State of Ohio Class A Drinking Water Operator Certification Program

Session One: Supplemental Materials

This course includes content developed by the Ohio Environmental Protection Agency, the Pennsylvania Department of Environmental Protection, the Indiana Department of Environmental Management, the California State University at Sacramento, and 360water, Inc.

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CONTENTS

1. License to Operate

A license to operate a public water system is issued to the owner of the system. The complexity of the treatment and size of the plant reflects the classification issued by the regulatory agency. As the size and complexity of the system increases, the skills and experiences of a good operator will need to be increased as well to ensure the delivery of safe potable water to consumers.

The Ohio Administrative Code describes the rules for public water system licensure.
3745-84-01 Public water system licenses.

A. Except as otherwise noted, the definitions in rule 3745-81-01 of the Administrative Code shall apply to this chapter.
   1. "Number of wells supplying system" means those wells that are physically connected to the plumbing system serving the public water system.
   2. "Population served" means the total number of individuals receiving water from the public water system during a twenty-four hour period averaged over at least sixty days during any calendar year.
   3. "Service connection" means the active or inactive pipes, goosenecks, pigtails, and any other fittings connecting a water main to any building outlet.
   4. "Church" means a fellowship of believers, congregation, society, corporation, convention, or association that is formed primarily or exclusively for religious purposes and is not formed or operated for the private profit of any person.
   5. "School" means any public or non-public school that meets the minimum standards of the state board of education.

B. Application for a license to operate or maintain a public water system.
   1. Except as provided in paragraphs (B)(6) and (B)(7) of this rule, no person shall operate or maintain a public water system in the state of Ohio without a public water system license issued by the director.
      a. Any person who operates or maintains a public water system shall obtain an initial public water system license.
      b. A completed application for an initial public water system license shall be filed with the director not later than thirty days prior to the operation of the public water system, and shall be accompanied by the appropriate fee as set forth in paragraph (E) of this rule.
   2. Application for an initial public water system license shall be on a form provided by the director, and the following information shall be provided by the applicant:
      a. Public water system identification number;
      b. Name, address, and telephone number of the public water system;
      c. Owner name, address and telephone number;

d. Population served (if applicable);

e. Number of service connections (if applicable);

f. Source(s) of water;

g. Number of wells supplying the public water system (if applicable); and

h. Additional data which may be required by the director.

3. Not later than thirty days after receiving a completed application and the appropriate fee, the director shall issue the initial public water system license.

4. A public water system license or license renewal, issued pursuant to section 6109.21 of the Revised Code and in accordance with this chapter, shall expire on the thirtieth day of January in the year following its issuance.

5. A person proposing to operate or maintain a new public water system shall submit a completed application to the director for an initial public water system license in accordance with this rule not less than thirty days prior to operation of the public water system.

6. Paragraph (B) of this rule does not apply to a church that operates or maintains a public water system solely to provide water for that church or for a campground that is owned by the church and operated primarily or exclusively for members of the church and their families.

7. Paragraph (B) this rule does not apply to any public or non-public school that operates or maintains a public water system solely to provide water for that school.

C. Renewal of license to operate or maintain a public water system.

1. Except as provided in paragraph (C)(6) of this rule, a person holding a public water system license or a public water system license renewal issued by the director under section 6109.21 of the Revised Code, who is proposing to continue operating the public water system, shall submit a completed application for license renewal to the director not less than thirty days prior to the expiration date of the license or license renewal.

2. The application for a public water system license renewal shall be submitted on a form provided by the director and shall be accompanied by the appropriate fee as set forth in this rule.

3. The application for a public water system license renewal shall include the information required in paragraph (B) of this rule reflecting the current conditions of the public water system.

4. Within thirty days of receipt of both a completed application for a public water system license renewal under this rule and the applicable fees, the director shall act on the application by:

a. Issuing the license renewal, or

b. Issuing the license renewal subject to terms and conditions which the director determines are necessary to ensure compliance with Chapter 6109. of the Revised Code and the administrative rules adopted thereunder, or

c. Acting to deny the license renewal upon a finding that the public water system was not operated in substantial compliance with Chapter 6109. of the Revised Code and the administrative rules adopted thereunder.

5. A public water system license renewal to operate or maintain a public water system issued by the director pursuant to section 6109.21 of the Revised Code and this chapter shall expire on the thirtieth of January in the year following its issuance.

6. This rule does not apply to a church that has previously obtained a license under paragraph (B) of this rule.

D. Display of license to operate or maintain a public water system.

1. A public water system license or license renewal issued by the director pursuant to this chapter is the property of the state of Ohio.
2. License or license renewal shall be prominently displayed at the office of the public water system.
3. License or license renewal shall be surrendered to the director upon revocation.

E. Fees for operating or maintaining a public water system.

3745-84-014

1. Pursuant to section 3745.11 of the Revised Code, a person applying for a public water system license or a public water system license renewal to operate or maintain a public water system under section 6109.21 of the Revised Code and this chapter shall pay the appropriate fee according to the schedule set forth in section 3745.11(M) of the Revised Code at the time of submission of the application to the director.
2. Failure to pay the appropriate fee required by section 3745.11(M) of the Revised Code at the time of submission of application for a public water system license or a public water system license renewal, shall require payment of an additional amount equal to ten per cent of the appropriate fee.
3. Failure to pay the fee required by section 3745.11(M) of the Revised Code shall render an application for a public water system license or a public water system license renewal incomplete.
4. Payment of fees required by section 3745.11(M) of the Revised Code shall be made by tendering a certified check payable to the treasurer of the state of Ohio. The director shall transmit all fees collected under this rule to the treasurer of the state for deposit into the drinking water protection fund created in section 6109.30 of the Revised Code.
5. For public water systems that are community water systems as defined rule 3745-81-01 of the Administrative Code, the fees for initial license and license renewal, required under this chapter shall be as set forth in section 3745.11(M)(1) of the Revised Code. The public water system may determine its means for obtaining fees, including the assessment of additional user fees which may be assessed on a volumetric basis.
6. For public water systems that are nontransient noncommunity water systems as defined in rule 3745-81-01 of the Administrative Code, the fees for initial license and license renewal required by this chapter shall be as set forth in section 3745.11(M)(2) of the Revised Code.
7. For public water systems that are transient noncommunity water systems as defined in rule 3745-81-01 of the Administrative Code, the fees for initial license and license renewal required by this chapter shall be as set forth in section 3745.11(M)(3) of the Revised Code.

F. Suspension and revocation of a license to operate or maintain a public water system. Upon a finding by the director that a person holding a license to operate a public water system issued by the director pursuant to section 6109.21 of the Revised Code and this chapter, has failed to operate or maintain a public water system in substantial compliance with Chapter 6109. of the Revised Code and the

administrative rules adopted thereunder, the director may suspend or revoke the license. In suspending or revoking a license the director shall act in accordance with the provisions of Chapters 119 and 3745 of the Revised Code and this chapter.

