

DEPARTMENT OF LICENSING

Guidelines for the Professional Practice of On-Site Wastewater Treatment System Design

Summer 2003



PREPARED BY:

On-Site Wastewater Treatment System

**Designer Licensing/Inspector Certification Advisory Committee of the
Board of Registration for Professional Engineers and Land Surveyors**

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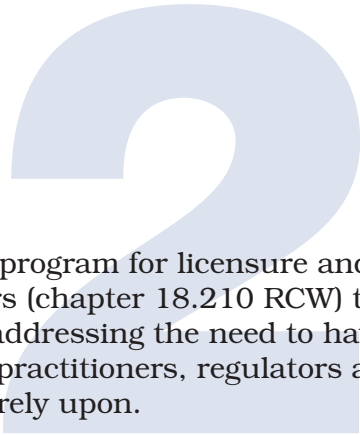
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Introduction



In establishing the statewide program for licensure and regulation of on-site Designers (chapter 18.210 RCW) the Washington Legislature was addressing the need to have uniform standards which all practitioners, regulators and members of the public could rely upon.

The Department of Health, State Board of Health, Local Health Districts, Department of Licensing and the Board of Registration for Professional Engineers and Land Surveyors (Board) each have a shared responsibility to protect the public against the design and installation of inadequate or unsafe on-site wastewater treatments systems. On-site sewage codes and professional licensing laws exist to meet a common goal. Where state and local health officials promulgate and enforce codes intended to protect public health and environment, the Board has established a rigorous process that is intended to assure that practitioners in this profession, whether licensed Designers or Professional Engineers, can accurately and competently apply the necessary knowledge to meet those codes. All design practitioners are obligated to be familiar with and comply with local ordinances and policies regulating the design of on-site systems for the jurisdiction in which they are practicing.

These guidelines are intended to provide design professionals and health officials with a basic framework of conduct and practice that illustrates the expected professionalism and technical skill befitting of those that hold a license to practice in this profession. They have been prepared in the spirit of service to the public and to assist health officials and on-site design professionals to

better understand the requirements of our state laws and codes. They are not intended to affect or limit the trade or business of individuals or firms that provide support services to the on-site wastewater treatment professions.

While these guidelines can be used as a resource, it should be understood that: design submittal criteria, application submittal requirements, construction drawing requirements and code compliance review remain under the jurisdiction of the local health permitting authority.

If any portion of these guidelines is determined to conflict with or contradicts Washington State law or rules, or those local ordinances governing on-site wastewater treatment systems, those publications and source documents will prevail.

Designer Licensing Law and Related Statute References

■ **Revised Code of Washington**

- Chapter 18.210 RCW On-Site Wastewater Treatment Systems Designer Licensing/Inspector Certification
- Chapter 18.43 RCW Engineers and Land Surveyors
- Chapter 43.20 RCW State Board of Health
- Chapter 70.05 RCW Local Boards of Health
- Chapter 43.70 RCW Department of Health

■ **Washington Administrative Code**

- Chapter 246-272 WAC ... On-Site Sewage Systems
- Chapter 196-30 through 33 WAC.....Licensing and Practice Rules for On-Site Wastewater Treatment Systems Design Professionals

Professional Certification of Documents



On-site wastewater treatment system Designers and Professional Engineers are responsible for their professional design services. The public, health officials, and their clients rely on their professional expertise. As a result, professional submissions such as plans, specifications, calculations and designs must conform to the applicable regulations and show the identity of the professional that prepared them.

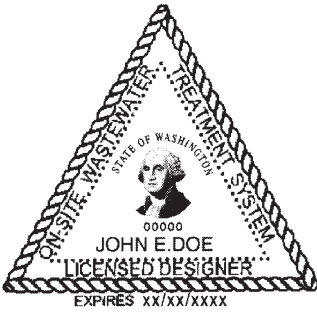
The applicable law and rules governing stamping are RCW 18.210.130 and WAC 196-33-400 & 500.

While these laws detail the requirements of stamp use, a good general rule is that professional stamping and signing of designs, plans or documents should occur whenever the documents are submitted for review or approval. This would include all documents in which your professional judgments and decisions are offered. The following are provided as examples:

- Site/Soil reports
- Final designs, including calculations, drawings and specifications
- Construction Reports
- As-builts when required of the licensee

Preliminary documents, designated as such, must be stamped but are the only documents that do not need a signature.

