerous for pregnant women, infants and children under 6 years old. Exposure to high levels of lead during pregnancy contributes to low birth
developmental delays in infants. In young children, lead exposure can lower IQ levels
span, and hurt school performance. At very high levels, lead can even

To protect public health, the U.S. E
test their drinking water for lead
recommends taking action to red

Is Our School's Drinking Water Safe
Yes, our schools' water is safe. Anyto
samples we tested, only (number) sh
water outlets tested did not have any



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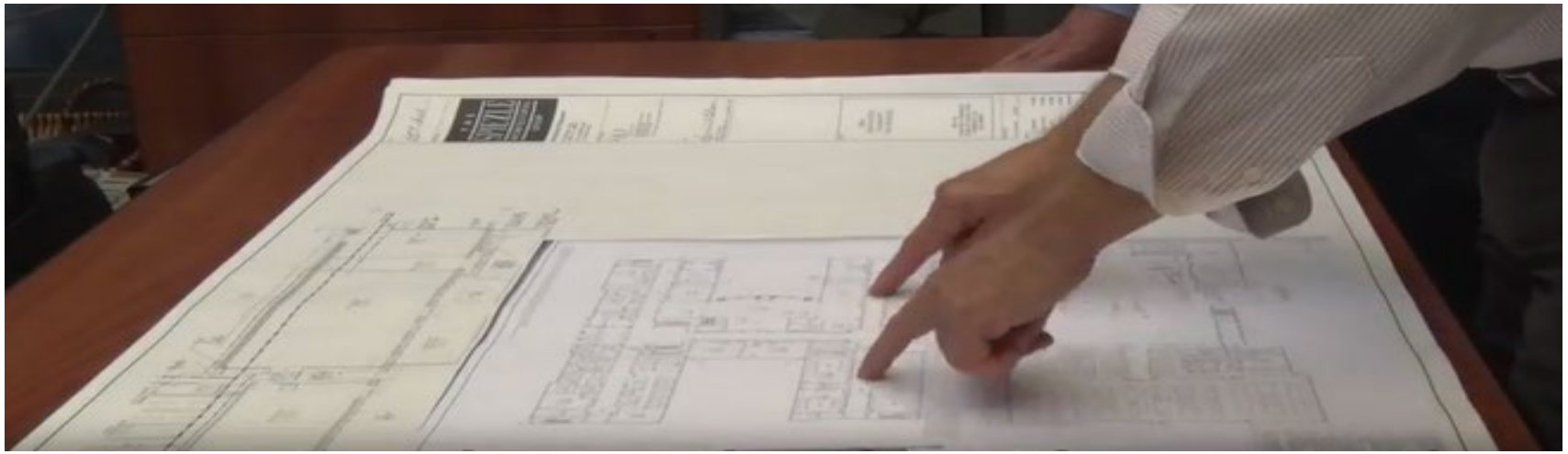
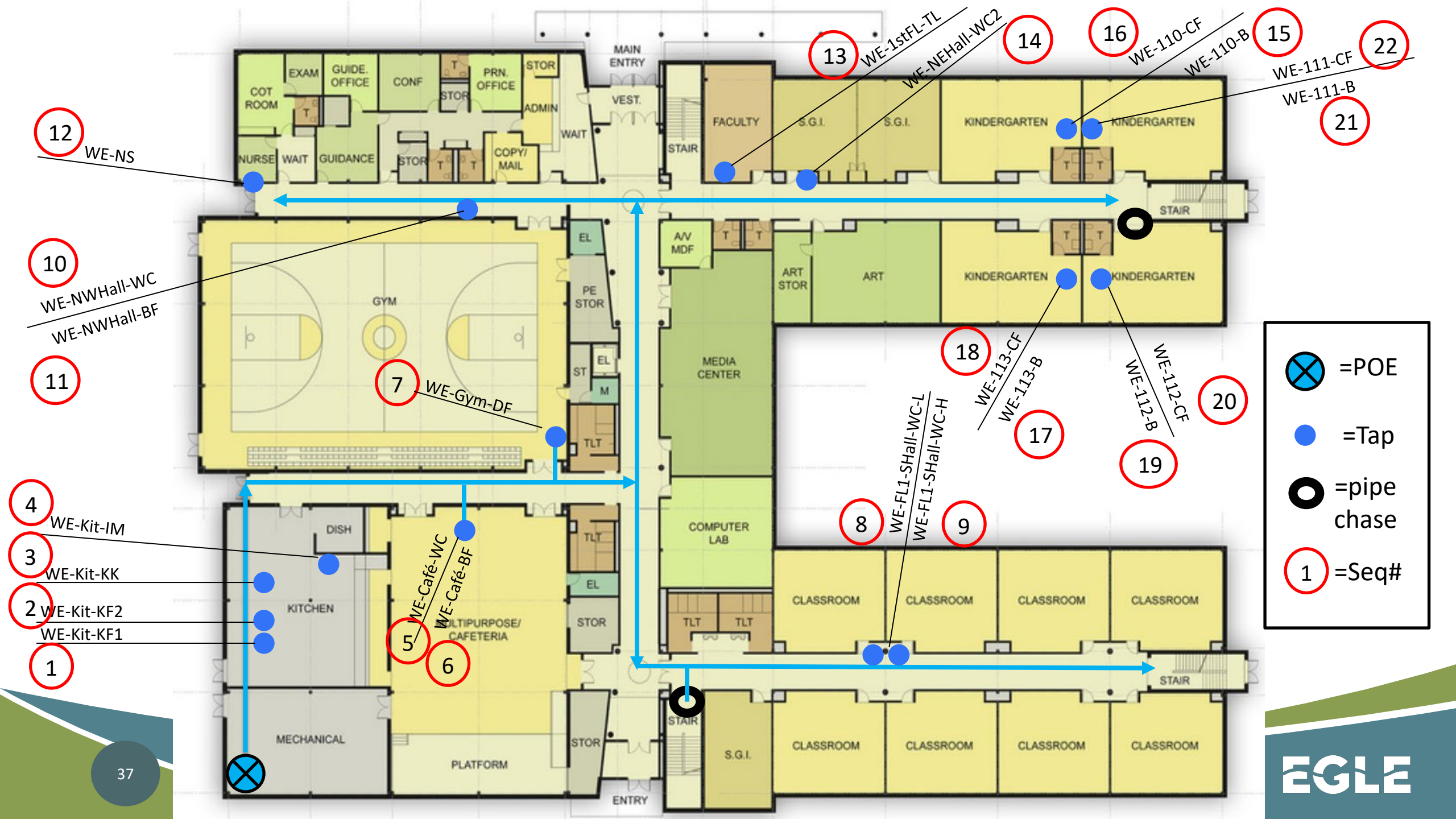
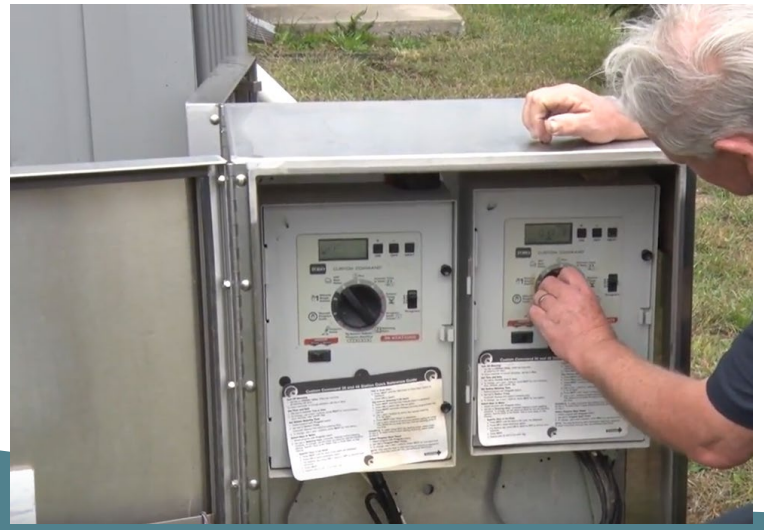
Plumbing Assessment



Building	Location	Tap Type	Fixture ID Code	Fixture ID Flush
Abbott Elementary	Room 110	Bubbler	AE-110-B	AE-110-B-F
High School	Gym	Water cooler	HS-GYM-WC1	HS-GYM-WC1-F
West Middle School	South Hall	Drinking fountain	WM-SHALL-DF	WM-SHALL-DF-F