Effective: 08/03/2004
R.C. 119.032 review dates: 05/05/2004 and 08/03/2009
Promulgated Under: 119.03
Statutory Authority: RC Section 3745.11, 6109.04 Rule Amplifies:
RC Section 6109.21
Prior Effective Dates: 04/21/01, 12/01/93, 01/01/99

2. Certified Operator

The OEPA requires that certified operators be in responsible charge of class A public water systems. Depending on the facts of each public water system, this regulation explains what is required so that public health is maintained.

The Ohio Administrative Code describes the rules for certified operators.

3745-7-02 Certified operators required.

(A) (1) Each person owning or operating a public water system, except as allowed in paragraph (B)(1) or (G) of this rule, shall place the direct supervision for the technical operation and maintenance of such a public water system under the responsible charge of a certified operator having valid certification of a class at least equal to that required by that public water system classification.

(2) Each person owning or operating a wastewater works serving a population over two hundred fifty or a wastewater works having a population equivalent over two hundred fifty shall place the responsibility for the technical operation and maintenance of such a wastewater works under the responsible charge of a certified operator having certification of a class at least equal to that required by the wastewater works classification, except as allowed in paragraph (G) of this rule.

(B) (1) Transient noncommunity public water systems serving populations of two hundred fifty or fewer are not required to place the operation of such public water system under the responsible charge of a certified operator, unless the director determines that a serious public health or environmental hazard is associated with the operation of any such public water system.

(2) Wastewater works serving populations of two hundred fifty or fewer are not required to place the operation of such wastewater works under the responsible charge of a certified operator, unless the director places such a requirement in a national pollutant discharge elimination system (NPDES) permit or determines that a serious public health or environmental hazard is associated with the operation of any such wastewater works.

(C) The certified operator required by paragraphs (A) and (B) of this rule shall be a full-time employee of the person owning or operating a public water system or wastewater works, except as provided in paragraphs (D), (E) and (F) of this rule. The full-time employee required by this rule may be responsible for two or more public water systems, wastewater works, or a combination of such systems in reasonable proximity, provided that the time spent in fulfilling daily responsibilities is appropriately portioned.

(D) When substantial evidence is presented to the director that the services of a full-time certified operator cannot be obtained, the director may authorize a public water system or wastewater works to place responsibility for the technical operation and maintenance thereof in charge of an appropriately certified operator who is not a full-time employee of the public water system or wastewater works on a temporary basis, upon submission of:

(1) Information adequately demonstrating that the services of a full-time employee meeting the certification requirements are not available, and

(2) A plan showing the duties and responsibilities of said certified operator, including hours of attendance, and

(3) The contract between the certified operator and the public water system or wastewater works, and

(4) An acceptable schedule for obtaining the services of a full-time employee with the appropriate certification.

Upon approval by the director of the schedule submitted for paragraph (D)(4) of this rule, the public water system or wastewater works shall comply with the compliance schedule(s) issued subsequently by the director.

(E) Class A or I public water systems may enter into a contract for the services of an appropriately certified operator to inspect, monitor, and supervise the operation thereof provided that:

(1) The system serves a population fewer than one thousand, and

(2) The system uses only purchased water or ground water source(s), and

(3) The contract requires that the certified operator be available to respond to emergencies and provide the services necessary to maintain the reliable operation of the system, and

(4) The contract is for a term not to exceed three years, but may be renewable, and

(5) The contract is submitted to and approved by the director.

(F) Class I wastewater works may enter into a contract for the services of an appropriately certified operator to inspect, monitor, and supervise the operation thereof provided that:

(1) The wastewater works serves a population over two hundred fifty but fewer than one thousand, and

(2) The wastewater works treats only domestic sewage, and

(3) The contract requires that the certified operator be available to respond to emergencies and provide the services necessary to maintain the reliable operation of the wastewater works, and

(4) The contract is for a term not to exceed three years, but may be renewable, and

(5) The contract is submitted to and approved by the director.

(G) Class IV public water systems and class IV wastewater works may be approved by the director to temporarily employ a class III operator where a class IV certified operator is required, if the class III operator has applied for and received approval to take a class IV examination.

Effective date: February 12, 2001

R.C. 119.032 review dates: 1/30/01, 1/30/06
Promulgated under: RC Chapter 119
Rule authorized by: RC Sections 6111.46 and 6109.04(C)(1)(b) Rule amplifies: RC Sections 6111.46 and 6109.04(C)(1)(b) Prior effective dates: 2/1/64, 4/17/86, 9/13/93, 1/1/99

3. Plan Approval

Plan approval is a process of reviewing engineered drawings produced by the owner, ensuring they meet the criteria and guidelines. The objective here is to assure that new or substantially modified public water system facilities such as those for mobile home parks, gas stations, restaurants, condominiums, and the like will be capable of producing an adequate supply of potable water in compliance with applicable regulations.

The Ohio Administrative Code describes the rules for plan approval.

3745-91-02 Application for Approval of Plans.

A. No person shall begin construction or installation of a public water system, or make a substantial change in a public water system, until plans therefore have been approved by the director of environmental protection. An application for approval of plans for such construction, installation, or substantial change in a public water system, as required by section 6109.07 of the Revised Code, shall be submitted to the district office and shall consist of all of the following:

   1. Three copies of plan drawings as specified by rule 3745-91-03 of the Administrative Code (two copies if the facility will be owned by a public entity);
   2. One copy of specifications as specified by rule 3745-91-04 of the Administrative Code;
   3. One copy of a data sheet as specified by rule 3745-91-05 of the Administrative Code;
   4. One copy of supporting information as specified by rule 3745-91-06 of the Administrative Code; and
   5. A submittal letter as specified by rule 3745-91-07 of the Administrative Code.

B. A person applying for a plan approval for a public water system under section 6109.07 of the Revised Code shall pay a fee pursuant to Section 3745.11 of the Revised Code. The fee shall be paid at the time the application is submitted by tendering a check payable to the treasurer of the state of Ohio.

C. General plans containing preliminary information concerning proposed source, treatment, and distribution may be submitted for approval or for comment. General plans submitted for conditional approval shall be submitted in three copies. The director may require submittal of general plans for conditional approval prior to submittal of an application under this rule for projects with a high degree of complexity, non-standard technology, unusual features, phased implementation, compliance schedules or deviations from standards and guidelines used by the agency.

2 Effective date: 01/01/2002
R.C. 119.032 review dates: 06/27/01, 10/04/06
Promulgated under: RC Chapter 119
Rule authorized by: RC Section 6109.04
Rule amplifies: RC Sections 6109.04, 6109.07, 3745.11 Prior effective dates: 11/26/80, 12/01/93, 12/1/99

4. Wells

Drinking Water Sources

There are two main sources of drinking water, Surface Water and Groundwater.

Surface Water sources typically include Rivers, Streams, Lakes, Reservoirs. Groundwater under the direct influence of Surface Water (GWUDI), such as Springs, is another Surface Water source.

Groundwater sources include Aquifers and other sub-surface water, such as Wells.

There are a number of advantages associated with using surface water as the source for your drinking water system.

Groundwater usually requires less treatment than surface water.