To the left is a copy of the approved design for On-Site Wastewater Treatment System Designer Licensing stamp:



Legal Definitions



1. The On-site Wastewater Treatment System Designer

The Washington statute (RCW 18.210.010 (3)) defines the professional Designer as:

“Designer,” “licensee,” or “permit holder” means an individual authorized under this chapter to perform design services for on-site wastewater treatment systems.”

2. On-Site Wastewater Treatment System Design

The Washington statute (RCW 18.210.010 (8)) defines the practice of On-site wastewater design as:

“the development of plans, details, specifications, instructions, or inspections by application of specialized knowledge in analysis of soils, on-site wastewater treatment systems, disposal methods, and technologies to create an integrated system of collection, transport, distribution, treatment, and disposal of on-site wastewater.”

3. Professional Engineer

The Washington statute (RCW 18.43.020 (2)) defines Professional Engineer as:

“...a person who, by reason of his or her special knowledge of the mathematical and physical sciences and the principles and methods of engineering analysis and design, acquired by professional education and practical experience, is qualified to practice engineering...”

Roles & Responsibilities



1. Statement of Purpose - The Design Professional:

An on-site wastewater treatment system Designer, whether a licensed Designer under RCW 18.210 or a licensed Professional Engineer under RCW 18.43, is engaged in creating an onsite wastewater treatment system design to ensure that the systems they design:

- are capable of performing to treatment standards appropriate for the locations where they are used,
- have been developed in consideration for the needs of the client for reliability and durability,
- conform with applicable regulations and codes as well as to the standard of care of the industry, and
- are designed ethically, competently and with due diligence.

A Designer is responsible for correctly characterizing the site conditions and wastewater. He or she must be able to intelligently apply professional judgment in order to prepare a design that addresses the limitations of the property in consultation with the client and with consideration of the ability to install the system. The design must also be consistent with adopted regulatory standards and prepared in a manner understandable by others. The Designer must be able to observe the construction of the onsite sewage system and verify that it is consistent with the approved design, evaluate the significance of any deviations from the

design, and document in a clear format his or her findings. The Designer must have a good understanding of the standards and workings of the system being designed and have the ability to trouble shoot malfunctioning systems.

2. Statement of Purpose - The Local Health Jurisdiction Regulator:

The role of the health jurisdiction, with respect to the practice of on-site sewage system design is to apply and enforce standards that provide basic public health protection. Standards may be proscriptive or performance based, but must be sufficient to assure that surface and ground water will not become contaminated at the density that on-site sewage systems will be used.

It is the regulator's responsibility to ensure that adopted standards are being followed in practice. This may involve the review of site conditions and plan review to ensure that the system technology or treatment standards selected in the design are appropriate for the limitations presented on the site. It also involves fact finding and reporting to appropriate authorities when practitioners are not performing to industry or regulatory standards. The decision to issue a permit is an affirmation that the design conforms to or meets the intent of adopted regulatory standards.

Areas of Responsibility for the Design Professional



Following is an outline of design considerations and general areas of responsibility for licensed professionals designing on-site wastewater treatment systems. It is formatted to follow a step-by-step process a design professional might use for a typical on-site design project. However, it is recognized that in practice the design professional may approach different projects from a different order than presented in this document. The subjects listed represent general areas and are not all-inclusive. Local requirements and processes will not necessarily be consistent with this information, and may require more from the design professional than is indicated here. Successfully obtaining a permit for design is not the sole measure of determining whether the licensed professional has met their obligation, rather the true measure is whether due consideration was given to influences affecting the design and success of the project. While not all projects will require the same depth of work, the design professional should be able to justify any and all decisions or omissions when called upon to do so.

1. Gathering Existing Information

The practice of design includes due consideration of relevant information about the site and proposed project.

Thorough research is the essential “first step” that an on-site design professional must incorporate in their service delivery. Analyzing what information is needed, where to obtain that information and what impact the information has on the intended project is a process that a successful design is based upon. Whether it comes from the client, a neighbor, public agency, contractor or other design professional, a Designer holds final responsibility to ensure that the research and the reliability of the data satisfies the standard of care.