12
WE-NS
10
WE-NWHall-WC
WE-NWHall-BF
11
7
WE-Gym-DF
4
WE-Kit-IM
3
WE-Kit-KK
2
WE-Kit-KF2
WE-Kit-KF1
1
5
WE-Café-WC
WE-Café-BF
6
13
WE-1stFL-TL
WE-NEHall-WC2
14
16
WE-110-CF
WE-110-B
15
WE-111-CF
WE-111-B
22
21
18
WE-113-CF
WE-113-B
17
WE-112-CF
WE-112-B
20
19
8
WE-FL1-SHall-WC-L
WE-FL1-SHall-WC-H
9
MAIN ENTRY
VEST.
COT ROOM
EXAM
GUIDE. OFFICE
CONF
PRN. OFFICE
STOR
ADMIN
WAIT
NURSE
GUIDANCE
COPY/ MAIL
FACULTY
S.G.I.
KINDERGARTEN
STAIR
GYM
EL
PE STOR
ST
M
TLT
A/V MDF
MEDIA CENTER
ART STOR
ART
COMPUTER LAB
DISH
KITCHEN
MULTIPURPOSE/ CAFETERIA
MECHANICAL
PLATFORM
ENTRY
CLASSROOM
=POE
=Tap
=pipe chase
=Seq#

Investigative Lead Sampling Tips



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Investigative First Draw Sample Collection

- Have 2 bottles for the tap
  - Second bottle is labeled for a flush sample with an "F" at the end
- Take the first bottle to get the first draw of water
- Take the cap off & put the bottle under the tap
- Open the cold-water side of the tap full stream
- Fill the first bottle to the neck w/out letting any water waste down drain
- Shut off the tap, cap the bottle, record time