Fairly consistent flow, quality, and temperature can make operation of treatment equipment easier.

Additionally, more sites are available for wells than surface water intakes for small, isolated communities.

Of course, there can be a number of disadvantages associated with using groundwater as the source for your drinking water system.

Although not as susceptible as surface water, groundwater can still be subject to contamination by agricultural and domestic chemicals. Once contamination occurs, it may be long-lasting and difficult to remove.

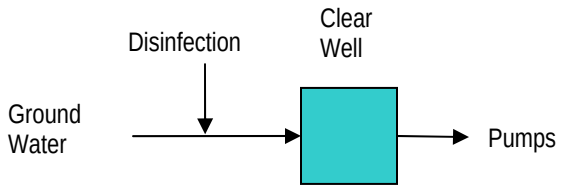
It can also be subject to high levels of hardness and nitrates along with problems from iron and manganese content.

Additionally, multiple wells may be required to supply a community. Property issues such as condemnation, leasing, and location of wells are also concerns.

Wellhead protection zone maintenance can be problematic.

Basic Water Treatment Processes

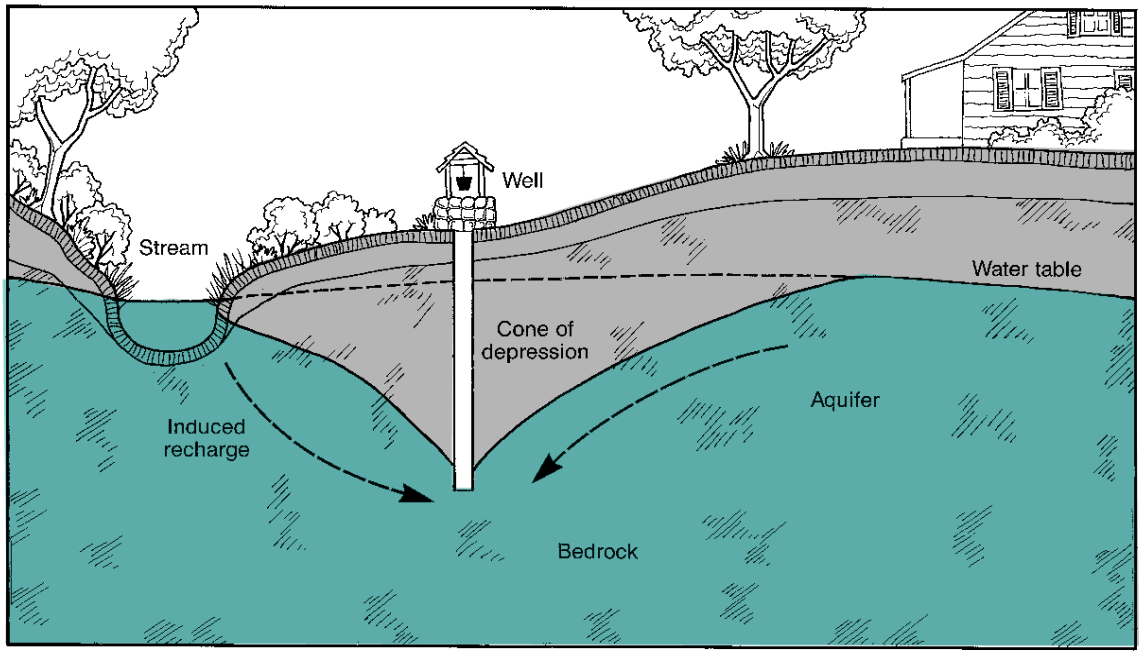
The following graphic depicts the typical groundwater treatment processes you will encounter.



Safe Yield – The amount of water that can be annually withdrawn from a groundwater basin without adverse impacts. This is the long term sustainable pumping rate.

General Well Hydraulics

- When water is pumped from a well, the water table in the vicinity of the well is lowered, creating a cone of depression.
- If cone of depression extends to surface water body, water will flow from the surface water body to the groundwater. This is known as Induced Recharge.
- Image below shows well drawdown.



Well

Disinfection

Sometimes coliform bacteria in a well may result in unsatisfactory sampling results. Disinfecting your well may assist in resolving bacteriological issues.

When to disinfect

- When coliform bacteria are present
- When water taste or odor change
- After casing or pump repairs
- After installing new plumbing fixtures
- After flooding of the well
- During startup of seasonal wells
- As part of annual maintenance

5. Source Water Protection

Delineation

Every public water facility in Ohio is required to have a Source Water (Wellhead) Protection Plan. There are not only requirements for what is in the plan but also, who is involved in the planning as well as how the plan is developed.

Public Water Systems

***The Safe Drinking Water Act defines a public water system as one that serves piped water to at least 25 persons or 15 service connections for at least 60 days per year.**

There are three types of public water systems in Ohio.

- Community public water systems, which have at least 15 service connections used by year-round residents of the area or regularly serve 25 year-round residents. Examples of community systems are municipalities, mobile home parks, homeowners associations and nursing homes. Ohio has approximately 1,300 community systems serving over 10 million people.
- Non-Transient Non-Community (NTNC) public water systems, which serve at least 25 of the same persons per day for *more than six months* of the year. NTNC systems are typically schools, offices, hospitals, churches and factories. Ohio has approximately 930 non-transient non-community systems serving over 200,000 people.
- Transient Non-Community (TNC) public water systems, which serve at least 25 persons per day for *at least 60 days* each year. The TNC systems typically are campgrounds, restaurants, hotels, rest areas, golf courses or large stores. Ohio has almost 3,200 transient non-community systems serving almost 500,000 people.

Ohio Class A System Defined

Class A Public Water System is defined as:

1. Is a community or non-transient non-community public water system which serves a population of no more than 250 or a transient non-community public water system which serves a population of greater than 250
2. Uses only purchased water or ground water sources
3. Does not provide precipitative softening
4. Has no serious public health or environmental hazard associated with the operation of the public water system.
5. Examples: Manufactured Housing Parks and Homeowners Associations, Schools, Places of Employment, Rest Areas and Churches
6. Ohio has about 1,495 Class A systems state-wide.

The Source Water Protection program involves two phases. The first phase is collecting information about the source water, or the "assessment phase". There are three steps to an assessment:

1. Delineating the protection area (drawing a map or describing in words an area encompassing the time it takes ground water to travel five years to the wellhead.)
2. Identifying the potential contaminant sources in that area, such as; Landfills and dumps, Underground tanks, Storm and sewer pipes, agricultural industry, gas stations and septic tanks
3. Determining the susceptibility of the source water to contamination

The second phase is developing and implementing a local drinking water source protection plan. This effort is led by the public water system owner/operator, with assistance from other stakeholders. Also, a part of this phase is management of the plan and updating.

Delineation Updates

- Has the amount of pumping increased or decreased since the date Ohio EPA provided the Drinking Water Source Assessment report?
- Have any wells been added or removed?
- Has a new wellfield been added or are there any plans for a new wellfield?