The following are typical tasks a design professional will consider when gathering existing information:

Information from Client

- Obtain history of past submittals or proposals for new systems
- Obtain history of system components for existing systems (e.g., problems, inspections, type and location)
- Obtain legal lot information (e.g., address, tax information)
- Obtain relevant property historical data
- Obtain a description of user’s habits and characteristics
- Obtain user’s current and future plans for improvements or site development
- Obtain information on potable water sources
- Obtain dwelling specifics (e.g., dimensions, room types)

Information Gathered from Other Sources

- Verify plats, surveys, and legal descriptions from county records
- Identify potential problems regarding zoning, land use, or other critical areas (e.g., wetlands, flood zone, steep terrain)
- Identify setback requirements
- Gather soil and geohydrologic information on the subject area
- Determine well locations
- Investigate relevant characteristics of adjacent sites
- Determine applicable regulations
- Verify availability of public sewers or sewage systems

2. Site Evaluation

The practice of design includes the inspection and analysis of the physical characteristics and limitations of the subject site and the surrounding areas to determine the suitability for design. The site evaluation may be general in nature, leading to generalized conclusions about future development, or specific to a design project.

The overall site evaluation takes place at the site usually after other recorded information has been gathered.

For design purposes the process starts with a physical review of the site, identifying the property lines and corners and taking visual note of the lay of the land, i.e., slopes, cuts or banks, surface water, drainage (on and off the property), vegetation (type and location), open spaces, potential building sites, existing improvements, and soil absorption areas.

Following consultation with the client, a subsurface soil investigation is conducted and soil logs are prepared in the areas identified as potential soil absorption drainfields. If

the soils in these areas are not feasible for an on-site wastewater treatment system (*see 3. Soil Evaluation*), additional sites must be investigated and established.

Once the site review is completed, initial mapping may take place.

Relative to the design, initial mapping includes establishment of horizontal and vertical controls, locating existing site features and collecting topographic features and other site conditions that may affect the design and function of the system. In the context of this document, the term “mapping” is not intended to include work restricted to the licensed practice of surveying. It refers to the collection of data points within defined property boundaries established by others.

In addition to evaluating site characteristics for new development, site evaluation may include the process of a designer determining the nature and probable cause of malfunction or failure of an existing system. It should be clear that not all systems that exhibit signs of malfunction are actually in failure, and as a result, the designer has a responsibility to use care in determining an action plan.

Whenever possible, diagnosis of the system malfunction or failure should occur prior to preparing a replacement system design. When evaluating a malfunctioning system the designer should, at a minimum, consider soil, hydraulic, biological and chemical factors. Establishing the cause of a system malfunction may require the designer to develop a detailed history of the system. If historical information is not available, the designer may have no option but to forego an attempt to determine the cause of failure and simply develop a design as though for a new system.

The following are typical tasks a design professional will consider when conducting a site evaluation:

- Identify existing structures (house and outbuildings)
- Identify components of existing systems
- Verify location of potable water source
- Verify existing property dimensions, property lines, and corners
- Assess quantity and type of vegetation on property
- Evaluate topography of the site and adjacent properties
- Identify surface waters, ground waters, and assess drainage (geohydrology)
- Identify location of utilities and easements
- Identify the most appropriate location for drainfields
- Identify potential construction pathways
- Establish and record horizontal and vertical control

3. Soil Evaluation

The practice of design includes the inspection and analysis of the physical characteristics and limitations of the site soils to determine the suitability for design.

The practice of design includes gathering preliminary soil data, field inspection, recording and testing, and sampling for laboratory analysis of the physical characteristics and limitations of site soils. The information is used to determine suitability for an on-site system, and the most appropriate type of treatment and dispersal system.

Preliminary data gathering includes collection of available background information on the proposed drainfield site such as soil survey maps and/or previously prepared geotechnical reports or soil logs. Direct soil evaluation

includes visual and tactile inspection of soil profiles at the site and may also include field tests and/or sampling for laboratory analysis.

An appropriate number of test pits must be examined in order to prepare a detailed description of the soil profile (usually at least three to five pits for residential systems) in representative locations in both the proposed primary and reserve drainfield areas. Characteristics to be determined include soil texture, structure, and level of consistency, color and color patterns, root penetration, percent of gravel and moisture content.