First draw

Flush Sample

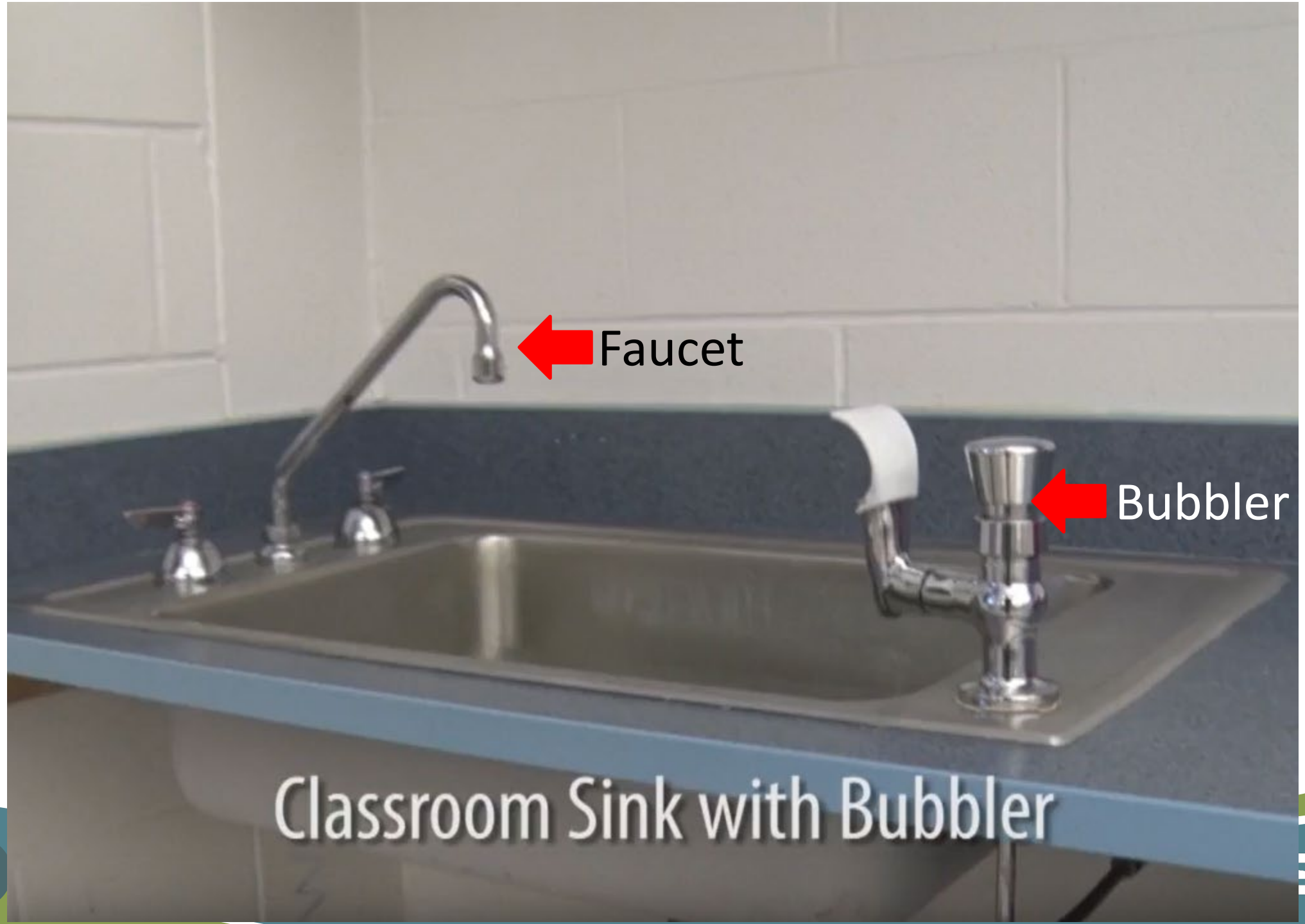
Investigative Flush Sample Collection

- After collecting the first draw sample
- Open the tap & let the water run full stream for 30-seconds (have the bottle ready to fill)
- At 30-seconds fill the second bottle
- Shut off the water, cap the bottle, record time
- Check the aerator if it can be removed
- Record observations
  (particles in aerator, leaking faucet, low flow, warm, etc.)