If the answer to any of the above questions is yes, please contact Ohio EPA's Source Water Assessment and Protection Program staff at your district office, to determine whether the protection area should be re-delineated. Ohio EPA staff can provide this service without charge, or—if preferred—the water supplier may contract with a private consultant.

Potential Contaminant Source Inventory Updates

- Has the surrounding community developed rapidly?
- Have land uses in and around the protection area changed?
- Has management of businesses in the protection area changed?

Ohio EPA recommends re-inventorying the protection area at least every 10 years and encourages updates at shorter intervals, especially where development has been rapid.

Ohio EPA's Source Water Assessment and Protection Program staff can provide assistance, with inventory updates and can also provide an updated map of potential contaminant sources located within and near the protection area.

Protection Plan Update

- Is the list of Protection Team members and contact numbers current?

- Are there new potential contaminant sources that need to be addressed with new potential contaminant source control strategies?
- Should local businesses and residents be reminded about the location of the protection area by redistributing educational materials?
- Are there any updates concerning the size and shape of the protection area that local businesses and residents need to know about?
- Are there any updates to the Drinking Water Shortage/Emergency Response Plan?
- Is there new water quality, potential contaminant source or land use issues that would influence the need to conduct or not to conduct ground water monitoring?

6. Protection Plan

PUBLIC PARTICIPATION AND EDUCATION - THE OVERALL SUCCESS OF A SOURCE WATER PROTECTION PLAN DEPENDS UPON THE COOPERATION OF PEOPLE LIVING AND WORKING WITHIN THE WHP AREA. RESIDENTS AND BUSINESSES NEED TO UNDERSTAND HOW THEIR ACTIONS MAY AFFECT THE QUALITY AND OF THEIR DRINKING WATER, AND WHAT THEY CAN DO TO PREVENT CONTAMINATION FROM OCCURRING.

Source Control Strategies - Describe specific actions or techniques that may be used to reduce the risk of ground water contamination from specific potential pollution sources, such as zoning or other use restrictions.

Ground Water Monitoring - A public water system must assess the need for ground water monitoring. Ground water monitoring can be the early warning to the public water supplier of contamination approaching the wellfield. The community must keep in mind that monitoring is not a preventive measure, and should not be the main focus of a source water protection plan.

Contingency/ Emergency - A public water supplier must have provisions for both a long and short-term alternative source of water due to contamination. The provisions must also take into account spill response, which is usually coordinated with the local emergency planning committee.

Submittal Process

When submitting a Protection Plan for endorsement, two copies of the report should be sent to Ohio EPA, one to the central office and one to the appropriate district office. A cover letter from the public water supplier (i.e., municipality or private firm) should accompany each copy. Although consultants are often retained to complete portions of the report, it is important that the report reflect the intentions of the entity responsible for protecting the drinking water source, and it should be submitted by that entity to Ohio EPA. Ohio EPA staff will review the document and respond to the entity within 60 days.

7. Ohio Well Regulations

Sites for new public water supply wells must be thoroughly investigated. Through several protocols, the well site will have to pass certain steps of testing in order to ensure there are no existing sources of contamination to the well site. Steps should be taken to ensure the well site not be in jeopardy of being contaminated throughout its useful life.

The Ohio Administrative Code describes the rules for well regulations.

3745-9-04 Well Siting.

A. A well shall be located in accordance with these requirements.

1. A well, other than a well for the removal of contaminants, shall be located the maximum practical distance from potential or known sources of contamination and only where it can be maintained in a sanitary condition.
2. A well, other than a well for the removal of contaminants, shall be located only where surface and subsurface conditions will not allow contaminants to be conducted into the well.
3. A public water system shall own all the land or obtain an easement or lease of the sanitary isolation radius of a public water system well, and such easement or lease shall be recorded with the county recorder.

   [Comment: the director recommends ownership by the public water system of land at least within the sanitary isolation radius.]
4. The sanitary isolation radius is determined from the estimated average daily water demand of the public water system well. Estimated average daily water demand may be determined by the director from the pumping design rate of the well.

Sanitary Isolation Rules	
Estimated Average Daily Water Demand (Q gallons per day)	Sanitary Isolation Radius (feet)
0-2,500	50
2,501-10,000	Square root of Q
10,001-50,000	50 + Q/200
Over 50,000	300

5. The director may specify greater sanitary isolation requirements for a public water system well where conditions are determined to exist such that the sanitary isolation radius set forth in paragraph (A)(4) of this rule is insufficient to protect the public health and the public water system from contaminants.
6. Potential sources of contamination shall not be constructed or placed within the sanitary isolation radius of a public water system well.
7. A well, other than a well for the removal of contaminants, shall be located at least ten feet from property boundaries and from easements that are granted to other persons, at least twenty-five feet from the normal driving surface of any public road, and at least five feet from the edge of a driveway or parking lot.

8. A well shall not be located either within ten feet of or within the foundation of any building, except within a pumphouse.
9. A well shall not be located in a floodway without prior acceptance of the director.
10. The director may require a hydrogeologic investigation to select the location of a well to ensure that contaminants will not be drawn into the well and that a sufficient quantity of ground water exists for the intended purpose. These investigations may be required where, without limitation, one of these well sitting circumstances exist: potential or known contamination; hydrogeologic setting that may allow transport of contaminants; or initial development of a community well field. The investigation shall be conducted by a hydrogeologist. A hydrogeological investigation is a study of the subsurface and geologic conditions. Information shall be collected, without limitation, about the type and thickness of geologic materials, the occurrence of ground water, how it flows in pore spaces and fractures, and the quantity and quality of the ground water.

B. A well shall be located so it is accessible for cleaning, treatment, repair, alteration, testing, and such other actions as may be necessary.

Replaces: 3745-9-04
Effective: May 1, 2003
R.C. 119.032 review dates: May 1, 2008

Promulgated Under: 119.03
Statutory Authority: 6109.04, 6111.42 Rule Amplifies: 6109.04(B), 6111.42(E) Prior Effective Dates: February 15, 1975

OhioEPA

3745-9-08 Well disinfection

(A) A public water system well shall be disinfected at the time of completion after construction, installation, development, alteration, or repair, and before supplying water for human consumption.

(B) The standard "AWWA C654-97, Disinfection of Wells," shall be used as a guide except for the topics presented in sections 4.2, 4.5, and 5 that are otherwise specified in paragraphs (C) and (D) of this rule.

(C) These disinfection procedures shall apply.

(1) All loose debris, sediment, mineral encrustation and bacterial slime shall be removed from the well prior to disinfection.

(2) Disinfectant shall be slowly poured into the well by wetting the inside casing circumference, drop pipe, and electrical cable.

(3) Disinfectant concentration in the water column shall be initially at least one hundred milligrams per liter chlorine. A public water system may use an alternative disinfectant concentration following consultation with the district office staff of the district in which the public water system is located, provided the disinfection procedure will ensure complete disinfection and includes:

(a) A mechanical cleaning of the well casing to remove loose debris, sediment, mineral encrustation and bacterial slime before disinfection;

(b) Monitoring of the pH and chlorine residual; and

(c) Maintaining at least fifty milligrams per liter free chlorine residual throughout the water column.