The evaluator must also be able to identify any restrictive layers (clay, bedrock, hardpan, and redoximorphic features that may indicate seasonal saturated conditions and affect drainage or aeration). The evaluator may also conduct field tests or collect samples for laboratory analysis as appropriate such as sieve analyses, hydrometer tests, bulk density test, etc. The evaluator should use commonly accepted nomenclature to document findings and justify decision-making for design purposes and for future use by the regulator and installer.

The above information is analyzed to verify site feasibility, to determine a suitable loading rate for drainfield sizing and to select the most appropriate and long-term cost effective system that matches owner needs to site conditions and limitations.

The following are typical tasks a design professional will consider when evaluating site soils:

- Determine the location and number of test holes needed
- Excavate test holes
- Visually inspect the soil
- Complete logs of soil sampling
- Determine soil classifications and types
- Determine depth of suitable unsaturated soil
- Determine and locate restrictive or impervious layers

- Determine location and nature if fill material is present
- Determine depth of seasonal water table
- Compare soil test results to previously gathered soil and geohydrologic information

4. Preliminary/Conceptual Design Documentation or Site Evaluation Report

The practice of design includes the compilation, documentation and interpretation of all the information gathered.

A site evaluation report is an accumulation of all the information gathered to this point. A preliminary design document is a simplified conceptual design without detailed plans and specifications, final calculations, etc., based upon information from the site evaluation report. The preliminary design provides the most important information needed to verify that a proposed on-site design meets owner requirements, site conditions and regulations.

The purpose of a site evaluation report is twofold:

- To document the cognitive process used to analyze the data gathered and arrive at the conclusions and intended recommendations.
- As a tool to assist the Designer in preparing the most cost effective design that meets regulations and owner requirements by matching the right system to site and soil conditions and help assure proper system layout and configuration (for drainfield sizing and location, accounting for any existing structures, landscape features, slope, contours, elevations, setbacks, lateral water movement (linear loading), etc.).

The purpose of the preliminary design is to provide:

- a brief written report of findings or narrative describing the design parameters, site and soil characteristics, and the proposed treatment and disposal concept.
- a dimensional or scaled drawing of the lot showing the proposed layout/configuration of the treatment and disposal components in relation to property lines, easements, any existing or proposed structures, water system components, other known utilities, vegetation, surface water, or any other limiting site conditions.
- all major system components including primary and reserve disposal areas (for new construction) along with any needed setbacks, separations, etc.
- potential construction pathways for both drainfield installation and related site improvements, so that the existing or proposed on-site system area and related setbacks can be protected from damage during construction.

This document may also be provided to the regulator as a preliminary check to assure the design is viable, meets regulations and can be approved.

The following are typical tasks a design professional will consider when forming their preliminary/conceptual design documentation:

- Prepare a site sketch
- Prepare a written report of findings

5. Design

The practice of design includes a deliberate process that takes the data collected through the Information Gathering, Site Evaluation, Soil Evaluation and the Preliminary/Conceptual Design Documentation phases to create the construction documents that will be used for review, permitting, construction, record drawings and O&M.

This phase of the design practice consists of analysis of the site data, calculations, evaluation and selection of applicable treatment methods, preparation of the design drawings, specifications, reports and the permitting process. It is important to note that a complete design is one in which drawings, narratives, forms, calculations, catalog cuts, photos and other data, including detailed equipment and installation specifications are logically assembled into a cohesive unit that provides individuals who may have never seen the site with sufficient information to grant a construction permit and install the design without the need for assumptions, completion of any design tasks by the installer or additional input from the Designer.

If the site has been developed, all structures, utilities and ingress & egress pathways should be identified. Property lines and corners and horizontal distances from improvements to proposed system must be verified. The source of potable water and distribution lines must be identified. If there is an existing on-site wastewater treatment system, all components including the reserve area should be flagged. The condition of each component must be recorded and verify that all minimum setbacks can be met.

The following are typical tasks a design professional will consider when preparing their design:

Location

- Identify location of system components
- Establish a benchmark
- Establish system component elevations
- Establish horizontal and vertical control

Type of System

- Determine type of treatment and disposal system
- Estimate daily flow requirements
- Determine wastewater strength requirements

- Determine disposal component configuration (e.g., drainfield, mound, etc.)
- Determine treatment component configuration (e.g., septic tank, sand filter, ATU etc.)