Flush Sample

Sample Collection at Different Taps

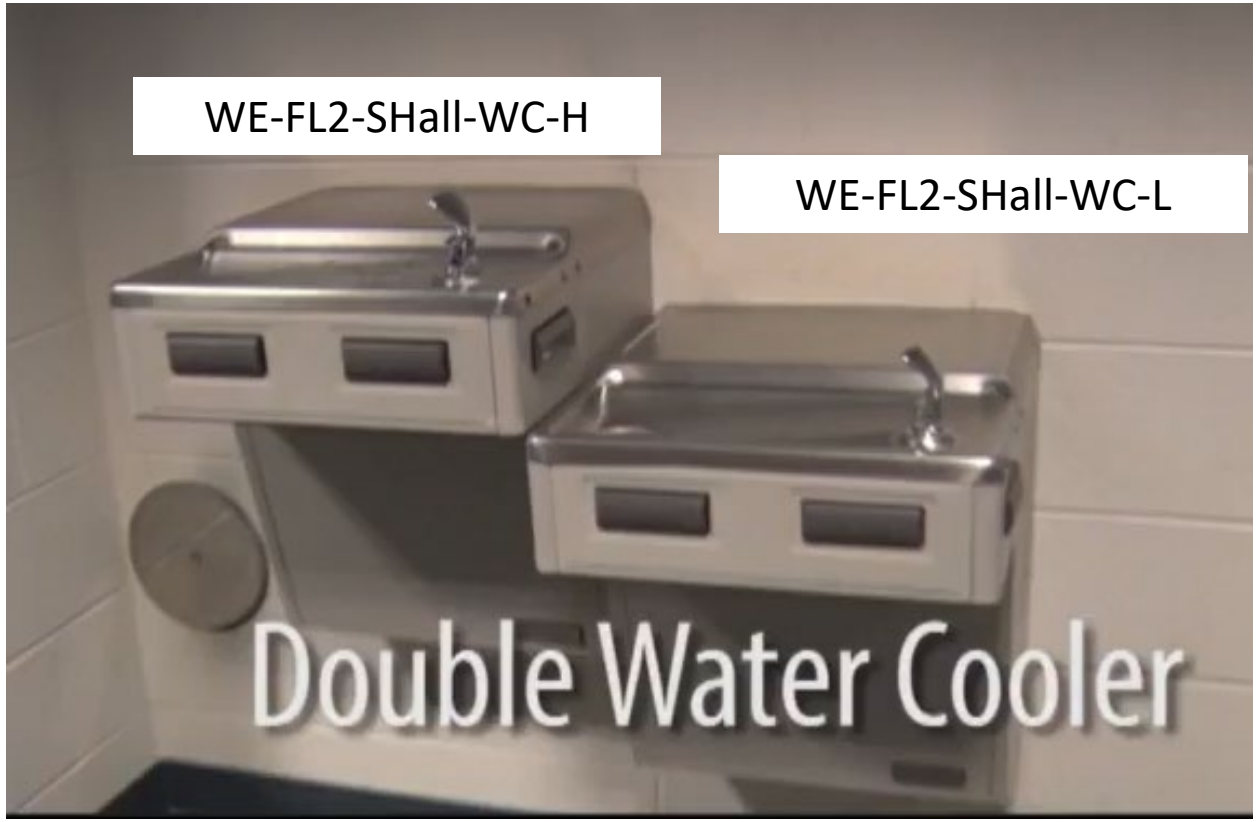

Ice Machine


Faucet
Bubbler
Classroom Sink with Bubbler

Water Cooler with Bottle Filler

- Each outlet coded separately
  - Water cooler (WC)
    - For the “bubbler” tap portion
    - Should be sequenced before the BF and sampled first
  - Bottle fill (BF)
    - Should be sampled last
  - No 30-second flush samples


WE-FL1-SHall-WC
Single Water Cooler


WE-FL2-SHall-WC-H
WE-FL2-SHall-WC-L
Double Water Cooler


BRITA


Aqua-Pure

Remediation Options for Lead Over 5 ppb

Remediation Options for Lead Results Over 5 ug/L

Immediate Response	Short-Term Response	Permanent Response
Steps facilities can take as soon as lab results arrive	**Protect children's health until permanent actions can be taken**	**Ways to reduce the risk of lead for the long term**
Respond quickly, protect public health, preserve trust	Keep the community safe until further investigation to identify lead sources or until more permanent action resources are available	Best ac knowing t
• Take fixtures out of service until risk is reduced • Notify staff, parents, and students • Increase awareness • Educate	• Continue to keep problem fixtures out of service • Clean or replace aerators • Develop flushing procedures • Use certified fixture filters • Provide bottled water in extreme cases • Notify staff, parents, and students	• Rem • Perm • Rep valv • Inst • Ins filt • De • R • R • N

Note: A laboratory test result for lead of 0.005 mg/L (milligrams per liter) is the same as 5 ppb (parts per billion).

Fixture Removal	Fixture or Plumbing Replacements	Limit Drinking Water Locations	Filtration	Flushing (Prevent stagnant water)
PROS	**PROS**	**PROS**	**PROS**	**PROS**
• Very effective • No material costs	• Generally effective • Low cost • Can be paired with building improvements	• Effective • Generally low cost • Drinking could be directed to "hydration stations" with filters that reduce risk	• Effective • Quick to implement • Low cost if temporary	• Effective • Low Cost • Can be manual or automatic
CONS	**CONS**	**CONS**	**CONS**	**CONS**
• Fixture removal may not be an option with widespread issues • May cause dead end pipes that affect other water quality issues	• Can be costly • "Lead-free" still allows 0.25% lead in fixtures • May not immediately solve issue • Dependent on correctly identifying lead sources	• Non-potable taps must have signs • Cannot ensure non-potable taps will not be used for drinking • Hydration stations can be expensive and need maintenance • May limit flow of water in system	• May be expensive • Requires proper installation and maintenance • May require a plumber to install • May be subject to tampering or bypass	• Increase water use • May take time to implement • Morning flushing only may not reduce lead levels all day • Automatic devices can be expensive

Summary

- Providing quality drinking water is important for children's health & development
- Building water systems must be properly maintained
- Flushing is an essential strategy to water quality management
- Good water management practices = good water quality
- Testing is the only way to know if the water is healthy

EGLE

Michigan Department of
Environment, Great Lakes, and Energy

517-220-1904
Gohlkeh@Michigan.gov

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