(4) Water in the well shall be agitated or surged to ensure even dispersal of the disinfectant throughout the entire water column.

(5) Disinfectant contact time shall be at least eight hours.

(6) Disinfectant shall be thoroughly flushed or dissipated from the well before supplying water for human consumption.

(7) When calcium hypochlorite is used for disinfection, the tablets or granules shall be completely dissolved in water prior to placement into the well. Sodium hypochlorite solution shall be used within the manufacturer's posted expiration date. Sodium hypochlorite solution with fragrance additives shall not be used for disinfection.

(8) With prior consultation with the district office, buffering chemical that has standard ANSI/NSF 60 certification may be used to enhance disinfection efficacy. The director may require submission of chemical disinfection procedures with specifications for the method, equipment, chemicals, and testing for residual chemicals.

(9) Disinfectant shall have ANSI/NSF 60 certification.

(D) After disinfection, a well shall not supply water for human consumption until a least two consecutive total coliform samples that are collected from a well at least twenty-four hours apart are analyzed and demonstrate inactivation

of microbiologial contaminants with total coliform-negative results.

(1) Total coliform samples shall be collected at least forty-eight hours after disinfection and after residual chlorine is completely flushed or dissipated from the well. Total chlorine shall be undetectable before total coliform sampling.

(2) If total coliform analysis is total coliform-positive, then an additional sample shall be collected and analyzed for total coliform and either fecal coliform or Escherichia coli (E. coli).

(3) Microbiological and total chlorine samples shall be analyzed in accordance with Chapter 3745-89 and rule 3745-81-27 of the Administrative Code.

[Comment: "Standard ANSI/NSF 60, Drinking Water Treatment Chemicals - Health Effects, February 9, 2001, Document Number NSF/ANSI 60- 2001." This rule incorporates this standard or specification by reference. At the effective date of this rule, a copy may be obtained from "NSF International, 789 N Dixboro Road, PO Box 130140, Ann Arbor, MI 48113-0140," (734)769-8010, www.nsf.org. This document is available for review at "Ohio EPA, Lazarus Government Center, 122 South Front Street, Colum bus, OH, 43215-3425."]

[Comment: "Standard AWWA C654-97, Disinfection of Wells," effective date January 1, 1998, catalog number 43654. This rule incorporates this standard or specification by reference. At the effective date of this rule, a copy may be obtained from "AWW A Bookstore, 6666 W Quincy Avenue, Denver, CO, 80235-3098," (303)795-2114, www.awwa.org. This document is available for review at "Ohio EPA, Lazarus Government Center, 122 South Front Street, Columbus, OH, 43215-3425."]

Replaces: 3745-9-08

Effective: May 1, 2003
R.C. 119.032 review dates: May 1, 2008

Promulgated Under: 119.03
Statutory Authority: 6111.42, 6109.04
Rule Amplifies: 6109.04(B), 6109.04(C)(1)(a), 6111.42(E) Prior Effective Dates:
February 15, 1975

8. Preventive Maintenance

The Role of Maintenance in the Overall Operation

As soon as a facility is built, its buildings and systems start a predictable decline in condition and efficacy. Some elements—such as a roof or building envelope—may have a life cycle of 25 to 30 years before major work is required. Other items—such as pumps and compressors—will need regular service almost immediately after start-up.

The role of maintenance is to identify and remedy potential problems before they impact plant operation. This requires establishment of a set of operating parameters. The design specifications for the equipment help to identify the maintenance parameters. By using a proactive approach (maintaining equipment so that it does not break down as often), we can ensure a level of service that ensures maximum operating efficiency.

Good practice also extends to the actual service and maintenance of the equipment. Injuries to plant personnel result when people work without thinking through the tasks or they accept risks that are not necessary. Common ways to minimize hazards include:

- using lockout-tagout procedures when isolating valves and equipment.
- always replacing guards over moving parts after service.
- following confined space procedures.
- performing good housekeeping procedures.

Poorly maintained equipment can lead to:

- poor water quality that is dangerous to public health.
- hazardous discharges of chemicals to the environment.
- safety hazards to plant personnel.

Standard Operating Procedures, or SOPs, are guidelines developed by management to ensure that the facility's practices conform to internal and external requirements. They establish uniformity and provide information on issues of safety and operation.

Finally, the organizational structure is supported by ready access to operations and maintenance manuals. The service information that these documents supply allows repairs and adjustments to be made in a

scheduled way that helps management to prudently allocate financial, equipment, and labor resources. A set of manuals for all equipment should be kept at the plant.

Maintenance is a support function providing a cohesive process that assists Operations and other departments in fulfilling the mission of the facility. This is achieved by ensuring that all equipment and systems are operated at an expected level of reliability within a specified budget and within the life cycle of the equipment.

Preventive Maintenance as the Key Effort

The heart of any maintenance operation is the preventive maintenance (PM) effort. PM involves regularly checking and servicing equipment so that it is in peak operating condition. Preventive maintenance allows the maintenance department to catch any potential problems before they impact the functioning of the equipment.

Preventive maintenance (PM) is sometimes referred to as "predictive" maintenance. This terminology reinforces the idea that PM is planned and scheduled. We can "predict" when it will be done, what will be done, and how much it will cost in terms of dollars, time, equipment, and personnel. Advanced maintenance techniques, such as vibration analysis, lubrication analysis, and IR scans, may provide clues to help determine when maintenance is required.

There are six major components of a maintenance program.

- Scheduled Preventive Maintenance Tasks
- Unplanned Daily Activities
- Planned Project Work
- Record Keeping
- Inventory Management
- Purchasing

Scheduled Preventive Maintenance Tasks

Typical areas of service include lubrication, calibration, condition assessment and monitoring, and consumable replacement.

Lubrication

Lubrication of moving parts is a fundamental aspect of equipment maintenance. The goal of lubrication is to prevent contact between the moving parts of the bearing surfaces. Choosing and using the proper lubricant is essential. Modern lubricant properties allow a narrower range of products to cover more applications, but it is important to meet the equipment manufacturer's recommendations for lubricant type and usage.

Calibration

Process systems rely heavily on monitoring and automated control. Inaccurate sensors and recorders can cause upset in an entire system. The manufacturer's recommended frequency of calibration should be incorporated into the PM program.

Condition Assessment and Monitoring

Early maintenance programs typically relied on calendar-based scheduling of work tasks. Today, a broad choice of tools helps to pinpoint the optimal maintenance timing. Oil analysis, vibration analysis, and infrared testing are examples of available assessment methods

Record Keeping

Recording and retaining treatment process information is an integral part of the operator's job. However, data gathering and retention is also important in the maintenance operation. It allows:

- Prediction of maintenance efforts.
- Better condition assessments for overhaul and replacement.
- Support for departmental staff and resource requests.

Inventory Management

The key to an effective inventory control system is keeping the minimum number of parts in stock while, at the same time, protecting against emergencies and providing flexibility to carry on daily activities. This is a difficult balance to achieve, and its success depends upon several factors.

