



PDH-Pro.com

Potable Water System Design

Course Number: CH-02-902

PDH: 6

Approved for: AK, AL, AR, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WI, WV, and WY

State Board Approvals

Florida Provider # 0009553 License #868

Indiana Continuing Education Provider #CE21800088

Maryland Approved Provider of Continuing Professional Competency

New Jersey Professional Competency Approval #24GP00025600

North Carolina Approved Sponsor #S-0695

NYSED Sponsor #274

How Our Written Courses Work

This document is the course text. You may review this material at your leisure before or after you purchase the course.

After the course has been purchased, review the technical material and then complete the quiz at your convenience.

A Certificate of Completion is available once you pass the exam (70% or greater).

If a passing grade is not obtained, you may take the quiz as many times as necessary until a passing grade is obtained).

If you have any questions or technical difficulties, please call (508) 298-4787 or email us at admin@PDH Pro.com.





Module 1: Design Review Process and Submittal Requirements

Learning Objectives

By the end of this section, you will be able to:

- **Navigate** the Department's multi-step design review and approval process for new and modified waterworks.
- **Select** the appropriate submittal type (Complete vs. Streamlined) based on project magnitude and site-specific constraints.
- **Evaluate** the technical requirements for a Basis of Design Report (BDR) and associated plans and specifications to ensure regulatory compliance.

Executive Summary: All new construction or substantial modification of waterworks in Colorado requires formal, written approval from the Department on official letterhead prior to the commencement of construction. Professional Engineers must ensure that submittals—ranging from Basis of Design Reports (BDR) to final plans—strictly adhere to the Design Criteria or provide robust technical justification for site-specific deviations.

Design Review Process

The Department approves plans and specifications in writing on Department letterhead; **verbal approvals and email approvals are not permitted or valid.**

Design Review Steps

When construction of new waterworks is planned, the supplier of water must submit a **complete design** to the Department for approval. For modifications, the supplier may either submit a complete design or request **streamlined approval**.

A successful review depends on two factors:

1. A **complete design** represented in the submittal package.
2. Appropriate **conformance** to the Design Criteria.

Factors Influencing Pertinent Information

- Type of submittal (Streamlined or Complete).
- Magnitude of the change to existing waterworks.
- Availability of water quality data.
- The degree of requested deviation from applicable criteria.



Mandatory Process Steps

1. **Submittal** of a complete design (BDR and Plans/Specifications).
2. **Obtain** Department approval on letterhead.
3. **Commencement** and completion of construction.
4. **Submittal** of the construction completion form.

⚠ **Safety Constraint:** For design-build projects, final design approval must be issued for **each phase** of the project prior to the commencement of construction for \square phase.

Design Review Document Submittals Community Water Systems

Documents must be prepared under the supervision of and submitted with the **seal and signature of a professional engineer** licensed in the State of Colorado.

Non-Community Water Systems

While a PE is not strictly required by CPDWR for submittal, the Department highly recommends professional consultation.

Submittal Format

- **One (1) hard copy** (sealed and signed).
- **One (1) electronic copy** (PDF).

Basis of Design Report (BDR)


The BDR provides sufficient information for the Department to evaluate if the proposed waterworks can reliably achieve compliance with the **Colorado Primary Drinking Water Regulations (CPDWR)**.

Application for Construction Approval

All BDRs must include **Basic Project Information**, including:

- Supplier name and address.
- System identification and area served.
- **Project purpose** and detailed description of affected unit processes.
- **Scaled map** of proposed structures and a **vicinity map** of the watershed.
- Requested **rated capacity** and approximate total project cost.
- List of site-specific deviations with justification.
- Implementation plan and schedule.



 **Design Tip:** For non-community systems serving **less than 500 people**, an aerial photograph (e.g., Google Earth) may suffice for maps, and total project cost is not required.

Sources of Potential Contamination

At a minimum, identify sources within the following radii:

- **Groundwater sources:** 500 feet.
- **Water treatment:** 500 feet.
- **Storage (Underground):** 500 feet.
- **Storage (Ground level/Above):** 100 feet.