Final Design Preparation and Application Submittal

- Consult with property owner regarding final design components
- Produce a detailed drawing for the site, including property lines, structures, easements, topographical features, vegetation, etc.
- Produce detailed drawing for system components.
- Establish site preparation requirements
- Document decisions made regarding system location and features
- Determine total dynamic head pressure requirements, as required
- Prepare specifications for equipment/materials based on calculations
- Prepare and submit permit application package

6. Construction Management

The practice of design includes pre-construction site status verification, pre-installation site preparation and component/material verification, and final inspection.

Construction management can be divided into three basic phases. Each phase is meant to offer assurance that what has been designed and installed will meet the Designer's intentions, specific codes/environmental concerns and user needs.

The first phase has been defined as the "Preparation" phase and includes functions such as conducting a pre-construction conference, assessing post design site character changes that might impact the system installation and final use, and the act of design modification based on that assessment.

The second phase is defined as the “Project Execution” phase. This phase generally involves Designer verification of system components, area of component placement, component elevation, quality of materials and system hydraulic performance. Verification of cover soil depth, landscaping and finished drainage characteristics are the final function of this process and can be one of the most important considerations of this phase.

The third phase of construction management is defined as the “Final Inspection” phase. During this phase the Designer makes the final determination of how well the design and the installation match. The amount and value of variations in the installation from the approved plan and how that might influence or modify the overall function and performance of the system is evaluated. A final report detailing those changes, if determined to be significant, is generated by the Designer and passed on to the appropriate parties.

The following are typical tasks a design professional will consider when performing construction management:

Preparation

- Conduct on-site pre-construction conference
- Assess changes in conditions (e.g., soil, topography, vegetation) that may have occurred since design work was completed
- Modify design components, if appropriate

Project Execution

- Verify designed treatment components and materials (e.g., tanks, ATU’s, floats, filter, etc.)
- Verify designed disposal site preparation (e.g., location, orientation, elevations, soil,)
- Verify designed component construction and materials (e.g., drain rock, squirt height, etc.)

- Functional test of system
- Verify designed component finished conditions (e.g., cover, elevations, drainage, landscaping)

Final Inspection

- Determine consistency between design and installation
- Report inconsistencies

7. Post Construction Activities

The practice of design includes the successful transfer of system responsibilities to the system operator and the attainment of closure of the permit and occupancy process.

Post construction activities include accurate documentation of all of the system components and the system location. The post construction activities phase includes creating as-built drawings, providing the owner with operations and maintenance manuals and fulfilling the requirements of the permit as issued by the local health jurisdiction.

Upon completion of construction of an onsite sewage system the Designer should prepare a scaled and dimensioned as-built drawing. This drawing is intended to record in detail the system as it was actually built including where appropriate such operational data that may be necessary to facilitate future O&M.

As part of or attached to the as-built drawing, the Designer should record that the materials and equipment meet the specifications that were established in the design. Where changes were made the Designer should verify that those changes are consistent with the design intent and are of similar or equivalent specification. When pumps, electronic controllers, hydraulic controllers and other devices with operating parameters that are determined and set by the Designer, the Designer should record those settings.

In addition, an operational test should be conducted to assure system is operating within the design parameters.

The Designer should prepare an O&M manual intended to provide the user/operator and the O&M technician with information about the system necessary to operate and maintain it. The O&M technician and user/operator should be able to follow the line of reasoning used when the system was designed.

The O&M manual should include design and measured performance data for equipment installed, timer settings, draw-down depths, gallons per inch of tank and actual pump delivery (gpm).

An operation and maintenance manual should explain the assumptions made to establish the design parameters and should include at least the following:

- A list of system “Do’s & Don’ts”.
- A list of relevant contacts related to system components and ongoing operations.
- An emergency number to call.
- A discussion listing the responsibilities of the user/operator.

The Designer should walk the user/operator through the entire system and provide the manual.

The following are typical tasks a design professional will consider when conducting post construction activities:

Documentation

- Develop a detailed as-built drawing
- Document all system components (e.g., equipment type and model, system settings)

Operations and Maintenance

- Prepare owners operations and maintenance manual
- Provide training on ongoing operations for the owner
- Provide contact information for follow up, if needed
- Perform operational assessment (e.g., troubleshooting) for an existing system
- Document system operating parameters
- Identify frequency and type of monitoring (e.g., providing checklists)