- Critical spare parts for key equipment should be on hand at all times.
- Work closely with service providers and contractors to ensure that they have parts which are readily available.
- Partner with providers and contractors to determine which parts will most likely be needed;
- keep these on hand at the plant.

- Plan a manageable inventory while considering the storage space available at the facility.
- Know, and develop a relationship with, vendors and suppliers for replacement parts BEFORE you need them in an emergency.

Pump Performance Issues

Before we review maintenance procedures, it is important to point out some pump performance issues.

To increase the life of a pump:

- It should be allowed to run for the longest period of time possible before being shut off. This helps to reduce the amount of starting torque on the thrust bearings and the pump. Starting also causes high power usage when compared to running the pump more consistently.

- Pump manufacturers always give a maximum amount of times a pump should be started per hour. This recommendation should be recorded in the O&M Manual and followed by the system.

Maintenance on a pump is important to keep the pump running at its optimum performance level. Worn impellers and bearings are just two issues that can cause poor performance.

It is important to note that when you see your pump performance affected, it is not always a problem with the pump itself. For example, suction head and suction lift on the pump can cause an apparent decrease in pump performance. These issues put a load on the pump, but they do not represent a pump maintenance problem.

Shaft Seal Adjustment

Shaft seals will be standard packing or mechanical. Generally, packing material is used to minimize leakage around the pump shaft where it penetrates the volute casing. A number of different kinds of material are available, depending on the application.

Standard Packing Seals

Shaft seals are rings of gasket material that wrap around the shaft of the pump.

Shaft seals are contained within a "Stuffing box." This is a cylindrical box that surrounds the pump shaft designed to hold the packing rings. The box has packing nuts that can be tightened to maintain seals as the shaft seals wear.

- Proper packing adjustment consists of small, incremental taking up of the packing nuts to maintain proper sealing.

- When gland nuts are fully taken up, another ring of packing should be added. A gland nut is a fitting used to adjust the pressure on the packing to control seal water leakage.

- Periodically, the packing requires replacement.
- All rings need to be replaced, including the rings past the lantern ring (if utilized).

  Note: A lantern ring is a perforated hollow ring located near the center of the packing box that receives relatively cool, clean liquid from either the discharge of the pump or from an external source and distributes the liquid uniformly around the shaft to provide lubrication and cooling. The fluid entering the lantern ring can cool the shaft and packing, lubricate the packing, or seal the joint between the shaft and packing against leakage of air into the pump in the event the pump suction pressure is less than that of the atmosphere.
- Over-tightening leads to shaft/sleeve wear.
- Under-tightening leads to excess water leakage, which can cause corrosion of the gland bolts and allow water to infiltrate the bearings.

Note the leaking gland on a small circulating pump in the image below.

Leaking Gland

Mechanical Seals

In some situations, the packing material is not adequate for sealing the pump shaft. A mechanical seal can be used instead. A mechanical seal consists of:

- A rotating element attach to the shaft
- A stationary element attached to the pump casing.
  - Always follow the manufacturer's recommendations carefully.
  - Once installed, periodically check for leaks.
  - Rapid failure is a concern; replace leaking seals immediately.
  - Check flushing lines (if equipped) to make sure they remain clear.

9. Electric Motors

Motor care typically involves the following three categories: cleaning; lubricating; and testing/inspecting.

Cleaning

- Ensure good ventilation.
  - Electric losses in motors create heat, which must be dissipated to avoid exceeding the design limits of the unit.
  - Heat is rejected by passing air internally or externally through or around the unit.
  - In some cases, motors are enclosed and cooled by a heat exchanger.
- Open type motors can draw dirt into the unit.
  - Inspect the motor openings for accumulations of dust and dirt.
  - Motors located outside often use screens to keep out leaves and rodents. Monitor them.
- Totally Enclosed Fan Cooled (TEFC) units rely on an extended exterior surface area to act as a heat sink, since the cooling air cannot flow freely closer to the point where the heat is generated.
  - It is particularly important to keep these clean for maximum heat transfer.
- Some wound rotor and many synchronous units are in service.
  - These older synchronous motors have brushes. Carbon dust from the brushes will be deposited on the brush holders and commutator area.
  - This can leak carbon, causing grounds.

- Clean, dry compression is usually used to blow out dirt.
  - Utilize the lowest possible pressure to prevent damage to insulation.
- In some cases, solvents can be used to remove accumulations of dirt and grease.
  - Make sure the solvent will not damage the insulation.
  - Make sure the solvent does not flow into the bearings.

10. Lubrication

The same considerations follow in motor lubrication as mentioned under pumps. However, it is important not to over-lubricate motors. This situation would allow grease or oil to work past the seals and into the motor windings, which might affect the insulation and promote retention of dirt.

11. Repairs

The heart of any maintenance operation is the preventive maintenance (PM) effort. PM involves regularly checking and servicing equipment so that it is in peak operating condition. Preventive maintenance allows the maintenance department to catch any potential problems before they impact the functioning of the equipment.

Preventive maintenance (PM) is sometimes referred to as "predictive" maintenance. This terminology reinforces the idea that PM is planned and scheduled. We can "predict" when it will be done, what will be done, and how much it will cost in terms of dollars, time, equipment, and personnel. Advanced maintenance techniques, such as vibration analysis, lubrication analysis, and IR scans, may provide clues to help determine when maintenance is required.

Breakdown Maintenance

Breakdown maintenance is often a result of the failure of preventive maintenance or corrective maintenance functions.

- Preventive Maintenance
  - The idea of preventive maintenance, or PM, is to avoid the need for costly repairs due to lack of attention to a system. It is performed on a regular basis and is scheduled in advance.
  - PM was named in the previous section as the heart of any maintenance plan.
- Corrective Maintenance
  - Corrective maintenance (CM) has the goal of preventing further damage to equipment that has suffered some ill effect. The maintenance is a result of inspecting the equipment and it addresses a specific problem. Often, a short time period exists between identification of the problem and the need to correct it.

- A quick corrective maintenance can prevent major system failure and prevents the equipment from being removed from service for extended periods without advanced warning.

Breakdown maintenance is also known simply as "repairs". Repairs are an unscheduled task and are often time-sensitive. The equipment usually must be removed from service for a prolonged period; spare parts may not be on hand; and the cost in labor is extensive. Ordinarily, repairs result from the failure to follow effective preventive maintenance and/or corrective maintenance.

Repairs and maintenance tasks are performed with varying degrees of frequency. The frequency may depend upon manufacturers' recommendations, amount of wear and tear received, staff time constraints, or plant conditions.

12. Operations and Maintenance (O&M) Manuals

What is an O&M Manual?

Most major pieces of equipment found in a Water Treatment Plant are accompanied by an O&M Manual. The O&M Manual is a scheduling tool for the operation and maintenance of that specific piece of equipment and a major resource for operators. All of the information needed to control, manage, perform service, and maintain proper operation of the equipment can be found in the O&M Manual.