Water Quality Data

When required, the following data must be submitted:


- **New Groundwater:** Raw water analysis for all applicable MCL parameters. At least **two full sample sets** in different quarters are required (four recommended).
- **Surface Water (Conventional):** No additional data for approval.
- **Direct/Alternative Filtration:** Turbidity analysis **once per calendar quarter** for four consecutive quarters to establish raw water turbidities (must not exceed 10 NTU for direct filtration).

Process Flow Diagram/Hydraulic Profile

The **process flow diagram** must show major liquid and solids flow paths, sampling locations, bypasses, chemical feed points, and flow metering. The **hydraulic profile** must show elevations at maximum and minimum plant flow conditions.

Capacity Evaluation and Design Calculations

Identify treatment goals and specify the **rate-limiting step** (e.g., disinfection, raw water pumping), as this determines the rated capacity.

 **Calculation Note:** The Capacity Evaluation Form (Appendix B) must be completed and included in the BDR for all treatment projects.

Technical Reports and Operations

- **Geotechnical Report:** Required if construction integrity depends on local soils or if the project includes new treatment structures.
- **Residuals Handling:** Must conform to Chapter 9 requirements.
- **Preliminary Plan of Operation:** Must discuss staffing (certification levels), operating configurations, emergency response, and safety issues.



Plans and Specifications

Plans must be clear, legible, and drawn to scale. They must include a **Design Criteria Summary Table** (if not in the BDR) and technical specifications detailing material quality, testing instructions, and O&M manual requirements.

Site-Specific Deviations

Deviations must be explicitly identified in the BDR. You must provide:

- **Theory and calculations** proving the waterworks will function as intended.
- Actual operating experience or **pilot test work**.
- Alternative peer-reviewed design basis documentation.

Streamlined Approval

This process allows for substantial modifications with a reduced submittal package and **does not require a PE stamp** for community systems.

- **Examples:** Switching coagulant types (no system redesign), modifying air scour, or relining tanks.
- **Exclusion:** Changing vent sizes requiring calculations is considered a **substantial modification** and requires a complete design.

Evaluations: Pilot Vs. Demonstration

- **Pilot Scale:** Water is **not** for human consumption (wasted). No prior approval required.
- **Demonstration Scale:** Full-scale installation serving **potable water** to the public. **Prior approval is mandatory.**

Construction and Alternative Tech

- **Construction Completion:** A PE (for community systems) must certify conformance with approved designs.
- **Changes During Construction:** Any change affecting **capacity, flow, or operation** must be submitted in writing for approval.
- **Alternative Technologies:** For technologies not in the current Criteria. Requires documentation of manufacturer warranty, operator training plans, and 12 months of operating data from other installations.

Checkpoint Quiz

1. Which project type is eligible for the Streamlined Approval process?

- a) Construction of a new surface water treatment plant.
- b) Relining an existing finished water storage tank.
- c) Increasing the rated capacity of a pump station.
- d) Installing a new, unaccepted alternative filtration technology.

Answer: (b). Relining a storage tank is specifically listed as a streamlined process, provided no calculations like vent sizing are changed.

2. A Professional Engineer (PE) seal is strictly required for design submittals for which type of system in Colorado?

- a) All Public Water Systems.
- b) Only Non-Community Water Systems.
- c) Community Water Systems.
- d) Only systems serving fewer than 500 people.

Answer: (c). Community water system documents must be prepared under the supervision of and signed by a Colorado-licensed PE.

3. What is the primary difference between a "Pilot Scale" and a "Demonstration Scale" evaluation?

- a) Pilot scale uses larger equipment than demonstration scale.
- b) Demonstration scale provides potable water to the public and requires prior Department approval.
- c) Pilot scale is only for groundwater, while demonstration scale is for surface water.
- d) There is no difference; the terms are used interchangeably.

Answer: (b). Pilot scale water is wasted; demonstration scale involves serving the public and thus requires Article 1.11 approval.



Purchase this course to
see the remainder of
the technical materials.