Most Public and Major Community Water Systems are required to maintain O&M Manuals. Non-community water system are not required to maintain O&M manuals, however it is always a good practice to have O&M manuals on the equipment found at any facility.

Typically, the information contained in an O&M Manual can be separated into the eight general categories listed below.

1. General Information

This is information that applies to the specific installation site. It contains the name of the equipment model and what type of auxiliary equipment is typically installed with the system. All bills of materials, packing lists, and the table of contents for the entire manual also can be placed into this category.

2. Equipment Description

A description of how the piece of equipment works and its common applications can regularly be found near the front of the manual. Here, the manual contains:

- a step by step listing of the processes the equipment performs
- an overview of the physical features of the equipment system
- an explanation of the individual components making up the system
- design limits for the equipment (i.e. maximum flow rate)
- typical applications for which the equipment is installed

3. Safety

Depending on the individual manual, there may be an entire portion completely devoted to recommended safety practices, or these tips may be included throughout the text. Regardless, the precautions outlined in the manual should be followed at all times, as they will prevent poor or unsafe operation and personal injury. Common safety concerns are:

- practicing safe operation and maintenance with and around electrical devices
    - knowing when and how to cut power from the equipment
    - lockout/tagout procedures
    - recognizing a problem caused by incorrect or worn wiring
- preventing unsafe conditions around mechanical instruments
- understanding the hazards of particular working conditions
- knowing procedures for handling hazardous materials (i.e. Material Safety Data Sheets)

4. Operation

A complete explanation of how to operate the equipment is provided. While the explanation is a general one that could apply to any installation, it is easily adaptable to a site specific application. Standard operation headings include:

- normal operation
- alternate operation
- emergency operation
- startup
- shutdown
- alarms
- electrical controls (if a computer system can be used to run the equipment, i.e. SCADA)

5. Maintenance

Some form of equipment maintenance instruction is included in the manual. Although it may reference the vendor/manufacturer documents (described below) for maintenance on components not provided with the specific piece of equipment, it will generally include the following:

- periodic maintenance schedule
    - the frequency of routine checks and service
    - how to perform the checks and spot indications of problems
- component maintenance procedures
- lubrication procedures
    - types of lubricant required

- procedure and points of application
- frequency requirements

6. Troubleshooting

The troubleshooting included in the manual is a list of common problems that could be encountered with the equipment, along with possible causes and solutions to each problem. Troubleshooting is generally provided in an easy to follow outline format or chart.

7. Vendor/Manufacturer documents

These inserted portions of the manual are supplied by the vendors or manufacturers of auxiliary equipment that is coupled with the entire system. They contain:

- specific information on the supplied item (i.e. motor specs)
- maintenance, lubrication, and troubleshooting for the auxiliary equipment
- warranty and contact information from the vendor/manufacturer of the auxiliary equipment
- detailed drawings of the auxiliary equipment that are not provided in the manual elsewhere

8. Drawings

Engineering drawings can occasionally be found throughout the text, and groups of them can often be found in one place of the manual. These drawings can show where the equipment system is located in the plant or its dimensions. Most commonly, the drawings contained in the manual will show:

- a general view of the equipment
  - profile view
  - overhead view (plan view)
- parts of the equipment that are relevant to operation or maintenance
  - a sectioned view to the working parts of the equipment
  - under removable parts (i.e. safety guards)
  - control panel layouts
- electrical wiring diagrams

13. Confined Space

It is important that you become familiar with the confined spaces and the hazards associated with your facility and that you have been thoroughly trained on the confined space entry procedures at your facility.

Never enter a confined space without following the appropriate procedures.

- A confined space is defined as a space that meets the following three criteria:
  - Is large enough and so configured that a person can bodily enter and perform their assigned work.
  - Has a limited or restricted means for entry or exit.
  - Is not designed for continuous worker occupancy.

Generally if you cannot walk upright into a space and you must duck, crawl, climb, or squeeze into a space, it is considered a confined space.

Characteristics of a Permit-Required Confined Space

A **permit-required confined space** is a confined space that has one or more of the following hazardous characteristics: it contains or has the potential to contain a hazardous atmosphere such as oxygen deficiency, toxicity or flammability; it contains a material that has the potential to engulf an entrant such as water; it has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section such as a hopper or bin; it contains any other recognized serious safety or health hazard.

A **non-permit required confined space** does not contain or have the potential to contain, any hazard capable of causing death or serious physical harm.

Atmospheric Testing

Potentially hazardous atmospheres present a threat of causing death, injury, illness or incapacitation due to flammable/explosive, toxic or oxygen deficient atmospheres.

The primary atmospheric concerns associated with treatment plants are:

- Oxygen deficiency (less than 19.5% oxygen) from metal corrosion, oxygen scavenging or depletion by another gas.
- Flammability/explosive atmosphere from methane gas, hydrogen sulfide and fuels.
- A toxic atmosphere from hydrogen sulfide, chlorine and other process chemicals.

Monitoring

- It is important to keep in mind that the work you perform within a confined space may create a hazardous atmosphere. Welding, painting, solvent cleaning, pipe grouting or use of power tools with combustion engines can all produce hazardous contaminants that will create a hazardous atmosphere. Therefore, it is imperative that the atmosphere of a confined space that you will be entering is checked using reliable, calibrated direct-reading instruments prior to and during your entry into a confined space.
- The monitoring must be performed by an individual who is knowledgeable about the potential confined space hazards and air monitoring procedures.
  - Atmospheric monitoring should be performed outside of the confined space in the vicinity of the opening or at potential contaminant sources that may pose a problem and, at stratified levels (top, middle, and bottom) within the confined space.
  - Monitoring should be performed in the following order and acceptable results should be within the acceptable concentrations:

Contaminant	Acceptable Concentration
Oxygen	19.5% - 23.5%
Flammable gases/vapors	>10% of the lower flammable/explosive limit
Potential toxic contaminants:	
Hydrogen sulfide	<10 ppm
Carbon monoxide	<25 ppm
Chlorine	<0.5 ppm
Other contaminants	< the OSHA PEL or ACGIH TLV or other recognized exposure limit

Ventilation

Air monitoring results that are not within the acceptable concentrations will classify the space as a permit-required confined space and appropriate action must be taken to eliminate or control the hazard. This will involve the following:

- Allowing the space to naturally ventilate.
- Use of forced air ventilation.
- Purge the space with an inert gas or water.

The space should be continuously ventilated using explosion proof, forced air blowers.

- The blowers should be set up to either supply fresh air into the space or to exhaust contaminants out of the space (this is especially useful when activities within the space such as welding or painting create a potential hazardous atmosphere) or, a combination of supply and exhaust ventilation.
- It is important to know the density of the potential contaminants in order to properly position ventilation equipment. Heavier than air gases/vapors will sink to the bottom and lighter than air gases /vapors will tend to accumulate at the top of a space and, therefore, ventilation equipment should be positioned accordingly.

Controls

Prior to entry into a confined space all physical hazards must be considered.

- These may include:
  - Electrical.
  - Hazardous energy sources.
  - Power driven equipment.
  - Material or water flow.
  - Fall hazards.
  - Noise exposure.
- These physical hazards must all be controlled prior to entering a confined space.
- Water supply lines should be disconnected, shut off and locked out or blanked to prevent water flow into the space.
- Electrical and other hazardous energy sources must be de-energized and locked out.
- Appropriate personal protective equipment must be worn.

Confined Space Entry Program

Confined space entries should be performed under a facility specific Confined Space Entry Program that establishes:

- Written entry procedures to be followed.
- The responsibilities of each individual involved in confined space entry (entrants, attendants and supervisors).
- The confined space entry permit system to be used.

Permit-required confined spaces can only be entered under a permit system. A Confined Space Entry Permit is a written document that identifies:

- The space to be entered.
- The work to be done within that space.
- The potential hazards associated with the space.
- The hazard control measures taken.
- Documentation of atmospheric testing results.
- Identification of the workers working within the space (entrants).
- The worker serving as the attendant outside the space.
- The competent person who certifies the permit and authorizes the confined space entry and work.

Work within confined spaces can pose serious safety and health hazards if you are uninformed or untrained in confined space hazards and proper entry procedures. Make sure that your plant's confined spaces have been identified and the hazards associated with each space have been identified and assessed and that appropriate procedures have been established to enter and work within a confined space.

The OSHA Permit-Required Confined Space Standard, 29 CFR 1910.146, establishes the requirements for confined space entry programs, permit systems and entry procedures.

14. Lockout / Tagout

A **tagout device** is a prominent warning, such as a tag, which can be securely fastened to an energy-isolating device to indicate that the energy isolating device and equipment are not to be operated until the tag is removed.

Lockout / Tagout Program

Standard operating procedures should be established for all equipment that has the potential for accidental startup or movement caused by an energy source such as electricity, hydraulics, pneumatic, rotating equipment, gravity, stored energy, pressure and water flow.

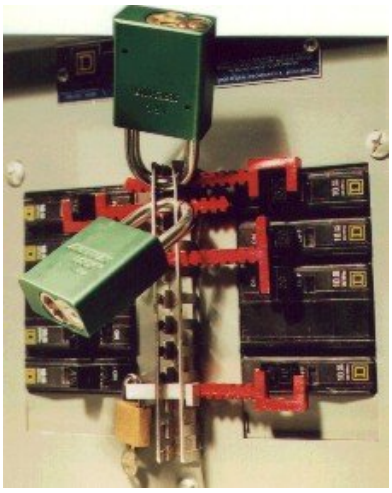
Purpose

These procedures usually are in the form of a lockout/tagout program. The purpose of a lockout/tagout program is to ensure that all personnel follow standardized shutdown and startup procedures to prevent accidental equipment start up, energization or release of stored energy and personal injury or property damage.

OSHA has established requirements for energy isolation, lockout/tagout in the Control of Hazardous Energy Standard, 29 CFR 1910.147 and the Electrical Safety Standard, 29 CFR 1910.333(b).

A lockout/tagout program should include the following basic elements:

- An energy control program that consists of energy control procedures for each piece of equipment, employee training and periodic inspections to ensure that the appropriate procedures and energy isolation is being performed.
- Lockout/tagout must be used to provide full protection for workers when performing maintenance or repair on equipment. If the energy isolating device for a piece of equipment is capable of being locked out then the energy control procedure should use a standardized lockout device similar to those shown in the figures below. A lockout device uses a positive means such as a lock, chain, blank flange, wedge, block or slip blind to prevent the energizing of a machine or equipment.



Lockout Device for Circuit Breakers

Typical Lockout Device

- A standardized tagout system must be used if an energy-isolating device is not capable of being locked out.
- The tags should have appropriate warning language such as: *Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate.* The following two figures are examples of tagout devices.

Warning Tags

A combination of both a lockout device and tagout device is recommended when possible to ensure the most protection.

Energy Control

- Energy control procedures should be developed, documented and used.
- The procedures should state the intended use of the procedure; the steps and responsibility for the placement, removal and transfer of lockout or tagout devices; and the requirement for testing a machine or equipment to ensure that the lockout/tagout devices are effective in controlling the hazardous energy.

Training

- Training should be provided to all employees that will be performing maintenance or may be affected by the maintenance.

The training should include the purpose and function of the energy control program and the procedures for the safe application, use, and removal of the energy controls such as locks or tags.

Sample Lockout/Tagout Procedure

A sample lockout/tagout procedure at your facility might look something like this:

An authorized employee who knows the type and extent of energy a piece of equipment uses and the associated hazards will notify all affected employees that a lockout or tagout system is going to be used and the reason why.

- Shut down the equipment by the normal shut down procedure.
- Operate the switch, valve or other energy-isolating device to ensure that the equipment is isolated from its energy source.
- Ensure that stored energy that may be in springs; elevated equipment parts (gravity); rotating flywheels; hydraulic systems; pneumatic systems; or gas, steam or water pressure is dissipated or controlled by venting, bleeding, blocking or repositioning.
- Apply the lockout or tagout device in accordance with your procedures.
- Perform a final energy isolation test by operating the start button or normal operating controls as a check to make sure that the energy source is isolated. This should only be done after making sure that no personnel are exposed and all tools and equipment are out of the area of operation. After completing the test make sure that all operating controls are reset to the neutral or off position.
- Proceed with the necessary maintenance or repair work.
- Upon completion of the work, remove all tools, reinstall the guards, and clear the area of all personnel.
- Remove the lockout or tagout device and restore energy to the equipment.

14. Record Keeping

The Ohio Administrative Code explains the requirements for record keeping and record maintenance for public water systems.

3745-81-33 Record maintenance.

Any owner or operator of a public water system subject to the provisions of this chapter shall retain on its premises or at a convenient location near its premises the following records:

A. Records of bacteriological analyses made pursuant to this chapter shall be kept for not less than five years. Records of chemical analyses made pursuant to this chapter shall be kept for not less than ten years. Actual laboratory reports may be kept, or data may be transferred to tabular summaries, provided that the following information is included:

    1. The date, place, and time of sampling, and the name of the person who collected the sample;
    2. Identification of the sample as to whether it was a routine distribution system sample, check sample, raw or process water sample or other special purpose sample;
    3. Date of analysis;
    4. Laboratory and person responsible for performing analysis;
    5. The analytical technique/method used; and
    6. The results of the analysis.

B. Records of action taken by the system to correct violations of state primary drinking water rules shall be kept for a period not less than three years after the last action taken with respect to the particular violation involved.

C. Copies of any written reports, summaries or communications relating to sanitary surveys of the system conducted by the system itself, by a private consultant, or by any local, state or federal agency, shall be kept for a period not less than ten years after completion of the sanitary survey involved.

D. Copies of public notices issued pursuant to rule 3745-81-32 of the Administrative Code and certifications submitted to the director pursuant to paragraph (A)(3) of rule 3745-81-32 of the Administrative Code must be kept for a minimum of three years after issuance.

3745-81-332 Effective: 11/01/2004

R.C. 119.032 review dates: 07/27/2004 and 11/01/2009
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